Scheme and Syllabus of
B.E. MBA (Mechanical Engineering)
3rd to 10th Semester Examination
2013-14
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There will be four weeks vocational training after 4th Semester either in the College or in the Factories approved by the Principal / Head of the Department.

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There will be four weeks Vocational Training in the manufacturing concerns after 6th semester

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Total: 900

1. The project will continue for a period of two weeks after 8th semester examinations.
2. The examination will be conducted in S.I. system of units.
3. In case of elective subject where there is no lab, project work/ seminar may be given.
4. The number of elective subjects to be offered in the 8th semester will be announced by the Branch Co-ordinator depending upon the availability of staff.
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<tr>
<th>Sr. No</th>
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Students are offered 4 specializations: marketing, human resource (HR), information technology (IT) and finance. Students have to select 2 specialization areas. They will then study 3 subjects.
In each of the specialization area they select, the students will thus study 8 subjects in IX sem (3 + 3 + 2 compulsory).

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<tr>
<th>Sr. No</th>
<th>Course No IBM-</th>
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In the X semester the students will study 2 subjects each in the area of specialization areas they have selected in the IX semester. The students will have 7 subjects in X sem (2+ 2 + compulsory +seminar +minor project)
SYLLABUS FOR
B.E. MBA (MECHANICAL ENGINEERING)
THIRD SEMESTER

MEC-301: APPLIED THERMODYNAMICS-I

Part A

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

1. Reciprocating Air Compressors: (5)

2. Steam Generators: (5)

3. Boiler Draught: (4)
   Classification, Natural, Forced and Induced draught, Comparison. Estimation of height and diameter of chimney condition for maximum discharge, Chimney efficiency, Draught losses. Balanced draught, Power required to drive fan.

4. Performance of Steam Generators: (3)

Part B

5. Nozzles and Diffusers: (4)

6. Impulse Steam Turbine: (5)
   Principle of operation of simple impulse turbine, General description, compounding of impulse turbine, pressure and velocity compounding. Velocity diagram and work done.
Combination of velocity diagram. Effect of blade friction on velocity diagram. Most economical ratio of blade speed to steam speed for single stage and multi stage impulse turbine, Blade efficiency and overall efficiency. Reheat factor and condition curve.

7. Reaction Turbine:

Degree of reaction, velocity diagrams, blade efficiency and its derivation, calculation of blade height etc. Requirement of an ideal working fluid, Methods of attachment of blades to turbine rotor, losses in steam turbine, Labyrinth packing and governing of steam turbine. Blade materials.

8. Condensers:


Books Suggested
2. Yunus A. Cengel and Michael A. Boles, "Thermodynamics: An Engineering Approach,"
   McGraw-Hill Higher Education
6. V.P. Vasandani and D.S. Kumar, "Heat Engineering", Metropolitan Book Co (P) Ltd
Note: Eight questions to be set in all. Candidates are required to attempt a total of five questions, selecting at least two questions from each part.

**PART – A**

1. **Thermal Stresses:**

   Longitudinal stresses in fixed bars of uniform cross-section, temperature effect in compound bars, stress calculation due to combination of longitudinal and temperature stresses.

2. **Stresses and Strains at an oblique plane:**

   2-D stress and strain systems, derivation and application of formulae in 2-D stress and strain system for: Normal stress and strain on any place, shear stress and strain on any plane, principal stress and strain, maximum shear stress and strain, position of principal planes, position of maximum shear stress/strain planes, Mohr’s stress circle.

3. **Strain Energy:**

   Strain energy, strain energy due to gradually applied loads (axial, shear, bending moment and torque), Strain energy of dilation and distortion due to three principal stresses, Stress due to suddenly applied and impact loads.

4. **Theories of Elastic Failures:**

   Maximum principal stress, maximum principal strain, maximum shear stress, total strain energy and distortion energy theories. Comparison and graphical representation of these theories for 2-Dimensional stress condition, Application of these theories of failures to 2-D stress problems such as (i) Combined bending and torsion and (ii) Combined torsion and axial loads

**Part B**

5. **Distribution of Shear Stresses in Beams:**

   Derivation of general formula and its application to rectangular, triangular, T, Circular and hollow circular sections, Simple Problems

6. **Slope and Deflection:**

   Relationship between bending moment, slope and deflection, Moment area method, Method of integration, Macaulay’s method, Castigliano’s theorem and Maxwell’s theorem of reciprocal deflection (proof not required for these theorems)

   Use of all these methods to calculate slope and deflection for cantilever & simply supported beams with or without overhang under various types of loads and its combinations

7. **Fixed Beams:**

   Calculation of deflection, fixing moment and reactions by Macaulay’s double integration methods for beams;
i. Fixed at one end and simple supported at other end with or without overhangs
ii. Fixed at both ends:

Under following loads:

i. Uniformly distributed load (UDI)
ii. Uniformly varying loads.
iii. Concentrated loads (one, two, or three etc.).
iv. Combination of the above loads.

Bending moment and Shear Force diagrams for the above cases.

Books Suggested:

1. Strength of Materials (SI Units), 3/e  
   G. H. Ryder, MacMillan India Ltd., 1969
2. Mechanics of Materials (SI Units), 5/e  
   R. C. Hibbeler  
   Pearson Education India Pvt. Ltd., 2007
4. Strength of Materials  
   J. M. Gere, B. J. Goodno  
   Cengage Learning India Pvt. Ltd., 2009
   S. Timoshenko, CBS Publishers, 1986
   E. P. Popov, PHI India Pvt. Ltd., 2009
   Riley, Wiley India Pvt. Ltd., 2009

MEC-352 Mechanics of Materials-1 Laboratory

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</table>

List of Experiments:

1. Study of wood testing machine and performance of various tests on it.
2. Determine the stiffness of a spring on a spring tester.
3. Determine the hardness of various materials with Brinell, Vickers, Pyramind and Rockwell hardness testing.
4. Study of creep testing machine.
5. Study of Fatigue testing machine and perform fatigue test on various materials.
7. Determine strain aging phenomenon of given metal.
8. Determine and plot shear stress distribution in various beams through interactive C/C++ computer programming or using MATLAB.
9. Determination & plot various cylindrical and spherical shells parameters through interactive C/C++ computer programming or using MATLAB.
MEC-303: THEORY OF MACHINES-I

Note: The examiner shall set 8 questions i.e., 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

PART-A

1. **Basic concepts:**  
   Kinematics and Dynamics of Machines, Mechanism, Pairs, Inversions of slider crank chains, Degrees of freedom, Kutzbach’s equation. Grubler criterion and Numerical problems

2. **Velocity and Acceleration:**  
   Basic concepts of machines, link, Mechanism, Kinematic chain, relative motion of parts of Mechanism, displacement, velocity, acceleration diagrams of all basic mechanisms including quick return motion mechanism. Advance problems on velocity diagrams (relative velocity method, instantaneous center method). Acceleration diagram. Coriollis component. Advanced problems involving their application and torque calculation.

3: **Kinematics Synthesis of Mechanism.**  
   Movability, Number synthesis, Frudensteins’s equation. Chebyshev spacing of precision points, Two and three position synthesis of Four-bar mechanism and slider crank mechanism, Overlay Method, Block’s method, Transmission angle, Limit position and Least square techniques.

4: **Flywheel and Turning Movement Diagrams:**  
   Turning moment and crank effort diagrams for steam and I.C. engine, dynamics of simple horizontal and vertical engine. Fluctuation of speed, co-efficient of fluctuation of speed and energy.
   Simple problems on turning moment diagrams and the determination of size of a flywheel taking centrifugal stresses into consideration.

5: **Force Analysis:**  
   Equations of equilibrium, Couple, equilibrium of three force and four force systems, Free body diagrams, Forces on slider crank mechanism, quick return mechanism, four bar mechanism and slider crank mechanism with friction at turning pairs and numerical problems.

PART-B

6: **Friction**  
   Efficiency of inclined plane, Friction in V-threads, screw-jack, pivots and collars plate and cone-clutches, Power lost in friction, friction circle and the friction axis of a link.

7: **BELTS, ROPES and CHAINS.**  
   Materials, type of drive, idle pulley, intermediate or counter shaft pulley, angle and right angle drive, quarter turn drive, velocity ratio, crowning of pulley, loose and fast pulleys, stepped or cone pulleys, ratio of tensions on tight and slack sides of belt. Power transmitted by belts with consideration of creep and slip, centrifugal tension and its effect on power transmitted. Use of gravity idler, flat, V-belts and rope material, Length of belt, rope and chain drive, types of chains.

8: **Brakes and Dynamometer:**  
   Types of brakes, principle of friction brakes, band, band and block, internal expanding shoe brakes, simple Problems of these brakes, description of vacuum brake, types of dynamometer, measurement of power by Prone brake and rope brake dynamometer, belt
transmission dynamometer, Heenan and Froude’s Hydraulic dynamometer, Bevis- Gibson’s flash light torsion dynamometer.

9: Governors. (4)

BOOKS SUGGESTED.


MEC-353: THEORY OF MACHINES-I

List of Experiments

1. (a) Find the moment of inertia of a given body with the help of Fly-wheel.
   (b) Calculate the minimum possible periods of oscillation if the point of suspension may be moved.
2. Study and draw the sketches of difference inversions of single slider chain and double slider crank chain.
3. Find the coefficient of friction for different belt material on a cast iron: Pulley.
4. To perform the various practical on Universal Governor Apparatus.
   (a) Determination the characteristics of sleeve position against speed for all governors.
   (b) Determination the characteristics curves of radius of rotation against controlling force for all governors.
   (c) To study the effect of varying the mass of central sleeve for porter and proell governors.
   (d) To study the effects of varying initial spring compression for Hartnell Governor.
5. Study the working and construction of D-slide valve and piston valve. Discuss their relative merits.
6. Study and sketch the Stephenson link motion and the Gooch link motion and describe their relative merits.
7. Study and sketch the Walschaert valve gear.
MEC-304: MACHINE DRAWING

1. Symbols of standard tolerances, machining symbols, Surface finish and welding symbols
2. Free hand sketching of shafts, splined shafts, keys and keyways
3. Form of screw threads, conventional representations of single and multi start threads, riveted joints, bolts, studs, screw, locking devices, pipe and pipe fittings. (3 Sheets Min.)
4. Cotter joints, knuckle joints. Pulleys and brackets. (2 Sheets Min.)
5. Flange and muff coupling. Pin type flexible coupling; claw Coupling and cone friction clutch. (2 Sheets Min.)
6. Footstep bearing, Plummer block, swivel bearing (2 Sheets Min.).
7. I.C. Engine Piston, connecting rod, spark plug, atomizer, Fuel injection pump. (2 Sheets Min.)
8. Machine Tool Parts: Tail stock. (1 Sheet Min)
9. Miscellaneous: Screw jack, drill press vice, valves (1 Sheet Min.)

Note: Students should develop the understanding of study of drawing with reference to manufacturing processes, projections, assembly drawings and should be able to draw simple assembly drawings and projections of simple machine parts. The syllabus given above indicates the broad outlines and the scope of subject to be covered. Teacher concerned may take suitable examples to make the student understand the topic.

Book Suggested


MEC-354: MACHINE DRAWING PRACTICAL

The candidates will be required to make minimum of 15 drawing sheets covering syllabus MEC-304 using the software such as AutoCAD, Pro-E and Inventor on the following topics as per B.I.S. SP46-2003 for General Engg. Drawing. First angle method of Projection should be used.
Note: The examiner set 8 questions i.e., 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

PART-A

1. Fundamentals of Engineering Materials: Metal (Cast Iron, Pig Iron and Steel) and Alloys (Aluminum, Copper, Magnesium, Nickel and Steel), Non-ferrous materials (Aluminum, Cobalt, Copper, lead, Magnesium, Nickel, Tin and Zinc) and Non-Metal, Mechanical behavior, Physical properties, Manufacturing properties, Testing, Applications of Engineering Materials.

2. Metal forming
(a) Definition and classification of metal forming, type of rolling, hot rolling, rolling mills, forging, smith forging, drop forging, machining forging and press forging, defects in forging.
(b) pipe and tube manufacture, extrusion, hot spinning, drawing and cupping, piercing, cold rolling, wire drawing, rod and tube drawing, metal spinning, coining, embossing and shot peening, sheet metal working operations, piercing, blanking, bending and drawing, punch and die setup, presses.

PART-B


4. Welding: (a) Definition and classification, types of welded joints, weldability, Gas welding: oxy-acetylene welding, equipment, lighting up, type of flames, welding techniques, welding of cast iron, flame cutting, advantages and limitations Electric arc welding: principle, metal transfer in arc welding, straight & reverse polarity in AC & DC, relative merits & demerits, various electric arc welding processes, coding & selection of welding electrodes.
(b) TIG, MIG welding processes, electric resistance welding, spot, butt, seam, upset, projection & high frequency resistance welding, thermit welding, brazing and soldering, description of special welding techniques, choice of process for welding, defects in welding joint, their causes and remedies.

Recommended Books

<table>
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<tr>
<th>Title</th>
<th>Author(s)</th>
<th>Publisher</th>
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<tr>
<td>Workshop Technology Vol. I &amp; II</td>
<td>Hazra Chowdhry</td>
<td>Media Promotors</td>
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<tr>
<td>Manufacturing materials &amp; process</td>
<td>Lindberg</td>
<td>Prentice Hall</td>
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<td>Manufacturing processes</td>
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<td>Laxmi Publications</td>
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<tr>
<td>Production Technology</td>
<td>R K Jain</td>
<td>Khanna</td>
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</table>
MEC-355: MANUFACTURING PROCESSES

List of Experiments

1. Experimental work pertaining to study & use of sand testing equipment
2. To prepare a mould & do casting.
3. Study of casting defects.
4. To prepare a lap joint using- electric arc welding.
5. To prepare a joint using- gas/spot welding.
6. Application of MIG/TIG welding

AS-301 Math – III

Paper Code: AS-301 Maximum Marks: 100 Time of examination: 3hrs.

