PROPOSED SCHEME OF EXAMINATION OF B.E. MBA integrated in
B.E.MBA integrated in ELECTRICAL & ELECTRONICS

Scheme of Examination and syllabi of B.E. MBA Integrated (Electrical & Electronics) for 3rd to 6th Semesters for academic session 2010-11 may be modified as follows:

BACHELOR OF ENGINEERING + MBA (ELECTRICAL & ELECTRONICS)
III SEMESTER

<table>
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AS 301
Engineering Mathematics – III

External: 100
Sessional: 50

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.

Part - A


(8 Lectures)

Linear Algebra: Concept of linear independence and dependence, Rank of a matrix: Row – Echelon form, elimination method. Inverse of a matrix: Gauss – Jordan elimination method (Scope as in Chapter 6, Sections 6.3 – 6.5, 6.7 of Reference 1).

(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:

EC - 311
SEMICONDUCTOR DEVICES

External: 100
Sessional: 50

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
1. **Transistor characteristics**: (10)
   Junction transistor, transistor current components, current gain, transistor as an amplifier, common emitter, common base, common collector configurations, Input & output characteristics in CE, CB & CC configurations, photo transistor & its characteristics, unijunction transistor & its characteristics.

2. **Transistor at low frequencies**: (08)
   Graphical analysis of CE configuration two port devices and hybrid model, h-parameters, comparison of amplifier configurations of circuits.

3. **Transistor biasing and Thermal stabilization**: (08)
   Concept of biasing & biasing of BJT circuits, operating point, bias stability, stabilization against variation in $I_{co}$, $V_{be}$, and $\beta$, thermal run away, thermal stability.

Part-B
4. **Field Effect transistor**: (09)
   Junction field effect transistor, JFET characteristics, pinch off voltage and equivalent circuit, MOSFETS their modes of operation and characteristics, equivalent circuit, biasing of FETS.

5. **Power amplifiers**: (10)
   Classification of amplifiers, Class A large signal amplifier, second and higher harmonic distortion, transformer coupled amplifiers, Efficiency of amplifiers, Push pull amplifiers (class A & class B).

Books Recommended:
- Microelectronic Circuits: AS Sedra & KC Smith (OXFORD) 5th edition
- Electronic Circuit Analysis & Design: Donald A. Neamen (TMH) 3rd edition

EC - 361
SEMICONDUCTOR DEVICES LAB

External: 40
Sessional: 60

Note: At least eight experiments to be done.

1. To study the specification sheet & draw the characteristics of transistor in CB or CE configuration.
2. To study the specification sheet & draw the characteristics of FET in CD or CC configuration.
3. To draw the frequency response of a single stage BJT amplifier.
4. To measure the voltage and current gain of a BJT amplifier.
5. To measure the distortion in the output of a push pull amplifier.

To simulate the following using P-spice
   1. Frequency Response of a single state FET amplifier.
   2. Voltage and current gain of BJT amplifier.
   3. Distortion of a push pull power amplifier.
EE- 311
Linear Circuit Analysis

External: 100
Sessional: 50

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
1. Systematic Analysis Methods for Circuits with Independent and Controlled Sources
   Independent and controlled sources, circuits with controlled sources, linearity and superposition, Thevenin and Norton networks.
   Nodal Analysis: Node voltages, matrix node equations, floating voltage sources
   Mesh Analysis: Mesh currents, matrix mesh equations, interior current sources.
   Applications of systematic analysis methods for analysis of ac circuits including unbalanced three phase circuits.
   [Carlson:1.2, 2.3-2.5, 4.1-4.4, 6.3, 6.5, 7.4] (10-hours)

2. Fourier Series Analysis
   Periodic Waveforms and Fourier Series: Periodic waveforms, trigonometric Fourier series, exponential Fourier series, waveform symmetry.
   Spectral Analysis of Periodic Waveforms: Line spectra, time and frequency relations, differentiation and integration.
   Spectral Circuit Analysis: Periodic steady state response. [Carlson:12.1-12.3] (7-hours)

3. Two-Port Networks
   Two-Ports and Impedance Parameters: Two-port concepts, impedance parameters, Reciprocal networks.
   Admittance, Hybrid and Transmission Parameters: Admittance parameters, hybrid parameters, transmission parameters, parameter conversion.
   Circuit Analysis with Two-Ports: Terminated two-ports, interconnected two-ports
   [Carlson:14.1-14.3] (6-hours)