Course Duration: 45 lectures of one hour each.

Note for the paper setter: Total of 8 questions may be set covering the whole syllabus. Candidate will be required to attempt any 5 questions selecting at least two from each part.

Syllabus:

PART A


(8 Lectures)


(7 Lectures)

Eigen values, eigen vectors, Cayley – Hamilton theorem (statement only). Similarity of matrices, Basis of eigenvectors, diagonalization (Scope as in Chapter 7, Sections 7.1, 7.5 of Reference 1).

(7 Lectures)

PART B

Complex Functions: Definition of a Complex Function, Concept of continuity and differentiability of a complex function, Cauchy – Riemann equations, necessary and sufficient conditions for differentiability (Statement only). Study of complex functions: Exponential function, Trigonometric functions, Hyperbolic functions, real and imaginary part of
trigonometric and hyperbolic functions, Logarithmic functions of a complex variable, complex exponents (Scope as in Chapter 12, Sections 12.3 – 12.4, 12.6 – 12.8 of Reference 1).

(8 Lectures)

Laurent Series of function of complex variable, Singularities and Zeros, Residues at simple poles and Residue at a pole of any order, Residue Theorem (Statement only) and its simple applications (Scope as in Chapter 15, Sections 15.1 – 15.3 of Reference 1).

(7 Lectures)

Conformal Mappings, Linear Fractional Transformations (Scope as in Chapter 12, Sections 12.5, 12.9 of Reference 1).

(8 Lectures)

References:

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A


Perception: Factors Influencing perception- perceptual selectivity Linkage between perception and Individual decision making-ethics in decision making.

Personality and Emotional Quotient (EQ): The meaning of personality, its determinants-personality Traits; The big five model, Emotional quotient.

Motivation & Morale: Concepts to Applications.


Part-B


Power & Politics: Definitions of Power-Distinction between Power and Authority-Bases of Power-Power Structure and Block, Impression management-political behavior in organizations.

Conflict & Inter Group Behaviour& Collaboration: Sources of Conflict, Intra-individual Conflict, Interpersonal Conflict, Inter-group behavior and Conflict, Organizational Conflict, Negotiations-Approaches to Conflict Management-Collaboration.


Text Books:
1. Behavior in Organizations ,Greenberg, Baron , PHI

References:
3. Organization Behavior ,Fred Luthans , TMH
MEC-401: APPLIED THERMODYNAMICS-II

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Part-A

1. Thermodynamics of I.C. Engines: (8 hrs)

   1.2 Combustion in SI Engines: Combustion in S.I. Engines, Combustion phenomenon, flame speed, ignition delay, effect of engine variables on Delay Period, abnormal combustion, preignition, detonation, effect of various engine parameters on detonation, effect of detonation on engine performance and methods employed to reduce detonation. Combustion chamber design for S.I. Engines

   1.3 Combustion in CI Engines: Combustion in C.I. Engines, Combustion phenomenon, Delay period, Diesel Knock, CI engine combustion chambers, High speed cinematography for combustion visualization- a brief note.

   1.4 Fuels: rating of SI Engines fuels; cetane ratings of CI Engine fuels, Octane and Cetane numbers

   1.5 Performance of IC engines: Performance curves of C.I. and S.I engines. Overall IC engine performance (engine sizing, mean effective pressure (MEP), power and torque) Effect of compression ratio and of air fuel ratio on power and efficiency of an engine: Variation of engine power with altitude, supercharging, its advantages and its applications, types of superchargers (2)

2. Gas Turbines: (5 hrs)
   Introduction; Classification of Gas turbines: on the basis of system of operation and on the basis of combustion (at constant volume, or at constant pressure). Thermodynamics of constant pressure gas turbine cycle: calculation of net output, work ratio and thermal efficiency of ideal and actual cycles; cycle air rate, temperature ratio; effect of change in Sp. heat and mass of fuel on power and efficiency. Operating variables and their effects on thermal efficiency and work ratio Thermal refinements and their effects on gas turbine cycle i.e. gas turbine cycle with regeneration, inter cooling and reheating; multistage compression and expansion, pressure losses in heat exchangers and combustion chambers. Comparison of gas turbine with a steam turbine and I.C. engine. Field of application of gas turbine.

3. Aircraft Propulsion using gas turbine : (5 hrs)
Principle of propulsion thrust work and thrust power, propulsion efficiency, Overall thermal efficiency, specific fuel consumption. Intake and Propelling nozzle efficiencies. classification and comparison of ram jets, turbojets, turbo props, pulse jets and rockets Thermodynamics cycle analysis and efficiencies of propulsive devices of turbojet engine, Advantages and disadvantages of jet propulsion over other propulsion systems. Fields of application of various propulsion units.

Part-B

4. Air Compressors: (1 hr)

Introduction: Classification of air compressors, Use of compressed air in industry, Complete representation of compression process on p-V and T-S coordinates with detailed description of areas representing total work done and polytropic work done.

4.1 Reciprocating Air Compressors: (5 hrs)


4.2 Rotary Compressors: (1 hr)

Introduction and general classification of rotary compressors: Comparison of rotary compressors with reciprocating compressor Stagnation and static values of pressure, temperature and enthalpy etc, for flow through rotary machines.

4.2.1 Positive Displacement Rotary Compressor: (2hrs)

Operation of positive displacement type of rotary Compressor like Roots Blower, Screw Compressor and Vane type Blower.

4.2.2 Centrifugal Compressors: (5 hrs)

Principle of operation, components of a centrifugal compressor. Complete thermodynamics analysis of centrifugal compressor stage, polytropic, isentropic and Isothermal efficiencies; work done and pressure rise. Velocity vector diagrams for centrifugal compressors and power calculation, preguide vanes and prewhirl, slip factor, power input factor; degree of reaction and its derivation, energy transfer in backward, forward and radial vanes; Pressure coefficient as a function of Slip Factor, efficiency and outgoing velocity profile from the impeller Non-dimensional parameters for plotting compressor characteristics; Surging and choking in centrifugal compressor Field of application of centrifugal compressor.

4.2.3 Axial Flow Compressors: (5 hrs)

Components of axial flow compressor and their arrangement, Principle of operation, velocity vector diagrams, thermodynamics analysis and power calculation; Factors affecting stage pressure rise work done factor; Degree of reaction and blade Efficiency and their derivation; Isentropic, polytropic and isothermal efficiencies Surging, choking and stalling in axial flow compressors. Characteristic curves for axial flow compressors, Flow parameters of Axial Flow Compressors like Pressure Coefficient, Flow Coefficient, Work Coefficient and Temperature rise coefficient, specific speed etc Comparison of Axial Flow Compressors with Centrifugal Compressors. Field of application of Axial Flow Compressors
BOOKS SUGGESTED

MEC-451: APPLIED THERMODYNAMICS-II

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List of Experiments.

1. Study of constructional details, cooling system, Lubrication system and Fuel Flow system of following Engines:
   Two stroke and four stroke Diesel engine.
   Four stroke Petrol Engine.
2. To find the mechanical and thermal efficiency of a Diesel Engine.
3. To draw the valve timing diagram for a Diesel Engine
4. Determination of B.H.P. at various loads (pump being given fixed setting not to be changed by governor) for a Diesel Engine/Semi Diesel Engine. Graphical representation of B.H.P. and torque with speed and its interpretation.
5. Trial of a Diesel Engine/Semi Diesel Engine. Determination of B.H.P., fuel consumption, I.H.P. and mechanical efficiency at various loads (speed parameters constant). Discussion on variation of thermal efficiency and specific fuel consumption with B.H.P.
6. To estimate the indicated power, friction power and mechanical efficiency of a multi cylinder petrol engine when running at constant speed under constant settings of a carburetor (Morse test).
7. To obtain a power consumption curve, thermal and mechanical efficiency curve for the four stroke diesel engine when tested over a range of power from no load to full load. Also to draw up the heat balance sheet for this range of output of power.
MEC-402: MECHANICS OF MATERIALS-II

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Part-A

1. Cylinders and Spheres

Thin cylindrical and spherical shells under internal pressure, Cylindrical shells with hemispherical ends, volumetric strain, Thick cylinders, Derivation of Lame's equations, Calculation of radial and longitudinal stresses and strains in thick cylinders. Compound cylinders: Hub shrunk on solid shaft

2. Rotational Stresses:

a. Rotating Rings. Derivation of formulae and calculations of stresses in rotating rings neglecting effects of spokes.
b. Rotating Discs- Calculation of stresses in rotating discs with central hole and without central hole. Disc of uniform strength, Temperature stress in uniform disc.
c. Rotating Cylinders- Derivation of formulae of stresses of rotating cylinders with or without central hole.

3. Columns and Struts:

Theory of columns, assumptions made in the derivation of Euler’s theory of column, Derivation of Euler’s equation for various end conditions, Rankine-Gordan’s formula, empirical formula for axially loaded column and their application.

Part-B

4. Bending of Curved Bars:

Curved beam theory and calculation of stresses in

a. Cranes and Chain Hooks
b. Rings
c. Chain links with straight sides of (i) circular (ii) Trapezoidal sections.

5. Springs:

a. Closed coiled helical springs
   i. Deflection of free end and strain energy under axial load
   ii. Rotation of free end and strain energy under axial couple
   iii. Combination of two closed coiled springs in (i) Series (ii) Parallel

b. Leaf Springs Deflection and bending stresses.
c. Open coiled Helical Springs Deflection and rotation of free end and strain energy under (i) Axial load (ii) Axial couple.
6. Analysis of Plane Frames: (4)

statically determinate and indeterminate, truss, frame, method of joints, simple problems

Books Suggested:

1. Strength of Materials (SI Units), 3/e  G. H. Ryder,  
   MacMillan India Ltd., 1969


   Pearson Education India Pvt. Ltd., 2007

4. Strength of Materials  J. M. Gere, B. J. Goodno  
   Cengage Learning India Pvt. Ltd., 2009

5. Strength of Materials vol. 1 & 2, 3/e  S. Timoshenko  
   CBS Publishers, 1986

   PHI India Pvt. Ltd., 2009

7. Mechanics of Materials, 5/e  Riley  
   Wiley India Pvt. Ltd., 2009
MEC-403: THEORY OF MACHINES-II

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Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Part-A

1. Inertia Forces in Mechanism
Determination of Forces and couples for a link, inertia of reciprocating parts, dynamically equivalent system. Analytical and graphical methods, inertia force analysis of basic engine mechanism (crank, connecting rod and piston etc). Torque required to overcome inertia and gravitational force of a four bar linkage.

Lower Pairs: -
Universal Joint: - single and double, calculation of maximum torque, Oldham’s Coupling, steering mechanism including. Ackermann’s and Davis steering mechanism. Mechanisms with lower pairs, pantograph, exact and approximate straight line motion, engine indicator, elliptical trammel.

Elementary knowledge of Kinematic synthesis of linkage by graphical and analytical methods.

Gyroscopes:-
Definition, axis of spin, axis of precession gyrooscope, gyroscopic couple, Gyroscope effect on the momentum of ships and vehicle, ship stabilization, stability of automobile and locomotive taking a turn.

2. Cams
Types of cams and followers, definition – basic circle & least radius, angle of ascent, dwell, descent & action. Displacement, velocity and acceleration diagrams for the followers with uniform velocity motion, simple harmonic motion, uniform acceleration and retardation, determination of maximum velocity, acceleration and retardation, analysis of follower motion for pre-specified cam profiles (tangent cams and convex cams).

Part-B

3. Balancing
Classification , need for balancing, balancing for simple and multiple masses, static and dynamic balancing – Primary and secondary balancing for reciprocating masses, inside and outside the cylinder locomotive balancing, swaying couple and variation of tractive effort, partial balancing of locomotive, balancing of the coupled locomotives and its advantages multicylinder in the line engines ( primary and secondary balancing conditions and their applications ), balancing of V-engines balancing machines (Static balancing M/c: dynamic balancing M/c, universal balancing M/c), introduction of balancing of the flexible rotors.

4. Gears
Toothed gears are their uses, types of toothed gears (spur gears, internal spur gears, spur &rack, bevel gears, helical gears, double helical gears, spiral gears, worm gears) definitions, pitch circle diameter, pitch surface, pitch point, circular pitch, diametric pitch, module pitch, addendum, dedendum, clearance addendum circle, outside diameter, internal diameter, dedendum circle, root diameter, base.

Base circle diameter, face and flank of tooth, fillet, angle of obliquity or pressure angle, path of contact, arc of contact, arc of approach, condition for correct gearing, forms of teeth, cycloid and its teeth variants epicycloids and hypocycloid, involute methods of drawing in involute and
5. Gear Trains
Types of gear trains single and compound epicyclic gear trains, Problems involving their applications, estimation of velocity ratio of worm and worm wheel, helical and spiral gears (Determination of No. teeth, spiral angle and efficiency).

Books Suggested:-


MEC-453: THEORY OF MACHINES-II

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1. Balance experimentally the given known force by introducing two weight (forces) parallel to the given force in two different planes and verify the result by analytical method.

2. Study the dynamic balancing machine & balance of a given body i.e. rotor by different methods.

3. Study the working and construction of the two types of steering gears. Draw neat sketches of each type and measure the angle in Ackerman's steering gear on different vehicles. Find the ratio of intersection of two arms from the front axle to the base of the vehicle.

4. Study the different types of mechanisms for tracing out the approximate straight line.

5. Find out the pressure distribution graph analytically & practically around a simple Journal bearing under variable load conditions on the shaft.

6. Balance as far as possible the known unbalance due to reciprocating parts by introducing two revolving weights in two different planes. Find out experimentally the fraction of the reciprocating pans which should be balanced so that the residual unbalance force may be least.

7. Find out experimentally the viscosity of the given fluid under varying conditions of temperature and pressure and draw the graphs - Viscosity Vs temp. and Viscosity Vs pressure.

8. Study the electrical dynamometer and find out the maximum torque of the given m/c.

9. Study the whirling speed apparatus and calculate the critical speed of the given System.

10. Find out the Co-efficient of friction between two given materials with the concept of vibration that is the effect of C. & frequency on co-efficient of friction.