PART-B
4. Network Functions and s-Domain Analysis
   Complex Frequency and Generalized Impedance: Complex frequency, generalized impedance and admittance, impedance analysis
   Network Functions: Network functions and circuit equations, network functions and impedance analysis.
   Network Functions with mutual Inductance.
   s-Domain Analysis: Poles and zeros, forced response and s-plane vectors, natural response and stability.
   [Carlson:10.1-10.4] (8-hours)

5. Laplace Transform Analysis
   Solution of circuit differential equations using Laplace transform.
   Transform Inversion: Partial fraction expansion, complex poles, repeated poles, time delay, initial and final values.
   Transform analysis with mutual Inductance.
   Impulses and Convolution: Impulses, transforms with impulses, convolution and impulse response.
   [Carlson:13.1-13.5] (10-hours)

Text Book

Other Recommended Books
Linear Circuit Analysis Lab

External: 40
Sessional: 60

1. To make 3-phase unbalanced network with neutral return of known impedance. Measure phase currents, neutral currents and the potential difference between the load and supply neutral. Verify the results theoretically.

2. To determine phase sequence of three phase supply system and to find the line currents for three phase three wire load when the sequence is i) RYB ii) RBY. Verify the results theoretically.

3. To study the current build up and current decay in RL / RC circuit by obtaining its response to a square wave input.

4. To check the polarity marking of a transformer and to determine self inductance of each winding and mutual inductance between the windings.

5. To study the resonance in R-L-C circuit, and to measure Q-factor of the coil.

6. To find the various two port network parameters (open circuit, short circuit, transmission and hybrid parameters)

7. For a circuit supplied from a non-sinusoidal source verify the following current and voltage relations:
   \[ V^2 = V^2_{dc} + V^2_1 + V^2_2 + \ldots \]
   \[ I^2 = I^2_{dc} + I^2_1 + I^2_2 + \ldots \]

8. To analyze a complex waveform.

9. To obtain capacitor voltage vs. time curve and time constant of an RC circuit when
   i) It is switched on to dc supply
   ii) Capacitor is discharged through the resistance

10. PSpice simulation of circuits to obtain steady state response for dc and ac excitation

11. PSpice simulation for transient response of circuits

12. PSpice simulation of unbalanced three phase circuits and for circuits with mutual inductance
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 Object Oriented Methodology:**
Object Oriented Programming, Analysis, Class and Objects, Abstraction, Encapsulation Inheritance, Derived classes, types of inheritance, various types of classes, virtual functions and polymorphism, Overloading, Overriding, OOP using C++:

**Part-B**

**Container Classes:**
Introduction to Arrays, Vectors, Stacks, Queues, Linked Lists and their different types, Trees, B-Trees, Heaps, Binary search Tree using Container Classes.

**Algorithms:**
Complexity, Insertion sort; Selection sort; Merging; Merge sort; Radix sort; Sequential & Binary Search; Indexed Search; Hashing schemes;

**Text Book:**

**Other Recommended Books:**
Object Oriented Programming in Microsoft C++ by Robert Lafore, 4th edition by Galgotia publications, 2005
C++ Primer, 3rd edition by Lippman, Pearson Publications.
Schaum’s Outline of Data Structures with C++ 1st edition By John R Hubbard, Tata Mcgraw Hill publications, 2000

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**CS-361**

OBJECT ORIENTED PROGRAMMING
AND DATA STRUCTURES LAB

Programming exercises related to functions, classes, dynamic memory allocation, pointers, constructors, destructors, operator overloading, inheritance, virtual functions, polymorphism, I/O files, arrays, stacks, queues, prefix, infix, postfix notations, linked list, two way and circular link list, insertion, deletion, searching, sorting of data in link list, linked stacks and queues, trees representation, insertion, deletion and searching in trees, heap sort, binary and other types of trees, various searching and sorting algorithms and other topics related to theory portion.
EE-312
ELECTRIC MACHINERY-I

L T P
3 1 0

External: 100
Sessional: 50

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
1. Transformers
   (10 hours)

2. Direct Current Machines
   Generators: Mechanical construction, Armature windings, Induced emf equation, Developed torque, Magnetization characteristics, Theory of commutation, Armature reaction, Types of d.c. generators, Voltage regulation, Losses, Separately excited, shunt, series and compound generators and characteristics, Maximum efficiency criterion.
   (10 hours)

Part-B
3. Polyphase Induction Machines
   Induction Generator: Motor to generator transition, Induction generator starting and operation with other three phase sources, Isolated generator operation and voltage build up. [Hubert : 5.18]
   (15 hours)

4. Single Phase Induction Motors
   Double revolving field theory, Analysis of single phase induction motor and speed torque characteristics, Split Phase, Capacitor start, Capacitor start capacitor run motor, Permanent split capacitor motor, Shaded pole motor, Testing of single phase induction motor: No load and block rotor tests. [Guru-Hiziroglu:10.1-10.4, 10.6-10.7]
   (8 hours)

Text book:

Other Recommended Books:
Note: At least eight experiments to be done.

1. Open circuit and short circuit test of single phase/ three phase transformer and obtain its equivalent circuit.
2. Parallel operation of two single phase transformers.
4. Different winding connections of three phase two winding transformer and to identify proper combination for parallel operation.
5. Parallel operation of two three phase transformers.
8. Efficiency at different loads of the given dc shunt machine through swinburne / load test.
9. Speed control characteristics of a given dc shunt motor by (i) Armature control (ii) Field control.
10. No load and blocked rotor test on a three phase induction motor and to obtain its Equivalent circuit
11. Torque speed characteristics of three phase induction motor.
Organization Behavior

IBM 301

L T P
3 1 0

External: 100
Sessional: 50

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 Organization Behavior [10]
Definition and meaning of OB, impact of other sciences (Anthropology, Sociology, Psychology) on OB, perception, self esteem, attitude & personality, meaning of culture, impact of technology on OB.

Motivation, Learning & Leadership [13]
Meaning of Motivation, Content theories of motivation (Maslows Hierarchy of needs, Herzberg’s two factor theory), Process theories (Vroom’s Expectancy theory, Porter-Lawler Model), Motivation applied (Job design, job rotation, goal setting, MBO), various methods of motivating employees, Behavioral & Cognitive theories of learning, Leadership theories (Trait theory, Fiedler’s Contingency theory, Path-Goal leadership theory), Leadership styles (Blake & Mouton managerial grid, Hersey & Blanchard’s life cycle approach)

Part B

Group behavior: [10]
Group Dynamics, conflict, power & politics, Group behavior, types of groups, group decision making, conflict in organizations and reason, interpersonal conflict, inter group conflict, meaning of power, classification of power, politics in organizations

Organization environment & Communication [12]
Authority & responsibility, delegation and division of work, quality of work life, communication process, modes of communication in organization and barriers to communication, formal & informal communication,

Recommended Books:
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<td>Theory of Electromagnetics &amp; Antennas</td>
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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.

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, 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
Management of Information Technology  
IBM 401 

L T P  
3 1 0 

External: 100 
Sessional: 50 

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) [8] 
IT and society, IT infrastructure in India vis-à-vis developed nations (Telecommunication, Internet reach, PC, Broadband, Mobile Phones), IT applications in Healthcare & Education, meaning of E-Readiness and E-participation index as defined by United Nations, areas where growth is expected in future.

System Investigation & Analysis, Networking [8] 
System Analysis & Design, Symbols used in modeling a business process, 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 [7] 
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 [12] 
E-Commerce models, Intermediaries in E-Commerce, E-Governance in India, study of successful E-Governance 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 like eBay, dealing with E-Waste.

Knowledge Management & Business Intelligence [10] 
Meaning of Knowledge Management, Designing a Knowledge Management System, Nature & Scope of Business Intelligence, Software for Business Intelligence, Data Warehousing and Data Mining techniques.

Recommended Books: 
EE- 411
POWER SYSTEMS-I

L T P
3 1 0

External: 100
Sessional: 50

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

1. Introduction
   Introduction to Power System, Representation of power system components, One line diagram and impedance diagram, Per unit system, Complex power. (4-hours)

2. Transmission-Line Parameters

3. Transmission Lines: Steady-State Operation

Part-B

4. Symmetrical Faults

5. Symmetrical Components
   Definition of Symmetrical Components, Sequence Networks of Impedance Loads, Sequence Networks of Series Impedances, Sequence Networks of Three-Phase Lines, Sequence Networks of Rotating Machines, Per-Unit Sequence Models of Three-Phase Two-Winding Transformers, Per-Unit Sequence Models of Three-Phase Three-Winding Transformers, Power in Sequence Networks [Glover-Sarma: 8.1-8.8] (6-hours)