11. To study the model of an Epicyclical gear train and to determine the speed ratio.

12. To study the various tooth profiles and to generate the involute profile on a blank.

MEC 404 - Numerical Analysis
Course Duration: 45 lectures of one hour each.

Note for the paper setter: Total of 8 questions may be set covering the whole syllabus. Candidate will be required to attempt any 5 questions selecting at least two from each part.

Syllabus:

PART A

Error analysis: Relative error, Absolute error, Round-off error, Truncation error, significant digits and numerical instability. (Scope as in Section 1.3, Chapter 1 of Reference 1).

(4 Lectures)

Transcendental and polynomial equations: Bisection method, Iteration Method based on first degree equation: Secant method, Regula-falsi method and Newton – Raphson methods, Rate of convergence of Secant method, Regula-Falsi method and Newton-Raphson Method. Bairestow’s method to find quadratic factor of a polynomial (Scope as in corresponding topics in Section 2.3, 2.5, 2.9 of Chapter 2 of Reference 1)

(8 Lectures)

Interpolation: Polynomial interpolation: Finite differences, Lagrange and Newton interpolation (Forward, Backward and Divided difference methods), inverse interpolation, Hermite interpolation (Scope as in corresponding topics in Section 4.1-4.3, 4.5 of Chapter 4 of Reference 1)

(10 Lectures)

PART B

Solution of Linear Systems: Gauss elimination method, Gauss-Seidel method, Cholesky’s Decomposition. Matrix inversion: Gauss-Jordan method. Eigenvalue problem: Bounds on Eigenvalues (Gerschgorin and Brauer theorems), Householder’s method for symmetric matrices, Power method (Scope as in corresponding topics in Section 3.2, 3.4, 3.6, 3.9, 3.11 of Chapter 3 of Reference 1).

(10 Lectures)

Numerical Integration: Trapezoidal Rule, Simpson’s 1/3 and 1/8 rule, Romberg integration, Newton – Coates formulae (Scope as in corresponding topics in Section 5.7, 5.8 of Chapter 5 of Reference 1).

(5 Lectures)

Numerical solutions of ordinary differential equations: Taylor’s series, Euler and Runge – Kutta methods. Finite difference methods for boundary value problems (Scope as in corresponding topics in Section 6.4 of Chapter 6 of Reference 1).

(5 Lectures)
Functional approximation: Chebyshev polynomials, Economization of power series, Least square approximation (Scope as in corresponding topics in Section 4.9 of Chapter 4 of Reference 1).

(3 Lectures)

References:

4. James B. Scarborough. Numerical Mathematical Analysis

MEC 454 -Numerical Analysis (Practical)

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Paper Code: MEC 454

List of practicals:

1. Interpolation
2. Numerical integration
3. Curve fitting
4. Approximations
5. Solution of simultaneous equations
6. Matrix manipulation
7. Eigen value problems
8. Solution of ordinary differential equations
MEC-406: FLUID MECHANICS

Note: - Eight questions to be set in all. Candidates are required to attempt five questions selecting at least two questions from each part. S. I. units to be strictly followed. Part A questions to be set from topics 1 and 2 while part B questions are to be set from topics 3 and 4.

Part-A

1. Incompressible Frictionless Flow:
   Potential flow: Uniform flow, plane source and sink flows, potential vortex flow, flow past half body, doublet, flow around circular cylinder, flow past rankine oval body and flow past a cylinder with circulation.

2. Incompressible Flow with Friction:
   Concepts of boundary layer, boundary layer parameters (thickness, displacement thickness, momentum thickness, energy thickness and shape factor), equilibrium equation, derivation of Navier stokes equations of motion for incompressible viscous (constant viscosity), laminar flow in rectangular coordinates and their applications, Prandtl’s boundary layer equations. Details of Blasius solution of Prandl’s boundary layer equations for flat plate (no derivations) and its applications for finding drag co-efficient, local skin friction coefficient, velocity distribution and drag force for flat plate.
   Von- karman –Momentum –integrals equation and its applications to laminar boundary layer with cubic profile. Application of Van- Karman Momentum integral equation to turbulent flow, boundary layer for smooth flat plate( Drag coefficients and drag forces), Boundary layer separation and prevention.

Part-B

3. Compressible- Isentropic Flow in Ducts (with negligible elevation changes)
   Propagation of small weak disturbance ( velocity of sound),Mach number and Mach cone, Continuity, momentum and energy equation for steady flow (one dimensional case only),Pipe flow problems , variation of stagnation parameters with mach numbers, compressibility correction factor, flow through nozzles & diffusers, changes of density, velocity, temperature, pressure & area with Mach number in a variable area flow duct, critical throat area related to Mach number, effect on convergent divergent nozzle parameters along the length of the nozzle with a variation of back pressure(discussion only).

4. Flow around immersed a Bodies,(Drag and Lift):

Books Suggested:
   1. Fluid Mechanics by Frank M White, Tata McGraw Hill
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part A
Information Technology (IT) : IT and society, IT infrastructure in India vis-à-vis developed nations (Telecommunication, Internet reach, PC, Broadband, Mobile Phones), IT applications in Healthcare & Education

System Investigation & Analysis, Networking: System Analysis & Design, Symbols used in modeling a business process, modeling different business processes, Networking concepts: Ethernet, IP addressing, Functioning of Routers, Bridges, hubs and switches in a network, Telecommunication (GSM, CDMA, Wireless and other new technologies)

Internet & Intranet: Functioning of Internet, Encryption & Digital signatures, Firewalls, Fraud on the Internet, Virus, Hacking & Denial of Service attacks, Intellectual Property Protection on the Internet, Intranet & security

Part B
E-Commerce & E-Governance: E-Commerce models, Intermediaries in E-Commerce, study of successful models like E-Choupal, E-Payments (E-Cash, E-Wallets) and major players in the area, Online Shopping, Revenue models for Online Shopping Portals, Web Auctions: study of portals like EBay, dealing with E-Waste, E-Governance in India, study of implementation of E-Governance in different states in India, scope for further improvement

New Technologies shaping the IT field: Study of new technologies like RFID, WiMAX, Bluetooth, GPS, smart cards etc and their implementation case studies
Online Banking: infrastructure and implementation of Online Banking in India, intermediaries in online banking
Cloud Computing: The business model of cloud computing, advantages and drawbacks of adopting the cloud computing framework.

References:
1. Business Data Communications & Networking, Jerry FitzGerald, Alan Dennis, John Wiley
2. Information Technology for Management: Improving Performance in the Digital Economy, Efraim Turban, Linda Volonino, John Wiley
SYLLABUS FOR
B.E. MBA (MECHANICAL ENGINEERING)
FIFTH SEMESTER

MEC-501: DESIGN OF MACHINE ELEMENTS-I

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Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part. Design data book is allowed in the examination hall.

PART-A

Introduction:
Scope and meaning of design with special reference to machine design, design process, codes and standards, economic aspects of design, safety aspects of design, introduction to computer-aided design and engineering. 4

General Design Considerations:
Mechanical behavior of materials, statistical nature of material properties, selection of materials. Concept of tearing, bearing, shearing, crushing, bending etc., stress and strength, stress concentration under static and dynamic loading, notch sensitivity, methods of avoiding stress concentration, fatigue loading, mechanism of fatigue failure, S-N diagram, endurance limit, endurance strength, design stresses for fatigue loading.

Fits, tolerances and surface finish 6

Fasteners:
Screws and bolts:
Design of screws, preloaded bolts, bolts subjected to shear, tension and torque, Design of eccentrically loaded bolted joints

Riveted Joints:
Types of failures of riveted joints, strength and efficiency of a riveted joint, design of butt and lap joints of a boiler, design of Lozenge joint, design of eccentrically loaded riveted joints

Welded Joints:
Types of failures of welded joints, strength of a welded joint, design of eccentrically loaded riveted joints

Design of cotter joint, design of knuckle joint 8

Shafts, Keys and Couplings:
Design of shafts subjected to torsional loading, bending loading, and axial loading and combined loading, design of shafts based on rigidity concept.

Types of keys, effect of keyway on strength of shaft, design of keys under different loading conditions.

Types of couplings, design of sleeve coupling, clamp coupling, slip coupling, Oldham coupling and pin type flexible coupling. 4

PART-B

Levers:
First, second and third types of levers, Design of hand lever, foot lever, bell crank lever.4

Pipes and Pipe Joints:
Design of pipes, design of circular, oval and square flanged pipe joints. 4

I.C. Engine Parts:
Design of Piston, cylinder and connecting rod. 4
**Power Screws:**
Various types of threads used in power screw drives, conditions for self-locking and overhauling, efficiency of power screw drives, stresses developed in screws, design procedure for power screw drives like screw jack etc.

**Books Suggested:**

**MEC-551: DESIGN OF MACHINE ELEMENTS-I**

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Design assignment to be given so as to cover the syllabus outlined in MEC 501
Note: The examiner shall set 8 questions i.e. 4 in each of part A & B and student shall be required to attempt total of 5 questions with at least 2 questions from each part.

PART-A

1. **Introduction** (2)
   The Design Process, Application of computers for design, definition of CAD, CAM and CIM, benefits of CAD, CAM, Automation and types of automation.

2. **Geometric Modeling** (3)
   Introduction & need of geometric modeling, types: wire frame, surface and solid model, coordinate systems, Geometric Modeling techniques. Use of geometric modeling.

3. **Transformations** (7)
   2D and 3D Transformations, coordinate system used in transformations, Homogeneous transformation, translation, rotation, scaling, reflection and shear transformation, concatenated transformations, 3D visualization.

4. **Curves** (8)
   curve entities, curve representation, analytic curves – lines, circles, ellipses, parabolas, hyperbolas, conics, synthetic curves, hermite cubic spline, bezier curve and B-spline curve.

PART-B

5. **Surfaces** (6)
   Surface entities, representation and analysis, analytic surface, surface of revolution.

6. **Solids** (4)
   Solid models and representation scheme, boundary representation, constructive solid geometry, sweep representation.

7. **NC words** (4)
   Introduction, CNC, DNC and Adaptive Control, Classification of CNC machines, Coordinate Systems, Components of CNC machine, turning and machining center.

8. **NC part programming** (4)
   Introduction and basic terms of part programming, description of codes, G code, M code, programming for 2D and 3D jobs. Canned cycles, Loops and Subroutines programming, computer aided part programming.

Books Suggested:

3. Principles of Computer Aided design and Manufacturing by Farid Amirouche - Pearson publication
MEC-552: COMPUTER AIDED DESIGN AND MANUFACTURING  

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1. CAD Modeling  
   1. Simple machine parts and components construction using Inventor/ pro E/ other 3D modeling package  
   2. Mechanical assembly of the parts.  
2. Write code to generate a circle, an ellipse, a tabulated cylinder, surface of revolution.  
3. Implement simple programmes for the graphics representation of  
   a) Transformation,  
   b) Projections,  
   c) Cubic & splines curves  
   d) Surfaces.  
4. To generate computer aided part program and find out CL file as well as post processor file in terms of G & M code for different components.

MEC-503: ROBOTICS  

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Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.  

Part-A  

1. Fundamentals of Robot  
   Robot degrees of freedom, robot parts: base, end effectors, drives, joints, classification, characteristics and applications of Robots.  
   4  
2. Spatial Descriptions and Transformations  
   Robot kinematics, Inverse of transformation matrices, Conventions for affixing frames to Links.  
   6  
3. Inverse Manipulator Kinematics  
   Solvability, Algebraic versus Geometric solutions, reduction to polynomial solution, Pieper’s solution, Examples of inverse manipulator kinematics.  
   6  
4. Jacobians: Velocities and Static forces  
   Differential relationships, Jacobians, Differential motions of a robot and its hand frame.  
   6  

Part-B  

5. Manipulator Dynamics  
   Dynamic equations for multiple degree of freedom robots, Langrangian mechanics, effective moment of inertia.  
   6  
6. Trajectory Planning  
   Joint space vs. Cartesian-space descriptions, Joint space trajectories, Cartesian space trajectories.  
   6  
7. Sensors & Manipulator Mechanism Design  
   Robot sensors: proximity, range, force, tactile, visual, auditory sensors. Kinematic configuration, actuation schemes, stiffness and deflections, position sensing, force sensing.  
   6  
8. Robot Programming
Methods of robot programming, Types of Programming, Robot programming Languages.

Books Suggested:

MEC-553: ROBOTICS

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1. Study of different types of robots based on configuration and application.
2. Study of different type of robotics links and joints.
3. Study of components of robots with drive system and end effectors.
4. Determination of maximum and minimum position of links.
5. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system.
7. Robot programming exercises on Pick and place, Painting, welding, polishing, gluing, stacking and drilling.
MEC-504: MECHANICAL MEASUREMENT AND METROLOGY

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Note: The examiner shall set 8 questions four from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Part-A

1. General Concept : (2)
Need and classification of measurements and instruments: basic and auxiliary functional elements of a measurement system; Mechanical vs. electrical/electronics instruments, primary, secondary and working standards. Errors in measurement.

2. Static and Dynamic Characteristics of Instruments: (10)
Range and span, accuracy and precision, calibration, hysteresis and dead zone, sensitivity and linearity, threshold and resolution: speed of response, lag, fidelity and dynamic error, dead time and dead zone. Zero, first and second order systems and their response to step, ramp and sinusoidal input signals.

3. Strain Gauges: (7)
Resistance strain gauges, gauge factor, bonded and un-bonded gauges, surface preparation and bonding techniques, signal conditioning and bridge circuits, temperature compensation, application of strain gauges for direct, bending and torsional loads.

4. Pressure and Flow Measurement: (7)
Bourdon tube, diaphragm and bellows, vacuum measurement-Mcleod gauge, thermal conductivity gauge and ionization gauge; Dead weight pressure gauge tester. Electromagnetic flow meters, ultra-sonic flow meters and hot wire anemometer: Flow visualization techniques.