6. Unsymmetrical Faults

Text Book

Other Recommended Books

EE- 461
POWER SYSTEMS-I LAB

L T P
0 0 2

External: 25
Sessional: 50

Design/analysis projects relating to the following.
1. Determination of line parameters and sequence impedances of transmission lines.
2. Line loadability.
3. Steady state operation of transmission lines.
4. Symmetrical and unsymmetrical power system faults.
EC- 411
ANALOG ELECTRONICS

L T P
3 1 0

External: 100
Sessional: 50

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

Response of transistor Amplifier (09)
Review Biasing, classification of amplifier, distortion in amplifiers, frequency & phase response of an amplifier, RC coupled amplifier, its low and high frequency responses, transistor model at high frequencies for CE and Emitter follower configuration, high frequency response of two cascaded CE transistor stages

Feedback and Stability (8)
Introduction to feedback, Basic-Feedback Concepts, Ideal Feedback Topologies,
Voltage(Series-Shunt) Amplifiers, Current(Series-Shunt) Amplifiers,
Transconductance(Series-Series) Amplifiers, Transresistance(Shunt-Shunt) Amplifiers,

Operational Amplifier (08)
Differential Amplifier, Block diagram representation of a typical Op-amp, Interpreting of a typical set of data sheets, ideal op-amp, equivalent circuit, of op-amp, ideal voltage transfer curve, open loop op-amp configuration, the practical op-amp, input offset voltage, input bias current, input offset current, total output offset voltage, thermal drift, noise, common mode configuration, CMRR., Frequency Response, Frequency response of internally compensated Op-Amps, Frequency response of Non-compensated OP-Amps, Open loop voltage gain as a function of frequency, Closed loop frequency response, Slew rate

Part-B

Op-amp Applications (10)
DC and AC Amplifiers, summing, Voltage-to-current converter, current to voltage converter, the Integrator, the Differentiator, Comparator, Zero-crossing detector, Voltage to frequency and frequency to voltage converters, Clippers and Clampers, Sample and Hold Circuit, Instrumentation Amplifier

Active filter, Oscillators & Tuned Amplifiers (10)
Active filters, Essentials of Oscillator, Types of Oscillator, Sinusoidal Oscillator, Schmitt Trigger Circuits, Introduction of Tuned Amplifiers, Single & Double Tuned Amplifiers

Book recommended
1 Electronics Circuit Analysis and Design by Donald A. Neamen, 3rd edition, Tata McGraw Hill
3 Integrated electronics by Millman & Halkias 2001, TMH
4 Operational Amplifiers by B B Brey.
Note: At least eight experiments to be done.

1. To study the Pspice Simulation software
2. Design fabrication & testing of Differentiator Circuits using Op-Amp & simulate using P-spice
3. Design fabrication & testing of Integrator Circuits using Op-Amp & simulate using P-spice
4. Design fabrication & testing of adder/Subtractor Circuits using Op-Amp & simulate using P-spice
5. Design fabrication & testing of Clippers and Clampers Circuits using Op-Amp & simulate using P-spice
6. Design fabrication & testing of Universal Active filter & simulate using P-spice
7. To study the frequency response of OP-Amplifier & simulate using P-spice
8. To design Butter worth Low pass filter & simulate using P-spice
9. To design Butter worth High pass filter & simulate using P-spice
10. To design Butter worth Band pass filter & simulate using P-spice
11. To design Monostable & Free running Multivibrator using 555
EC - 412
THEORY OF ELECTROMAGNETICS AND ANTENNAS

External: 100
Sessional: 50

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

1. Maxwell’s equation:
   Review of Maxwell’s equations in their integral and differential forms, Maxwell’s equations in free space and in harmonically varying fields. Physical Interpretation (03)

2. Plane waves in Dielectric and Conducting Media:
   Conductors and Dielectrics, Wave equations in conducting and dielectric media its solution, Skin effect, relaxation time, impedance of the conducting medium. Reflection and transmission of the wave at a boundary. Pointing Vector application to energy radiation, Velocities of propagation: group velocity, phase velocity, poynting vector, wave polarization. (12)

3. Guided Waves:
   Waves between parallel planes, TEM waves, Field analysis of T.M. & T.E. wave, Characteristics of T.M. & T.E. Waves. (06)