Part-B

5. Temperature Measurement: (7)
Thermal expansion methods: bimetallic thermometers, liquid-in-glass thermometer and filled-in-system thermometers; thermo-electric sensors: common thermo couples, reference junction considerations, special materials and configurations: metal resistance thermometers and thermistors; optical and total radiation pyrometers; calibration standards.

6. Speed, Forces, Torque and Shaft Power Measurement: (7)
Mechanical tachometers, vibration tachometer and stroboscope; proving ring, hydraulic and pneumatic load cells, torque on rotating shafts, Different types of Dynamometers: electrical and mechanical.

7. Metrology: (10)
levels or auto-collimator method. Flatness testing: level or autocollimatormethod, optical flatness, square ness testing, indicator method, auto-collimatormethods, engineer’s squares.

BOOKS SUGGESTED:

MEC-554: MECHANICAL MEASUREMENT AND METROLOGY

1. Measurement of the area of an object by using a planimeter.
2. Calibration of Pressure-gauge with the help of a dead weight gauge tester.
4. Measurement of speed by photoelectric pick up, proximity typesensors.
5. Measurement of linear displacement by linear motion potentiometer, LVDT.
7. Measurement of strain using strain gauge.
8. To measure a gap gauge with slip gauges.
9. To calibrate a micrometer.
10. To measure a plug screw gauge.
11. To check a straight edge.
12. To check a engineer’s square.
13. To measure the angle of a taper plug gauge with sine bar.
14. To set and calibrate an Engineer’s block level.
15. To calibrate a dial gauge.
16. To test the flatness of the surface plate using a block level.
Note: - Eight questions to be set in all with four questions in each of the part A and B. Candidates are required to attempt a total of five question selecting at least two questions from each part. S.I. System of Units to followed.

Part-A

1. **Principles of Hydraulic Machines & General Study of Hydro Power Plants:**
   Force of Jet on stationery, moving flat and curved plates, flow over radial, vanes, velocity triangles, Determination of power. Different types of runners, classification of Hydraulic Power and turbines (General description)

2. **Impulse Turbine:**
   Description of Pelton impulse turbine, design of Pelton turbines such as number of jets, number of buckets, depth and width of buckets, velocity diagrams, jet ratio, power and efficiency.

3. **Reaction Turbines:**
   Description of Francis, Kaplan Turbines, velocity diagrams, speed ratio, flow ratio, degree of reaction as applied to Kaplan and Francis turbines, cavitation. Governing of Turbines: Description of oil pressure governor, double regulation of impulse and reaction turbines. Draft Tube: Description, function and simple problems.

Part-B

4. **Centrifugal Pumps:**

5. **Dimensional Analysis and Performance of Hydro Machines:**
   Derivation of equations for Reynold, Froude Euler, Mach, and Weber numbers from ratio of forces. Buckingham Theorem and its practical applications to turbines and pumps. Derivation of various dimensionless, specific and unit quantities for turbines and pumps by application of Buckingham theorem. Characteristics curves of turbine and pumps.

6. **Reciprocating Pumps**
   Slip and coefficient of discharge, Effect of acceleration on pressure in suction and delivery pipes, Air vessels (work saved by air vessel on suction and delivery pipe) Comparison with centrifugal pumps.

7. **Hydraulic Devices and Control (Description only):**
   Basis of control system, Brief classification of control devices, symbolic representation of control system components, Example of control devices (valves) such as accumulator, Intensifier, relief valve, reversing valve and time delay valves, gear pumps and hydraulic ram controls. Brief description of hydraulic fluids used in control system.
**Books Suggested:**


**MEC-556: FLUID MACHINERY**

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1. Determination of various efficiencies of Hydraulic Ram.
2. To draw characteristics of Francis turbine.
3. To study the constructional features of reciprocating pump and to perform test on it for determination of pump performance.
4. To draw the characteristics of Pelton Turbine.
5. To draw the various characteristics of Centrifugal pump.
6. Determine the effect of vane shape and vane angle on the performance of centrifugal fan.
IBM- 501 MARKETING MANAGEMENT

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part A
Introduction to Marketing: Definition; Scope and Importance of Marketing; Key Customer Markets; Concepts/Philosophies of Marketing; Holistic Marketing Concept; Marketing Tasks; Marketing Mix

Marketing Environment: Marketing Environment; New Marketing Realities; New Consumer Capabilities; Demographic Environment; Social-Cultural Environment; Natural Environment; Technological Environment and Political-Legal Environment; SWOT analysis.

Analyzing Markets: Marketing Research Process; Sources of data collection; factors influencing consumer behavior; buying decision process; post-purchase behavior; Organizational Buying; Stages in the Buying Process.

Market Segmentation: Levels of market segmentation; segmenting consumer markets; Niche Marketing; segmenting business markets; Michael Porter’s five forces model; Analyzing competitors; strategies for market leaders; Targeting and Positioning.

Part B
Product Decisions: Product characteristics; classifications; differentiation; packaging and labeling; Product Life Cycle.

Pricing Strategies: Understanding Pricing; Setting the Price; Initiating and Responding to Price Changes; Reactions to Competitor’s Price Changes.

Marketing Channels: Marketing Channels; Role of Marketing Channels; Identifying Major Channel Alternatives; Types of Intermediaries; Channel-Management Decisions, Retailing, Wholesaling.

Marketing Communication: The Role of Marketing Communications; Communications Mix-Advertising, Sales Promotion, Public Relations and Publicity, Events and Experiences, Direct and Interactive Marketing, Personal Selling.

References:
1. Principles of Marketing, Philip Kotler, Pearson
2. Marketing Management,R. Saxena, TMH
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A


Job analysis: Methods - IT and computerized skill inventory - Writing job specification - HR and the responsive organization. (4)

Recruitment and selection process : Employment planning and forecasting – Building employee commitment : Promotion from within - Sources, Developing and Using application forms - IT and recruiting on the internet. (5)

Employee Testing & selection : Selection process, basic testing concepts, types of test, work samples & simulation, selection techniques, interview, common interviewing mistakes, Designing & conducting the effective interview, small business applications, computer aided interview. (8)

Part-B

Training & Development: Orientation & Training: Orienting the employees, the training process, need analysis, Training techniques, special purpose training, Training via the internet Performance appraisal: Methods - Problem and solutions - MBO approach – The appraisal interviews - Performance appraisal in practice. (7)

Managing careers: Career planning and development - Managing promotions and transfers. (3)


Industrial relation and collective bargaining : Trade unions - Collective bargaining - future of trade unionism. Discipline administration - grievances handling – managing dismissals and separation. (6)

References:
MEC-557: VOCATIONAL TRAINING after 4\textsuperscript{th} Semester

Each student shall attend 4 weeks training after 4\textsuperscript{th} semester in Mechanical Industry, National/International level technical institute/research organization.

SYLLABUS FOR
B.E. MBA (MECHANICAL ENGINEERING)  
(SIXTH SEMESTER)

MEC-601: DESIGN OF MACHINE ELEMENTS–II

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Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part. Design data book is allowed in the examination hall.

1. Introduction:
Types of mechanical drives and their applications. factors influencing the choice of a mechanical drive. 4

2. Belt and Rope Drives:
Types of belt drives, design of flat belt drive, design of V-belt drive including selection of V-belt, design of wire rope drive including selection of rope, design of pulleys for a flat belt drive. 5

3. Chain Drives:
Design of chain drive including selection of chain. 3

4. Gear Drives:
Design details of spur, helical and bevel gear drives, design of worm and worm wheel drive. 6

5. Bearings:
Classification of bearings, types of sliding contact bearings, properties requirements of sliding contact bearing materials, hydrodynamic lubricated bearings, terms used in hydrodynamic journal bearings, bearing characteristic number, bearing modulus, coefficient of friction, Sommerfield number and critical pressure for journal bearings, heat generated in a journal bearing, design of journal bearings, bearing caps and bolts, design of foot-step bearings. Types of rolling contact bearings, materials of ball and roller bearings, basic static load rating, static equivalent load, life of a bearing, basic dynamic load rating, dynamic equivalent load, dynamic load rating under variable loads, selection of radial ball bearings, lubrication of ball and roller bearings. Comparison of sliding contact bearings and rolling contact bearings. 6

PART-B

6. Flywheels:
Design of flywheel rim, arms, hub, shaft and key. 4

7. Clutches and Brakes:
Types of clutches, design of plate clutch under uniform pressure case and uniform wear case, design of cone clutch under uniform pressure case and uniform wear case, design of centrifugal clutch. Types of brakes, design of single shoe brake, double shoe brake, pivoted shoe brake, simple band brake, differential band brake, band and shoe brake, concept of self energizing and self locking brakes, design of internal expanding shoe brakes. 6

8. Springs:
Types of springs, materials for helical springs, terms used in helical springs, end connections for compression helical springs and tension helical springs, design of helical springs of circular wire based upon stress, deflection, eccentric loading, buckling, surge, energy stored and fatigue loading, design of helical springs of non-circular wire based upon stress and deflection, design of spring based systems having springs in series, parallel and concentric or composite arrangements, design of helical torsion springs, design of flat spiral springs.
Materials for leaf springs, nipping in spring leaves, design of leaf springs.

6

**Books Suggested:**

8) Elements of Machine Design   V.B.Bhandari, Tata McGraw Hill, New Delhi, 2005

**MEC-651: DESIGN OF MACHINE ELEMENTS-II**

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Note: Design assignments so as to cover the principles outlined in MEC-601 such as:

1. Design of flat belt drive.
2. Design of V-belt drive.
3. Design of rope drive.
4. Design of pulleys.
5. Design of chain drive.
6. Design of spur gear drive.
7. Design of helical gear drive.
8. Design of bevel gear drive.
10. Design of journal bearings.
11. Exercise on selection of rolling bearings.
12. Design of flywheels.
15. Design of helical springs.
16. Design of leaf springs
MEC 602: FINITE ELEMENT METHODS

Note: The examiner shall set 8 questions i.e., 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Part-A

1. Introduction:
Background of continuum mechanics and FE methods; Range of applications of FE methods; stresses; equilibrium; boundary conditions; strain-displacement relations; stress-strain relations; temperature effects; Principle of virtual work; Principle of minimum potential energy; Galerkin’s method; Saint Venant’s principle; Von Mises stress; Overview of the software used for FE methods; Advantages and disadvantages of FE methods; Future of FE methods. (4)

2. Discretisation of the domain:
Types of elements; location of nodes; number of elements; simplification offered by physical configuration of body; node numbering scheme. (4)

3. One & Two Dimensional Problems:
Introduction; Coordinates and shape functions; Potential energy approach; Galerkin Approach; Assembly of the global stiffness matrix and load vector; FE equations and treatment of boundary conditions; Quadratic shape functions; Two dimensional problems using constant strain triangles. (5)

4. Axisymmetric solids subjected to axisymmetric loadings:
Axisymmetric formulation; FE modeling using triangular element; problem modeling and boundary conditions. (4)

Part-B

5. Static Analysis:
Plane and three dimensional Trusses; Assembly of global matrix for the banded and skyline solutions; Beams and frames under various boundary conditions. (5)

6. Dynamic Analysis:
Formulation for solid body with distributed mass; Element mass matrices; Evaluation of eigenvalues and eigenvectors; Guyan reduction; Rigid body modes. (5)

7. Preprocessing and Postprocessing:
Preprocessing; Mesh generation; Postprocessing; Deformed configuration and mode shape. (5)

8. Finite Elements in Design:
FE based optimal design; Design parameterization; Structural optimization; Topology optimization; Approximation techniques; Design sensitivity analysis. (5)

Recommended Books:
1. Introduction to use of MATLAB for FE related programming.

2. FE modeling and analysis (Eigen values and mode shapes) of thin rectangular plate under one edge fixed type conditions. (using MATLAB)

3. Introduction to modeling and analysis in any existing general purpose finite element (FE) analysis software.

4. Using FE software (such as ANSYS) for modeling and analysis (Eigen values and mode shapes) of thin rectangular plate under one edge fixed type conditions. Compare the results obtained by FE software and MATLAB.

5. FE modeling and analysis (Stress and deflection) of a rectangular beam under simply supported conditions. (using MATLAB)

6. Using FE software (such as ANSYS) for modeling and analysis (Stress and deflection) of a rectangular beam under simply supported conditions. Compare the results obtained by FE software and MATLAB.

7. FE modeling and analysis (Stress and deflection) of a rectangular beam having a uniformly distributed load over its entire length, under simply supported conditions. (using MATLAB)

8. Using FE software (such as ANSYS) for modeling and analysis (Stress and deflection) of a rectangular beam having a uniformly distributed load over its entire length, under simply supported conditions. Compare the results obtained by FE software and MATLAB.
MEC-603: MECHANICAL VIBRATIONS

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Note: The examiner shall set 8 questions i.e., 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Part-A

1. **Fundamentals of Vibration**
   5
   Free vibration, Forced vibration, Simple harmonic motion, Combination of two simple harmonic motions, Fourier analysis, Fourier integral.

2. **Single degree of freedom system-free vibration**
   5
   Natural frequency, Equivalent systems, Energy method (average energy principle, principle of conservation of energy, principle of virtual work, maximum energy principle), Response to an initial disturbance, Phase plane method, Duhamel’s integral.

3. **Single degree of freedom system-damped vibrations**
   3
   Damping models (viscous damping, structural damping, and coulomb damping), Over-damped case, critically damped case, under-damped system, Logarithmic decrement.

4. **Single degree of freedom system-forced vibrations**
   5
   Harmonic excitation, Mechanical impedance (analysis of system with structural damping, analysis of system with elastically coupled viscous damper), System identification from frequency response, Support motion (solution for absolute/relative motion of the system, seismometer, accelerometer), Bending critical speeds of simple shafts, Vibration isolation (viscous damper and elastically coupled viscous damper).

Part-B

5. **Two degrees of freedom systems**
   4
   Free vibration of spring coupled systems, Two degrees of freedom mass coupled systems, Bending vibrations of two degrees of freedom systems, Forced vibration of an undamped two degrees of freedom system, Undamped vibration absorbers, Vibration isolation.

6. **Multi degree of freedom methods**
   6
   Close coupled systems (eigen value problem upto four degree of freedom system using Graeffe’s method), Far coupled systems, Orthogonality of mode shapes, Modal analysis (Undamped analysis, damped systems), Forced vibration (modal analysis, forced vibration by matrix inversion).

7. **Numerical methods**
   4
   Dunkerley’s lower bound approximation, Rayleigh’s upper bound approximation, Holzer method (fixed-free systems, free-free systems, branched systems), Method of matrix iteration.
8. **Continuous systems**

   6

   Systems governed by wave equation (stretched string, axial vibrations of a bar, torsional vibration of a circular rod), Free vibration of beams.

**Books suggested:**


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**MEC-653: MECHANICAL VIBRATIONS**

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1. To determine the mass moment of inertia of a body by Trifilar suspension.
2. To determine damping ratio of a vibrating body by rap test.
3. To determine damping ratio of a damper by forced vibration.
4. Investigate node and antinode position for a cantilever.
5. Find first three natural frequencies of a body from its time response. (using FFT algorithm of Matlab)
6. Experimentally find out different harmonic frequencies present in vibrations of an IC engine.
7. Use instrumented impact hammer to find transfer function between two given points of a structure.
Note: The Examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part. Numerical terminology must be in S.I. units only.

Part A

1. Basic Concepts
Difference between the subject of Heat Transfer and its parent subject “THERMODYNAMICS”
Different methods of heat transfer – Conduction, Convection, and Radiation. 2

2. Conduction
Fourier’s law of heat conduction, coefficient of thermal conductivity, effect of temperature and pressure on thermal conductivity of solids, liquids and gases and its measurement. Definition and explanation of the term Thermal Diffusivity.

Three-dimensional most general conduction equation in rectangular, cylindrical and spherical co-ordinates involving internal heat generation and under unsteady state conditions. Derivation of equations for simple one dimensional steady state heat conduction without heat generation from three-dimensional equations through walls, cylinders and spherical shells (simple and composite). Electrical analogy of the heat transfer phenomena in the cases discussed above. Equivalent areas, shape factors. Critical thickness of insulating layers on electric wire and pipes carrying hot fluids. Influence of variable thermal conductivity on conduction through simple cases of walls, cylinders and spheres.

System with Heat Sources: Internal generation cases along with some practical cases of heat conduction, heat conduction through piston crown and case of nuclear fuel rod with cladding. Introduction to unsteady heat transfer. 8

3. Extended Surfaces
Straight rod type of fins of uniform cross-section: (e.g. of circular and rectangular cross-section). Circumferential fins of rectangular cross-section provided on the circumference of a cylinder.
Fins effectiveness and fins efficiency for straight rod fins of rectangular and circular cross-section. Application of fins in temperature measurement of flow through pipes and determination of error in its measurement. 8

Part B

5. Convection
Introduction, Processes, Newton’s law of cooling, theory of dimensional analysis as applied to free and forced convective heat transfer. Analytical formulae of heat transfer in laminar and turbulent flow, flow over vertical and horizontal tubes and plates. Hydrodynamic and Thermal boundary layers over a flat plate, Blasius solution for hydrodynamic and Thermal boundary layer (No. Derivation) 3

1. Heat Exchanger
Classification of heat exchangers, Overall coefficient of heat transfer, effect of scale formation, Log mean temperature difference for parallel and counter flow heat exchangers, Heat Exchanger effectiveness, Calculation of number and length of tubes in
2. **Heat Transfer with change of phase**

Boiling, Boiling Regimes, Bubble Growth and Nucleate Boiling, forced convection boiling, Theory accounting for the increased values of h.t.c. during nucleate phase of boiling of liquids; different phase of flow boiling (theory only).

Condensation and its classification, laminar filmwise condensation on a flat vertical plate and its mathematical analysis, drop-wise condensation.

3. **Radiation**


Derivation formula for radiation exchange between two bodies using the definition of radiosity and irradiation and its application to cases of radiation exchange between three bodies, simplification of the formula for its application to simple bodies like two parallel surfaces.

**Books Suggested:**


**MEC-654: HEAT TRANSFER**

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1. To study and compare temperature distribution, heat transfer rate, overall heat transfer in parallel flow and counter flow heat exchanger.
2. To study the parallel flow and counter flow heat exchanger.
3. To find the thermal conductivity of metal rod
4. To determine heat transfer coefficient in natural convection.
5. To determine heat transfer coefficient in forced convection for air flowing in a tube.
6. To determine heat transfer coefficient in drop wise and film wise condensation.
7. To determine the emissivity of a given plate at different temperatures.
8. Evaluate the performance of a heat pipe.
9. To determine Overall Heat Transfer coefficient in Shell and Tube heat exchanger.
10. To determine the Stefan Boltzmann’s constant in radiation heat transfer process
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A
Introduction to Managerial Economics and Demand Concepts: Nature Scope and Importance of Managerial Economics, opportunity costs, incremental principle, time perspective, Equi marginal principles, Individual Demand, Market Demand, Kinds of Demand, Determinants of Demand, Demand Functions and Law of Demand, Income and Price elasticity of demand, substitution effect. (12)


Production Function: Concept and types, Returns to Factor and Returns to Scale, Law of Variable Proportions, law of diminishing marginal returns (4)

Cost concepts and Analysis: Concept of Cost, Short run and Lung-run Cost Curves, Relationships among various costs (3)

Revenue Curves: Concept and Types. (2)

Part B
Perfect Competition: Characteristics, Equilibrium Price, Profit Maximizing output in Short Run and Long Run, Price Discrimination; Imperfect Competition, Monopolistic Competition, Oligopoly and Barriers to Entry. (8)

Economic Environment of Business- Meaning of GDP, Monetary and Fiscal Policy, Deficit Financing, Inflation, Subsidies, Devaluation of Rupee, Liberalization, Privatization and Disinvestment (8)

References:
1. Managerial Economics, Mote, Paul Gupta, Vikas Publisher, New Delhi
3. Microeconomics, Robert. Pindyck, Daniel Rubinfield, Pearson
**Note:** Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part A**

The Contract Act 1872 : Introduction: Meaning of contract; Types of contract; Essential elements of a valid contract. Offer: Meaning and Definition of offer; Types; Rules regarding offer; Revocation of offer; Lapse of offer. Acceptance: Meaning and Definition of acceptance; Rules regarding acceptance; Revocation of acceptance. Consideration: Definition; Types; Rules; Exceptions Capacity of Parties: Position of Minor, Person of unsound mind, Persons disqualified by law. Free consent; Discharge of contract, Remedies for Breach of contract, Contract of Indemnity, Contract of Guarantee (10)

Sales of Goods Act 1930 : Meaning; Difference between Sale of Goods and Agreement to Sale, Essentials of Contract of Sale; Difference between Contract of Sale and Hire-Purchase Agreements; Conditions and Warranties; Transfer of property or ownership; Performance of Contract of Sale; Rights of Unpaid Seller; Auction Sale. (8)

The Companies Act, 1956 : Definition; Meaning; Features; Types of companies; Incorporation of a company; Memorandum of Association; Articles of Association and Prospectus; Doctrine of Indoor Management; Lifting of Corporate Veil; Registration and Incorporation of a company; Doctrine of Ultravires Transactions; Winding up of company. (10)

**Part B**


Information Technology Act-2000 : Objective of the act, documents excluded from the scope of the act, digital signatures, types of digital signatures in India, certifying authorities in India, regulation of certifying authorities, duties of subscribers, offences, appellate tribunal, penalties and adjudication (7)

**References:**

2. An Introduction to Mercantile Laws- N.D. Kapoor, Sultan Chand & Sons
SYLLABUS FOR
B.E. MBA (MECHANICAL ENGINEERING)
SEVENTH SEMESTER

MEC–701: REFRIGERATION & AIR CONDITIONING

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Note: The examiner shall set 8 questions i.e., 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

PART - A

1. Basic Concept
Natural and Mechanical refrigeration; Application of Refrigeration; Units of refrigeration and Coefficient of performance; Refrigeration effect, cooling capacity and COP of a refrigerator; heating effect, heating capacity and COP as heat pump; Reversed Carnot cycle and its limitations

2. Bell Coleman Cycle and Aircraft Refrigeration
Bell Coleman Cycle and its analysis; optimum COP and pressure ratio, necessity of aircraft refrigeration - air cycle refrigeration systems and their comparison

3. Vapour Compression Refrigeration Cycle and Refrigeration
Vapour compression cycle on P-V, P-H and T-S diagrams; Deviation of actual cycle from the theoretical cycle; Compressor capacity and volumetric efficiency, Analysis of theoretical and actual vapour compression cycles; Effect of suction pressure, discharge pressure, sub-cooling, super heating and pressure drop in valves on performance and cooling capacity. Compound compression with single and multiple expansion valves, water inter-cooling and flash inter-cooling; multiple load systems with single and multiple expansion valves

4. Vapour Absorption Refrigeration Cycle (No Mathematical Analysis)
Principle of absorption system; components of the system; Desirable properties of absorption system refrigerant and absorbent; Aqua - ammonia absorption refrigeration system; Lithium Bromide - water absorption system; Theory of mixtures; temperature concentration and enthalpy concentration diagrams; comparison between absorption and compression systems; Electrolux refrigeration system.

PART-B

5. Refrigerants
Classification and nomenclature of refrigerants; Desirable thermodynamic, chemical and physical properties of refrigerants; comparative study of commonly used refrigerants and their fields of application; Azeotropes; Effect of moisture and oil miscibility; Refrigerants dying agents and antifreeze solution; leak detection and charging of refrigerants; environmental aspects of conventional refrigerants; Eco-friendly refrigerants and action plan to reduce ecological hazards.

6. Air Conditioning Concept, Psychometric Processes and Applications;
Psychometric properties of air; Dry bulb, wet bulb and dew point temperatures; Relative and specific humidity; degree of saturation adiabatic saturation temperature, enthalpy of air and water vapours; psychometric chart. Human requirement of comforts; effective temperature and comfort charts; Industrial and comfort air conditioning. Sensible heating and cooling, cooling
with dehumidification; Heating with dehumidification; by-pass factor; chemical
dehumidification; adiabatic mixing, air washer.

7. Calculations for Air –Conditioning Load:
Sources of heat load; sensible and latent heat load; sensible heat factor; apparatus dew point
temperature; Rate and state of supply - air for air- conditioning of different types of premises.

8. Refrigeration and Air Conditioning Equipment
Brief description of compressors, condensers, evaporators and expansion devices; Cooling
towers; Ducts; dampers; grills; air filters; fans; room air conditioners; split units; Package and
central air conditioning plants.

SUGGESTED BOOKS:
1. Refrigeration and Conditioning by CP Arora, Tata McGraw Hill
2. Refrigeration and Conditioning by Manohar Prasad, Wiley Eastern Limited
3. Refrigeration and Conditioning by Jordan and Priester, Prentice Hall of India
5. A course on Ref. & Air Conditioning by Arora, Domkunder Dhanpat Rai & sons
7. Low temperature techniques by din F. and Cockett.

MEC-751: REFRIGERATION AND AIR CONDITIONING

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1. Study of various elements of a mechanical refrigerator system through cut sections
   models / actual apparatus
2. Study and performance of domestic refrigerator,
3. Study the performance of and Eectrolux refrigerator
4. Study of an Ice plant and visit to a cold storage for study
5. Calculation/ Estimation of cooling load for large building
6. Visit to a central Air conditioning plant for study of processes for winter and summer
   air conditioning
7. Study and performance of window type room air conditioner
8. Study and performance of Cooling Tower.
9. Study and performance of Air conditioning Trainer (Direct and Indirect type)
10. Study and performance of Air Washer Test bench.
Note: The examiner shall set 8 questions i.e., 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

**Part-A**

1. **Introduction**
   - Introduction, Types of control systems, Open or closed loop systems, Analog or Digital control systems, Regulators and servomechanism, Sequence control, typical block diagram, Performance analysis.

2. **Representation of processes and control elements**
   - Mathematical modeling, Block diagram representation, Representation of systems or processes, Liquid, gas and thermal systems, Mechanical rotating systems, Geared systems, Hydraulic servomotor, Electric motors, Control valve, Comparison elements, Potentiometer-type comparator, Synchro-control transformer type error detector.

3. **Representation of feedback control systems**
   - Block diagram and transfer function representation, Signal flow graphs, Mason’s formula.

4. **Types of controllers**
   - Types of control action, Proportional, Integral, Derivative, On-off, Hydraulic controllers, Pneumatic controllers, Electronic controllers.

**Part-B**

5. **Transient and steady state response**
   - Time domain representation, Laplace transform representation, Systems with proportional control, Transient response due to reference input, Steady state response, Response to load input, Proportional cum derivative control, Reference input, Load input, Proportional cum integral control, Reference input, Load input.

6. **Stability of control systems**
   - Characteristic equation, Routh’s equation, Nyquist criterion.

7. **State space analysis of control systems**
   - Generalised state equations, Techniques for deriving system state equations, Transfer function from state equations.

8. **Introduction to virtual instrumentation**
   - Graphical programming, Concept of sub-VI, Data acquisition and control using Labview software, Simulation of proportional, derivative, integral control actions.
1. Perform two mode (P + I) controls on a temperature/flow control trainer.
2. Perform two mode (P + D) controls on a temperature/flow control trainer.
3. Perform three mode (P + I + D) controls on a temperature/flow control trainer.
4. Tune the temperature/flow control trainer using Zeigler-Nichols method.
5. Simulate first order system and second order systems on Labview software.
6. Acquire data from an analog sensor using PC and Labview software.
7. Control vibrations of a cantilevered beam using negative velocity feedback.
MEC 703: FINITE ELEMENT METHODS

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Note: The examiner shall set 8 questions i.e., 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Part-A

1. Introduction:
Background of continuum mechanics and FE methods; Range of applications of FE methods; stresses; equilibrium; boundary conditions; strain-displacement relations; stress-strain relations; temperature effects; Principle of virtual work; Principle of minimum potential energy; Galerkin’s method; Saint Venant’s principle; Von Mises stress; Overview of the software used for FE methods; Advantages and disadvantages of FE methods; Future of FE methods. (4)

2. Discretisation of the domain:
Types of elements; location of nodes; number of elements; simplification offered by physical configuration of body; node numbering scheme. (4)

3. One & Two Dimensional Problems:
Introduction; Coordinates and shape functions; Potential energy approach; Galerkin Approach; Assembly of the global stiffness matrix and load vector; FE equations and treatment of boundary conditions; Quadratic shape functions; Two dimensional problems using constant strain triangles. (5)

4. Axisymmetric solids subjected to axisymmetric loadings:
Axisymmetric formulation; FE modeling using triangular element; problem modeling and boundary conditions. (4)

Part-B

5. Static Analysis:
Plane and three dimensional Trusses; Assembly of global matrix for the banded and skyline solutions; Beams and frames under various boundary conditions. (5)

6. Dynamic Analysis:
Formulation for solid body with distributed mass; Element mass matrices; Evaluation of eigenvalues and eigenvectors; Guyan reduction; Rigid body modes. (5)

7. Preprocessing and Postprocessing:
Preprocessing; Mesh generation; Postprocessing; Deformed configuration and mode shape. (5)

8. Finite Elements in Design:
FE based optimal design; Design parameterization; Structural optimization; Topology optimization; Approximation techniques; Design sensitivity analysis. (5)

Recommended Books:

MEC 753: Finite Element Methods
1. Introduction to use of MATLAB for FE related programming.

2. FE modeling and analysis (Eigen values and mode shapes) of thin rectangular plate under one edge fixed type conditions. (using MATLAB)

3. Introduction to modeling and analysis in any existing general purpose finite element (FE) analysis software.

4. Using FE software (such as ANSYS) for modeling and analysis (Eigen values and mode shapes) of thin rectangular plate under one edge fixed type conditions. Compare the results obtained by FE software and MATLAB.

5. FE modeling and analysis (Stress and deflection) of a rectangular beam under simply supported conditions. (using MATLAB)

6. Using FE software (such as ANSYS) for modeling and analysis (Stress and deflection) of a rectangular beam under simply supported conditions. Compare the results obtained by FE software and MATLAB.

7. FE modeling and analysis (Stress and deflection) of a rectangular beam having a uniformly distributed load over its entire length, under simply supported conditions. (using MATLAB)

8. Using FE software (such as ANSYS) for modeling and analysis (Stress and deflection) of a rectangular beam having a uniformly distributed load over its entire length, under simply supported conditions. Compare the results obtained by FE software and MATLAB.

MEC-756: MINOR PROJECT
IBM-701 ACCOUNTING FOR MANAGERS

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A

Accounting and its functions; Basic Accounting Concepts and Accounting Conventions; Accounting Principles; Generally Accepted Accounting Policies (GAAP); Accounting Standards; Branches of Accounting: Financial Accounting; Cost Accounting; Management Accounting; Accounting Equation; Accounting Structure; Types of Accounts. (4)

Rules regarding Journal Entries; Recording of Journal Entries; Ledger Posting; Trial Balance; Preparation of Final Accounts; Trading Account; Profit & Loss Account; Balance Sheet; Treatment of Adjustments into trial balance. (7)

Meaning of Management Accounting; Nature; Scope; Objectives; Functions of Management Accounting; Relationship between Financial and Management Accounting; Tools and Techniques of Management Accounting; Limitations; Meaning of Financial Statement; Importance and Limitations of Financial Statement; Meaning and Objectives of Financial Statement Analysis; Limitation of Financial Analysis. (10)

Ratio Analysis: Meaning of Ratio; Interpretation of Ratios; Significance of Ratio Analysis; Limitations of Ratio Analysis; Classification of Ratio; Analysis of Short-term financial position; Analysis of Long term financial position; Analysis of profitability. (7)

Part-B

Fund Flow Analysis: Meaning and Concept of Funds; Meaning of Fund Flow; Meaning of Fund Flow Statement; Significance; Limitations; Procedure of Preparing Fund Flow Statement; Schedule Showing Change in working capital; Adjusted Profit & Loss Account; Statement of Sources and Applications of Funds. Treatment of Adjustment; (9)

Cash Flow Analysis: Meaning; Classification of Cash Flow; Comparison between Fund Flow Statement and Cash Flow Statement; Difference between Cash Flow Statement and Cash Budget Limitations; Preparation of Cash Flow Statement (as per AS-3); Treatment of Adjustments. (8)

References:
1. Managerial Accounting, Hilton, Ramesh, Jaidev, TMH
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part A**

Introduction to Descriptive Statistics: Types of Data, Measures of Central Tendency; Measures of Dispersion- Range, Quartile Deviation, Mean Deviation, and Standard Deviation, Skewness & Kurtosis. (4)

Probability : Basic probability concepts, Joint probability, Conditional probability, Bayes Theorem, Random Variables and Discrete Probability distributions: Poisson, Binomial and Normal, Normally distributed variables, areas under the standard normal curve (10)

Research Design: Meaning, Characteristics and various concepts relating to research design and classification of research design, Importance. (4)

Measurement and Scaling: Data Types Nominal, Ordinal and Ratio scale; scaling techniques. (3)

**Part B**

Formulation of Hypothesis: Confidence Intervals, Meaning, Characteristics and concepts relating to testing of Hypothesis (Parameter and statistic, Standard error, Level of significance, type-I and Type-II errors, Critical region, one tail and two tail tests); Procedure of testing Hypothesis. Numerical problems based on chi-square test, Hypothesis tests for one population mean: Z test, t-test, Wilcoxon Signed-Rank test, Inferences for two population means, Mann-Whitney Test, F-test (15)

Data Analysis & Interpretation: Introduction to Multivariate analysis- Multiple and partial correlation, Analysis of Variance (ANOVA)-One way and Two way ANOVA. Introduction to discriminant analysis and Factor Analysis (9)

**References:**

1. Business Research Methods, William G. Zikmund, Cengage Learning India
2. Business Research Methods, Cooper, D.R. & Schindler, TataMcGraw-Hill
SYLLABUS FOR  
B.E. MBA (MECHANICAL ENGINEERING)  
EIGHTH SEMESTER  

MEC-801: AUTOMOBILE ENGINEERING  

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Note: The examiner shall set 8 questions i.e. 4 in each of part A & B and student shall be required to attempt total of 5 questions with at least 2 questions from each part.  

PART-A  

1. Introduction  
Components of automobile, basic structure, classification of automobile, body styles, frame and frameless construction, power for propulsion, traction and tractive effort, relation between engine revolution and vehicle speed, road performance curves, calculation of equivalent weight, gear ratio for maximum acceleration.  

2. Automobile Engine  
Engine Types, Piston, Piston rings, valves, cooling system, lubrication system, turbocharger, supercharger, fuel supply system for petrol and diesel engine, throttle body and multi point fuel injection system, battery coil ignition system.  

3. Clutches  
Requirements of clutches, types of clutches, working of single plate, multiplate and centrifugal clutch, clutch operation, clutch plate, fluid flywheel.  

4. Transmission  
Functions of transmission, necessity, types of transmission, sliding mesh, constant mesh, synchromesh, selector mechanism, transfer box, automatic transmission, torque converter, overdrive, propeller shaft, universal joint, final drive, differential, rear axle, rear axle drive.  

PART-B  

5. Suspension  
Basic classifications, types of suspension systems, leaf springs, shock absorbers, independent suspension, types of front wheel, independent suspension system, air suspension.  

6. Front Axle and steering  
Front axle, wheel alignment, steering geometry, under-steer and over-steer, steering linkage, steering ratio, reversibility, power steering.  

7. Brakes wheel and Tyres  
Brake efficiency and stooping distance, fading of brakes, wheel skidding, types of brakes, drum and disk brakes, hydraulic and pneumatic brakes, servo brakes, antilock braking system, types of wheels, wheel dimensions, types of tyres, cross ply, radial ply and belted-bias type, tyre designation.  

8. Emission control  
Automotive air pollution, emission control, crank case emission, evaporative emission control, exhaust emission control, catalytic converter.  

BOOKS SUGGESTED:
1. Study of various tools and working of various systems/components from an actual automobile/working model.
2. Removing the car tyres, repairing the tubes - their testing and fitting back.
3. Valve re-facing and valve seat grinding and checking the seat for leakage.
4. Checking of the cooling system, water pump, radiator, thermostat valve and its faults.
5. Checking of cylinders for wear and finding out the next possible over-size of the Piston replacing rings and studying methods of replacing piston after re-boring.
6. Overhauling the fuel pumps, cleaning the jets and testing on the engine.
7. Overhauling of the distributor, setting C.B. Points and spark plug gaps and study of the complete ignition circuit.
8. Study of Vehicle steering system and measuring steering geometry angles.
9. Replacing of car battery and casting of plate connectors, cell connectors etc.
10. Overhauling of breaking system, adjusting the brake shoes, bleeding the system and testing.
11. Engine trouble shooting.
MEC-802: OPERATION RESEARCH

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Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

Part–A

1. Definition of Characteristics of O.R.
   Decision making, scientific decision making approach for scientific decision making in OR.need & limitation of O.R.  2

2. Definition of Models
   Classification of models, Construction of models, Approximation in O.R. models  2

3. Allocation Models
   Analysis of industrial situations to find characteristics like key decision, objective possible alternatives & restrictions – Three categories of allocations type situations to be considered. General mathematical formulation for linear programming, feasible and optimal solutions.  4

4. Graphical and simplex techniques to solve linear models, Modification of minimization situations so as to be solvable by simplex method. Duality and degeneracy in simplex method, application and limitations of linear optimization models.  10

Part-B

5. Network Models
   Transportation models, method of finding starting solution, Vogel’s approximation method to find feasible models, Hungarian method to find optimal solution in assignment models.  5

6. Cyclic shortest route models, traveling salesman ‘s problem and Branch and Bound method to solve it. A cyclic short route models and their solutions.  4

7. Queuing theory, various types of queuing situations and their solutions.  4

8. PERT & CPM
   Network situations where PERT & CPM can be applied, planning, scheduling & Control, work–breakdown structure.
   (a) PERT NETWORKS : Events and activities, constructions of network, forward & Backward planning, Fulkerson’s rule, optimistic, pessimistic & most likely time Estimates, frequency distribution, mean, variance and standard deviation, expected time, earliest expected time and latest occurrence time, definitions of slack and critical path.
   (b) CPM NETWORKS : Similarity and difference of CPM & PERT, construction of network, earliest event time, latest occurrence time, float, total float, free float, independent float, contracting the network so as to an optimum project schedule.
Books Suggested:


MEC-852: OPERATION RESEARCH

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1. Projects and case studies concerning the topics in theory.

MEC-803: COMPUTATIONAL FLUID DYNAMICS

Note: The examiner shall set 8 questions i.e. 4 from each part and students shall be required to attempt a total of 5 questions with at least 2 questions from each part.

PART-A

1. **Introduction**
   History of CFD; Comparison of the three basic approaches in engineering problem solving – Analytical, Experimental and Computational Methods. Recent Advances in Computational Techniques. (5 hrs)

2. **Problem Formulation:**
   The standard procedure for formulating a problem Physical and Mathematical classification of problems; Types of governing Differential equations and Boundary conditions. (7 hrs)

3. **Methods of Discretisation:**

PART-B

4. **Numerical Solution to Heat Conduction Problems:**

5. **Numerical Solution to Fluid Flow Problems**
   Types of fluid flow and their governing equations; Viscous Incompressible flows Calculation of flow field using the stream function-vorticity method; Calculation of boundary layer flow over a flat plate; Numerical algorithms for solving complete Navier-Stokes equations- MAC method; SIMPLE algorithm; Project problem. (13 hrs)
Books Recommended:

2. Computational Fluid Dynamics by J. Anderson Publisher, McGraw Hill:
6. Introduction to CFD by P. Niyogi, Pearson Publications.

MEC-853: COMPUTATIONAL FLUID DYNAMICS

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1. Two dimensional heat conduction in a rectangular geometry.
2. To solve the temperature distribution for a fin.
3. To solve two dimensional incompressible viscous flow in a lid driven cavity.
4. Temperature distribution for a heated plate subjected to insulated boundary condition on one side.
5. Temperature distribution for a heated plate subjected to fixed boundary conditions

MEC-855: MAJOR PROJECT

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IBM- 801 BUSINESS RESEARCH

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A


Measurement and Scaling- Primary Scales of measurement, Comparative Scaling Techniques, Non comparative Scaling techniques-Likert, Semantic Differential Scale, Stapel Scale, Questionnaire Design-question content, structure and order (10)

Part-B

Sampling Design: Meaning and need of Sampling, Probability and non-probability sampling design, simple random sampling, systematic sampling, stratified sampling, cluster sampling and convenience sampling, judgement and quota sampling (non-probability), determination of sample size, Hypothesis Testing, Parametric and Non-Parametric Tests (9)

Discriminant and Logit Analysis- Formulating the problem for Discriminant analysis, Multiple Discriminant Analysis, Logit model (8)

Factor analysis, Cluster analysis and Multidimensional Scaling - Conducting Factor analysis, Cluster analysis and Multidimensional Scaling- Conjoint Analysis (8)

2. Marketing Research- Text and Cases, Rajendra Nangundkar, TMH
3. Marketing Research – GC Beri, TMH
4. Marketing Research- Parshuram, Dhruv Grewal, R. Krishnan – Biztantra
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A

Introduction to Financial Management: Meaning; Scope; Finance Function; Financial Goals; Agency Problem; Relationship of Finance with Accounts and Economics. (4)

Sources of Finance: Features; Advantages and Limitations of Equity Shares; Preference Shares; Debentures; Term-Loans; Right Issue. (3)

Cost of Capital: Meaning; Calculation of Cost of Debt Capital; Equity Capital; Preference Capital; Retained Earnings; Weighted Average Cost of Capital. (6)

Capital Structure: Meaning; Determinants; Assumptions; Net Income and Operating Income Approach; Traditional Position; M-M Position; EBIT and EPS Analysis; Capital Structure and Taxation. (3)

Leverage Analysis: Meaning; Types; Estimation of Financial; Operating and Combined Leverage; Relation of Financial Leverage with Risk and Return. (3)

Management of Working Capital: Meaning of WC; Need of WC Management; Determinants of WC; Operating Cycle; Estimation of WC. (5)

Part-B

Inventory Management: Meaning; Need to hold Inventory; Objective of Inventory Management; Inventory Investment Analysis; Inventory Control System. (6)

Capital Budgeting: Meaning; Basic Principles of Costs and Benefits; Investment Criteria; Pay back Method; Accounting Rate of Return Method; Net Present Value Method; Benefit-Cost Ratio; Internal Rate of Return; Capital Rationing; Introduction to Basic Techniques of Risk Analysis in Capital Budgeting. (7)

Dividend Decisions: Meaning and Types of Dividend; Issues in Dividend Policy; Traditional Model; Walter Model; Gordon Model; Miller and Modigliani Model; Bonus Shares and Stock Splits. (8)

References:
1. Financial Management, Van Horne ,PHI
**IBM-901 QUANTITATIVE TECHNIQUES FOR MANAGEMENT**

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**Note:** Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**

Linear Programming- Equation formulation, Graphical solution of two-variable linear programming problems, Simplex algorithm, Transportation and Assignment problems (8)

Game theory- Game models, zero sum games, dominance rule, 2 x n and m x 2 games, solution of m x n games (8)

Queuing: Single channel single-phase queuing system, multichannel single-phase queuing system, single channel multiphase queuing system (8)

**Part-B**

Markov Chains – Markov processes, Markov analysis, input transition probabilities, input conditions, output- specific state probabilities, steady state probabilities, absorbing chains (9)

Simple linear regression and multiple regression analysis (with two independent variables), specification of regression models and estimation of parameters, interpretation of results (6)

Forecasting models- Moving- average forecast methods, Simple Exponential Smoothing, Holt’s method- Exponential Smoothing with trend, Winter’s Method- Exponential Smoothing with Seasonality (10)

1. Business Forecasting : John.E.Hanke, Dean.W.Wichern, PHI
2. Statistics for Managers using Microsoft Excel : Levine, Stephan, Krehbiel, Brenson, PHI
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part –A**

**Market and Technical Analysis:** Market and Demand Analysis – Market Survey, Demand Forecasting, Uncertainties in Demand Forecasting; Technical Analysis-Product Mix, Plant Capacity, Materials and Inputs, Machinery and Equipment. (5)

**Project Costing and Finance:** Cost of project; Cost of production; Break even Analysis; Means of Financing Project; Tax Aspects in Project Finance; Role of Financial Institution in Project Finance. (5)

**Project Appraisal:** Time Value of Money; Project Appraisal Techniques – Playback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return, Benefit Cost Ratio; Social Cost Benefit Analysis; Effective Rate of Protection. (6)

**Risk Analysis:** Measures of Risk; Sensitivity Analysis; Simulation Analysis; Decision Tree Analysis. (5)

**Project Scheduling/Network Techniques in Project Management:** CPM and PERT Analysis; Float times; Crashing of Activities; Contraction of Network for Cost Optimization, Updating; Cost Analysis of Resources Allocation. (7)

**Part-B**


Institutions for - entrepreneurship development, Role of constancy organizations - Role of financial institutions -Bank finance to entrepreneurs, Making a business plan, Entrepreneurship development: Role of Government in supporting entrepreneurship programs in the country. (6)

**References:**
IBM-903 SUPPLY CHAIN MANAGEMENT

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Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part -A
Definition of Supply Chain Management and Logistics - Scope of Transportation, Relationship between transportation and other business functions, Transport Economics: Distance – volume-density, Freight Cost – Handling – Liability - market factors; Third party logistics (3 PL) & fourth party logistics service provider (4 PL), Logistics equipment; Reverse Logistics, Govt. rule & regulations related to Logistics; Documentation related to Transportation :- Bill of Lading, Freight Bill, Claims and F.O.B Terms of Sale, Legal Classification of carriers- Private, Contract carrier etc. (10)

Inventory Control, Planning & Managing Inventories: Strategic role of stock, costs of holding stock, Economic Order Quantity (EOQ), uncertainty in demand and costs, models for known demand: price discount from suppliers, planned shortages and back-orders, models for uncertain lead time demand (8)

Material Handling & Wastage Control; Packing & Packaging; Order Management; Competitive advantage through logistics and supply chain management; Responsive Supply Chain, RFID applications in Supply Chain. (7)

Part –B

Network Design and Facility Location – Facility location analysis, Optimization models, Heuristic Modeling – Grid Technique. Information systems for Supply Chain Management- Contemporary Logistics Information Technologies, e-enabled logistics management and tracking systems. (10)

Planning & Sourcing in Supply Chain; Planning demand and supply: Demand forecasting – Type and Time horizon of forecast and category of forecasting, aggregate planning: Strategic sourcing; Sourcing decision in Supply Chain- selection of source, technical up-gradation of vendor, vendor performance evaluation, vendor rationalization. (10)

References:
1. Designing & Managing the Supply Chain, Simchi-Levi, David, TMH
2. Inventory Control and Management, Donald Waters, Wiley
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A
Marketing of services - Introduction - Growth of the Service Sector - The Concept of Service - Characteristics of Services - Classification of Services - Designing the Service - Blueprinting, Using Technology, Developing Human Resources, Building Service Aspirations. (8)
Marketing Mix in Services Marketing - The Seven Ps - Product Decisions, Pricing Strategies and Tactics, Promotion of Services and Placing or Distribution Methods for Services - Additional Dimensions in Services Marketing - People, Physical Evidence and Process. (7)
Strategic Marketing Management for Services - Matching Demand and Supply through Capacity Planning and Segmentation - Internal Marketing of a Service - External versus Internal Orientation of Service Strategy. (10)

Part-B
Quality Standards, Factors and Solutions – Quality standards in Service delivery, External Communication to the Customer: the Promise versus Delivery Gap - Developing Appropriate and Effective Communication about Service Quality. (4)
Marketing of Services with special reference to (a) Financial Services (b) Health Services (c) Hospitality Services including Travel, Hotels and Tourism. (d) Professional Services (e) Public Utility Services (f) Communication Services (g) Educational Services (10)

References
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**

**Advertising:** As an element in Marketing Mix, its role and importance; Advertising as a means of communication, Setting advertising objectives, DAGMAR approach to setting objectives. Preparing advertising plan, Developing message, writing copy, advertising appeals and pre-testing and post-teaching copy

Media decisions, media strategy and scheduling decisions; Planning and managing advertising campaigns; Different types of advertising, public relations; Industrial advertising; advertising budget and relevant decisions; Advertising agencies; their role and importance; management problems of agencies; client-agency relations; advertising in India, problems and prospects. (15)

**Part-B**

**Sales Management:** Size of the sales force, sales organization based on customer, geography, product and combinations and current trends – sales training programs and motivating the sales force – sales force compensation, sales incentives and sales force evaluation – controlling the sales effort – sales quotas, sales territories, sales audit, selecting channel members, setting distribution objectives and tasks – Target markets and channel design strategies. (8)

Product, Pricing and Promotion issues in Channel Management and Physical Distribution - Motivating channel members – Evaluating channel member performance – Vertical marketing systems – Retail co-operatives, Franchise systems and corporate marketing systems. (7)

E-commerce and e-retailing as a channel of distribution, Electronic intermediaries, Disintermediation and Re-intermediation (5)

**References:**
1. Advertising and Promotion : An integrated marketing communication perspective, George Belch, M.Belch, K.Purani
3. Sales Management : Concept and Cases, W.L.Cron, Wiley
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**

Commercial Banking-Evolution, Financial Services, Fiduciary Services, Off-balance Sheet Activities, Analysis of Assets and Liabilities of Scheduled Commercial Banks; Reserve Bank of India-Central Banking- Introduction to Central Banking, Instruments of Monetary Control, Public Debt, Secondary Debt Market, REPO’s, Reserve Requirements, Selective Credit Controls, Advances to Priority Sector, Supervision System; Regional Rural Banks- Objectives, RBI Assistance, Evaluation of RRB’s.

Cooperative Credit- Introduction, Role of RBI, Organizational Structure, National Bank for Agriculture and Rural Development (NABARD), Reforms in Cooperative Credit.

Non-banking Finance Companies – Introduction, Definition of Non-banking Finance Company, Financial Sector Reform, Liberalization Measures for NBFC’s, Regulations for NBFC’s Accepting Public Deposits, Limits on Acceptance of Deposits, Size of Non-banking Companies, Deposits, Distribution of Deposits, Comparison of NOF and Deposits, Capital Issues by Finance Companies, FCNR Deposits for NBFC’s, Assets of NBFC’s, Investment Norms for NBFC’s, Deployment of Funds, Funds Mismatch of HP/Leasing Companies.

**Part-B**


References:
1. Indian Financial System ,Markets, institutions and services ,B.V.Pathak, Pearson
2. Indian Financial Systems & Markets , S.Saha, Tata Mcgraw Hill
3. Indian Financial System , M.Y.Khan, Tata Mcgraw Hill
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**
Financial Services - Meaning, types and their importance, Securities Trading - Online Vs Offline Trading, Demat and Remat, Depository - Introduction, Concept, depository participants, functioning of depository systems, process of switching over to depository systems, benefits, depository systems in India, SEBI regulation. (8)

Insurance Services- Introduction, Principles of insurance, Types of Insurance, Life Insurance Products- Traditional and ULIPs, Credit rating - the concept and objective of credit rating, various credit rating agencies in India and International credit rating agencies, factors affecting credit rating & procedural aspects. (8)

**Part-B**
Leasing - concept and development of leasing, business, difference between leasing & hire purchase, types of leasing business, advantages to lessor and lessee. (8)

Venture capital - concepts and characteristics of venture capital, venture capital in India, guidelines for venture capital. (7)

Call money market, Treasury bill market, Commercial Bill market, Market for CPs and CDs, Discount market and market for financial guarantees, Factoring - Development of factoring types & importance, procedural aspects in factoring, financial aspects, prospects of factoring in India. (7)

Plastic Money - Concept and different forms of plastic money - credit and debit cards, pros and cons. Credit process followed by credit card organizations. Factors affecting utilization of plastic money in India. (7)

**References:**
1. Financial services & system, S Gurusamy McGraw-Hill
2. Financial Instruments and services, Nalini P T PHI
3. Financial Services, M Y Khan Tata McGraw-Hill
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**
Options, Futures and Corporate finance: call options, put options, valuing options, option – pricing formula, stocks and bonds as options, capital structure policy and options
Warrants and convertibles: difference between warrants and call options, warrant pricing and Black-Scholes model, value of convertible bonds
Derivatives and Hedging risk: forward contracts and futures contracts, interest-rate futures contracts, duration hedging

**Part-B**
International Corporate Finance: Foreign exchange markets and exchange rates, law of one price and purchasing-power parity, interest rates and exchange rates, interest rate parity, international bond marketing

References:
1. Mergers, Restructuring and Corporate Control, Weston, Chung, Hoag , PHI
2. Corporate Finance, Ross, Westerfield, Jaffe, TMH
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A

Ecommerce terminology: Blogs, Message boards, Newsgroups, Banner Advertising, Spiders / crawlers/ robots, hacking, SSL / SET protocols, Escrow, Podcast, webcast, web beacons, spyware, Adware, RSS feed, Spam, Web agents, cookies, search engine, worms (2)

Planning for a Ecommerce: Value chain analysis, SWOT analysis, studying trends and current technology, government incentives, hardware and software assessment for building a web store, intermediaries in Ecommerce (8)

Characteristics of E-Business markets: Various business models, Business model design, pricing and distribution of digital products, bundling, building customer traffic, subscription vs paid model, bricks and clicks business model, call centre integration in ecommerce, affiliate marketing, viral marketing (10)

Part-B

Security in ecommerce transactions: Public key infrastructure, process of getting a digital signature in India, types of digital signatures, role of intermediaries like Verisign (6)

Internet audience: study of internet audience, online consumer behavior, Online research: Click stream analysis, Search log analysis, emails, pop-ups, online focus group (10)

Online payment systems: On-Line Electronic Cash, Electronic Payment Schemes, Credit card secure electronic transaction, e-cheque, accumulating balance payment system, stored value payment system, digital wallets (9)

References

1. E-commerce Management, Text and cases, Sandeep Krishna Murthy, Cengage
2. E-business organizational and technical foundation, Michael P. Papazoglou, Pieter M. A. Wiley
3. Ecommerce, Strategy, Technology and Implementation, Gary P. Schneider, Cengage
4. Web commerce Technology Handbook, Daniel Minoli, Emma Minoli, TMH
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**

Software development process: waterfall model, prototyping, spiral model, software configuration management process, process management- capability maturity model

Software requirement analysis and specification: problem analysis, data flow diagram, entity-relationship modeling, decision tables, creating a requirement document

Planning a software project: cost estimation-COCOMO model, schedule and milestones, personnel plan, software quality assurance plans, configuration management plans, project monitoring plans, risk management

**Part-B**

Function-Oriented design: Modularity, Top-down and bottom-up strategies, structure charts, first-level factoring, design heuristics, Metrics- network metrics, stability metrics, information flow metrics

Object oriented design (OO): classes and objects, encapsulation, inheritance and polymorphism, OO design notation and specification, dynamic modeling, metrics- Weighted Methods per Class (WMC), Depth of Inheritance (DIT), Number of Children (NOC), Coupling between Classes (CBC)

Software testing: error, fault and failure, top-down and bottom-up approaches, test cases and test criteria, functional testing- equivalence class partitioning, cause-effect graphing, structural testing-control based criteria, data flow based criteria

Software delivery: models, managing IT project teams

**References:**

1. Software Engineering, Ian Sommerville, Addison-Wesley
2. Software Engineering Project Management, R.Thayer, Wiley
**Note:** Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**

Distinction between Transaction Processing System (TPS), Management Information System (MIS), Expert System (ES) and Decision Support System (DSS)  (5)

Architectures of DSS system: components, classifications, backend and front end components of DSS, Web based DSS, Group Decision Support System (GDSS), technologies and infrastructure for group decision making, distributed computing  (6)

Modeling for DSS: the decision making modeling process, Intelligence, design and choice phases, design under certainty, risk and uncertainty, sensitivity analysis, what-if, goal-seek and scenario analysis with spreadsheets  (10)

DSS design to support operational, tactical and strategic decision making  (2)

DSS design methodology for Healthcare, Insurance, Manufacturing and Education sectors (4)

**Part-B**

Enterprise Decision Support System (EDSS): Characteristics and capabilities of EDSS, integrating DSS and EDSS, Computerized systems like CRM, ERP, MRP and their design basics, EDSS and supply chain, Corporate Enterprise portals and their design, Electronic Document Management (EDM) systems  (12)

Importance of Knowledge Management Systems (KMS) and its integration with DSS, Design of Knowledge Management System for different sectors, Artificial Intelligence based DSS systems.  (6)

**Reference**

1. Decision Support Systems and Intelligent Systems, E.Turban, J.E.Aronson, Pearson
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A
National Training Interventions: Training as an economic instrument, achievements and challenges, National initiatives: 1964 to the present day, the European scene, which way forward.

Attitudes Towards Education and training: Education, training and work, changes in attitudes to training and development, Philosophies of training. Learning and Training: What do we understand by learning, Reinforcement theories, cybernetic and information theories, cognitive theories and problem solving, experimental learning, Learning to learn and self-development, Mental process, other horizons.

The Learner and the Organization: The learner, the organization as a learning environment, the learning organization. Approaches to Training Interventions: Organization learning systems, Generalized approaches, Planned training interventions, the costs and benefits of training interventions.

Part-B
The Training Function in Organizations: The training function, Management's responsibility for training, Creating and appropriate structure, The training of training staff, Ethical standards

Assessing Organizational Training Needs: The levels of organizational needs, types of organizational reviews, before starting the review, reasons for an organizational review, carrying out an organization-wide review.

Training Policy, Plans and Resources: Training policy, policy development, annual training plan, training resources, from policy to training plan and budget, Assessing Training Needs-the job and the individual: Job training analysis, Analytical techniques, Carrying out an individual training needs analysis, assessing performance.

Determining and evaluating training interventions: Training interventions, determination of training objectives, determination of the appropriate training strategy, planning and implementation of the training, evaluation of the programme.

References:
1. Effective training, systems, strategies and practices, P.N.Blanchard, J.W.Thacker, V.A.Ram, Pearson
IBM- 913 ORGANIZATIONAL CHANGE AND DEVELOPMENT STRATEGIES

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A


Values, Assumption, And Beliefs in OD- Chronology of Events in Management and organization Thought, early Statement of OD values and assumptions, A Values Study. (3)


OD Interventions :Thinking about OD Interventions, Classifying OD Interventions. (4)

Part-B


Intergroup and Third-Party Peacemaking Interventions :Intergroup Team-Building Interventions, Third party Peacemaking Interventions,organization Mirror Interventions, Partnering. (7)


References:
1. Organization development and transformation –Managing effective change , W.French,C.Bell, R.Zawacki
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**

Nature and scope of Industrial Psychology: Psychology and management, contributions of Freud and post Freudian development of Psychology (5)

Factory organization: industrial bureaucracy, formal and informal groups, status system, balancing of social power, union and employer’s organizations (7)

Psychology of leadership, understanding and motivating employees, industrial morale and job satisfaction, counseling, Psychology of industrial conflict, stress management (7)

**Part-B**

Personality: Idiographic approach, Nomothetic approach, psychoanalytical perspectives, levels of awareness, defence mechanism, projective tests, Rorschach test, Thematic Appreciation Test (TAT), Role playing or visualization, stereotyping, brand personality (10)

Trait perspective: Allport’s trait categories, Catell’s 16 PF test, personality tests, personality questionnaire, Type perspective- four humours, Sheldon’s typology, Eysenck’s typology, Factor theory, Jung’s typology, Allport’s typology (9)

Intelligence: models, Stanford-Binet intelligence scale, Wechsler scale, Emotional intelligence (7)

**References:**

1. Psychology in Organizations, S.Alexander Haslam, Sage publications
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part -A
Definition, nature, scope, and importance of strategy; and strategic management (Business policy), Strategic decision-making. Process of strategic management and levels at which strategy operates, Role of strategists, Defining strategic intent: Vision, Mission, Business definition, Goals and Objectives. 

Environmental Appraisal—Concept of environment, components of environment (Economic, legal, social, political and technological).

Environmental scanning techniques- ETOP, QUEST and SWOT (TOWS) PEST. 

Internal Appraisal – The internal environment, organizational capabilities in various functional areas and Strategic Advantage Profile. Methods and techniques used for organizational appraisal (Value chain analysis, Financial and non financial analysis, historical analysis, Industry standards and benchmarking, Balanced scorecard and key factor rating). Identification of Critical Success Factors (CSF).

Part -B


Strategic Management of Technology and Innovation- Licensing new technology, imbibing new technology, searching for strategic partners in new business areas, Internal and external sources of technology , linking new technology and novel customer needs ,building competence through new product development, technological innovation and strategy

Recommended Text Books
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A

Global Marketing: Development of Global Marketing, market characteristics, Industry conditions, marketing infrastructure, regulatory framework, basis for trade- absolute vs comparative advantage, protectionism and trade restrictions, tariffs, quotas, GATT (8)

Selecting markets: list of selection criteria, market index for country selection, grouping global markets, consumer market, business market and government market, categorizing global marketing mindsets, global market entry strategies- exporting, local production, ownership (10)

Pricing for global markets: transportation cost, tariffs, taxes, local production costs, channel costs, market and environmental factors affecting price, determining transfer prices, dealing with parallel imports or gray markets, sources of finance- commercial banks, government sponsored financing (8)

Part-B

Developing new products for global markets: three strategic choices – extension, adaptation, invention, role of foreign subsidiaries in R&D, acquisitions as a route to new products, joint venture route to new products, concept test, test marketing (7)

Developing a global distribution strategy: distribution density, channel length, channel alignment, distribution logistics, locating and selecting channel partners (6)

Planning and controlling global marketing: selecting control metrics, resolving conflicts between headquarters and subsidiaries (6)

References:
2. Global Marketing, Johny K.Johansson, TMH
**IBM- 1003 CONSUMER BEHAVIOR**

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**Note:** Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**

Current trends in Consumer Behavior (CB), Consumer empowerment through the web, Information bank for understanding CB, consumer need arousal, need recognition, consumer Psychological set, consumer information search and processing, Brand evaluation, Purchase and post purchase behavior

Consumer learning, Habit and Brand Loyalty, unplanned purchase behavior, strategic implications of low-involvement decision making, situational influences, use of situational variables in marketing strategy, consumer perception, perception interpretation, price perception, Attitude development for change, lifestyle and personality

(9)

**Part-B**

Group and culture influences, culture values, cross-culture values, subculture influences, reference group influences, Household decision making, group communication – word of mouth as diffusion process, Market segmentation and Micromarketing

Marketing communication process – source effects in marketing communication, message effects, media effects, consumer decoding of marketing communication, Alternatives evaluation and selection – how consumers make choices, evaluation criteria, decision rules for Attribute based choices

(10)

Consumer Rights and Social responsibility

(7)

1. Consumer Behavior – Insights from Indian Market, Majumdar, PHI
2. Consumer Behavior – A Strategic Approach, Henry Assael, Biztantra (Dreamtech)
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A


Risk and Return: Concept of Risk, Components of Investment Risk, Measurement of Risk through Standard Deviation, Regression Equation, Covariance, Concept of Return, Expected Yield, Actual Yield, Holding Period Yield, Relationship between Risk and Return


Part-B


References:

2. Investment Management - Lofthouse, Stephen , John Wiley & Sons Publications
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A
Global Financial markets and interest rates: domestic and offshore markets, Euromarkets, Interest rates in the global money markets, money market instruments (6)
Foreign exchange market: types of transactions and settlement dates, exchange rate quotations and Arbitrage, exchange rate determination and forecasting (6)
Forwards, Swaps and Interest parity: Swaps and deposit markets, interbank forward dealing, option forwards, Exchange Rate Agreements and Foreign Exchange Agreements (FXA), Forward currency markets in India (10)

Part-B
Currency and Interest rate futures: futures contracts, markets and trading process, future prices expected spot prices and forward prices, option pricing models, Over the Counter (OTC) market prices (8)
Hedging, Speculation and Management of Transaction exposure: Hedging with money market, currency options, currency futures, internal hedging strategies (8)
Management of Interest Rate Exposure: Forward Rate Agreements (FRAs), Interest (7)

References:
1. International Financial Management, P.G.Apte, Tata McgrawHill
2. Multinational Financial Management, Shapiro, Wiley
Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A

ERP Package selection: Need assessment, Justifying ERP implementation, cost benefit analysis, ERP package evaluation and selection, make or buy decision (8)

ERP systems development process: ERP implementation life cycle, planning, requirement analysis, reengineering vs customizing, transition strategies- big bang, phased, parallel, hybrid, implementation-hidden costs (8)

ERP systems: Sales and Marketing- sales and distribution, sales forecasting, product pricing systems, billing systems ERP and Customer Relationship Management (CRM), Accounting and Finance- cash management process, capital budgeting process, financial accounting and management accounting Production and Materials management- MRP system, capacity planning process, manufacturing execution systems, Human Resources-compensation and benefits administration (12)

Part-B

Managing an ERP project: Risks in ERP implementation, managing large scale ERP projects, project team selection, user training, technological challenges, operation and upgradation issues (10)

Role of consultants and vendors: maintenance of ERP system, future trends and directions in ERP, open source ERP systems (7)

References

1. Enterprise Resource Planning, Mary Sumner, Pearson
2. Enterprise Resource Planning, Alexis Leon, TMH
3. Class A ERP Implementation- Integrating Lean and 6 sigma, S. Donald, Cengage India
**IBM-1007 DATA WAREHOUSING & DATA MINING**

**Note:** Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**

Data Warehousing (DW): components of DW, DW and data marts, planning for DW, specifying business requirements, DW and Meta Data, dimensional modeling, slowly changing dimensions type 1, 2 and 3, factless fact tables, aggregate fact tables, data extraction, transformation and loading (ETL), ETL tools, indexing the DW, DW and OLAP (12)

Data mining: preprocessing data for data mining, descriptive data summarization, data cleaning, prediction modeling with simple linear regression and multiple regression, logistic regression (8)

Classification data mining modeling: classification by decision tree induction, tree pruning, Bayesian classification, classification by back propagation in Neural networks (8)

**Part-B**

Mining frequent patterns and associations: market basket analysis, Apriori Algorithm, web mining, web log analysis, text mining (7)

Cluster analysis: interval scaled variables and binary variables, cluster analysis by partitioning, hierarchical methods, density based methods, clustering based on distance (8)

Open source data mining software and proprietary software (2)

**References:**

1. Data Mining –Concepts and Techniques, J.Han, Micheline Kamber, Elsevier
2. Data Mining –Methods and Models, Daniel T. Larose, Wiley
3. Data Mining- Galit Shimuli, Wiley
**IBM- 1008 STRATEGIC HUMAN RESOURCE MANAGEMENT**

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**Note:** Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

**Part-A**

Introduction to Strategic Human Resource Issues, Challenges of Career development, Diverse work force development, self development, Pay-for-performance systems, Types of Pay-for-performance plans- individual based, team based, plant wide and corporate level (10)

Hofstede’s cultural orientation model, FIRO-B questionnaire, Johari Window questionnaire, HR metrics and importance, Factor analysis in HR Research, competency mapping models and framework (10)

**Part-B**

Determining the mix of Host-country and expatriate employees, the challenges of expatriate assignments, selective training, career development and compensation of expatriate employees, developing a global HR system and pay system, international staffing managing diversity, off shoring, equal employment opportunities, repatriation –problems and solutions, HR strategies and orientation for Mergers (14)

Managing employee separation, Downsizing and outplacement, cost and benefits of employee separation, types of early separation (voluntary and Involuntary), features of early retirement policies, managing layoffs, alternatives to layoffs, the goals of outplacement. (11)

3. Human Resource Research methods, Dipak Kumar Bhattacharyya, Oxford
IBM- 1009 MANPOWER PLANNING & PERFORMANCE APPRAISAL

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Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part-A and two from Part-B.

Part-A
Manpower planning: setting up objectives, aligning manpower planning with strategic business goals, Role analysis, job analysis, job specification, job description

Recruitment and selection: recruitment and legislation, fair employment practices, recruitment, hiring procedure, forecasting human resource requirements, managing growth and replacement of top executives

Part-B
Performance appraisal: need for performance appraisal, parameters of performance appraisal, computerized performance appraisal systems, self appraisal questionnaire, 360 degree performance appraisal systems


References:

IBM- 1010 SEMINAR

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The students are required to prepare and deliver a presentation to the class on a given topic. The topic will be related to current business scenario / specialization area.

Presentation - 30 minutes

Question Hour session - 10 minutes

The student will be evaluated on the basis of Presentation content, Communication ability and handling question’s.

IBM- 1011 MINOR PROJECT

The students are required to prepare a minor project on the topic allotted to them. The topic will be allotted by consultation with the student in the area of specialization.

The student is required to submit the report in the following format:

a) Problem statement
b) Literature review
c) How to solve the problem
d) Research methodology
e) Data sources identified
f) Data collection
g) Statistical analysis
h) Results
i) Shortcomings