Part-B

4. Wave Guides:
   Rectangular and Circular waveguides: T.M. & T.E. Modes, Wave impedance and characteristics impedances, Attenuation factor and Q of waveguides. (08)

5. Antenna:
   Antenna Parameters, Radiation field, Radiation power and Radiation resistance of alternating current element and dipole antenna. One dimensional Broad side and End Fire arrays, multiplication of patterns. VLF and LF Transmitting Antennas: Effect of Earth on vertical patterns and radiation resistance, grounding, effective length, top loading and tuning. (10)

6. Wave Propagation:
   Modes of Propagation: Surface Wave Propagation, Sky Wave (Ionospheric) Propagation- Virtual height, Maximum usable Frequency, Skip Distance, Optimum working frequency, Space Wave (Tropospheric) Propagation- line of sight distance, Effective Earth’s radius, Duct propagation (09)

Books Recommended:
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 (10)
Concept of digitisation, Representation of Logic, Logic Variables, Boolean Algebra, Boolean Expressions and minimization of Boolean expression using K-Map(up to five variables), Review of Logic Gates, design & Implementation of Adder, Subtractor, Multiplexer, DeMultiplexer, Encoder, Decoder, ROM, Digital Comparators, Code Converters using gate, multiplexers / decoders

Flip-Flops (04)
A 1-bit memory cell, clocked & unclocked flip flop, S-R Flip-Flop, JK Flip-Flop, Race around Condition, Master Slave Flip-Flop, D&T type Flip-Flop

Counters & Shift Registers (10)
Ripple Counters, Design of Modulo-N ripple counter, Presettable Counters, Up-Down counter, design of synchronous counters with and without lockout conditions, design of shift registers with shift-left, shift-right & parallel load facilities, Universal shift Registers.

Part -B

Data Converters (06)
Sample & Hold switch, D/A converters: weighted resistor type, R-2R Ladder type; A/D Converters: Counter-Ramp type, Dual Slope Type, Successive approximation type, flash type; Specifications of ADC & DAC

Digital Logic families (05)
Characteristics of digital circuits: fan in, fan-out, power dissipation, propagation delay, noise margin; Transistor-transistor Logic(TTL), manufacturer Data Sheets & Specifications, Types of TTL Gates (Schottky, standard, low power, high speed). Emitter Coupled Logic(ECL), Manufacturers Data sheets & Specifications, Comparison of Characteristics of TTL and ECL, Tristate Logic & its applications.

Semiconductor Memories & Programmable Logic (10)
ROM, PROM, EPROM, EEPROM; RAM: Static RAM, Typical Memory Cell, Memory Organisation, Dynamic RAM cell, Reading, & Writing Operation in RAM, PLA, PAL & FPGA

Books Recommended
Note: At least eight experiments to be done.

1. To Study the data sheets of TTL and ECL gates
2. Verify the truth tables of with various gates, RS, D, JK Flip Flops
3. To design and implement a Modulo-N Counter
4. To Design and implement a Universal shift register
5. To Perform arithmetic & Logic operations on two 4-bit binary numbers using an ALU.
6. To Transfer the Data between Three Registers through Tristate Circuit
7. To Understand Decoder/Driver and their applications with display. To display a count from 00 to 99 with a delay of N seconds.
10. To convert 8 bit Digital data to Analog value using DAC
11. To convert Analog value into 8 bit Digital data using ADC
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Sessional: 50

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

1. Power System Protection
   Power System Overvoltages, protection against over voltages by shielding or ground wires and lightning arrestors, insulation coordination.

2. Circuit Breakers
   Transient recovery voltage, resistance switching, first pole to clear factor, Transient recovery voltage, arc and arc extinction, volt ampere characteristics of arc, methods of arc extinction, construction, working and applications of air-break circuit breakers, oil circuit breakers, vacuum circuit breakers, air blast circuit breakers, SF6 circuit breakers, circuit breaker ratings

Part - B

3. Substations and Distribution
   Location and types of substations, bus-bar arrangements, major substation equipment
   Types of insulators, voltage distribution across suspension insulators, string efficiency, methods of improving string efficiency
   Types of Underground cables, capacitance of single core cables, grading of cables, capacitance of three core belted cables, power factor and heating of cables
   Radial, parallel or loop, network or grid types of distribution systems and their relative merit.

4. Grounding
   Grounding fundamentals, Ground resistance, step voltage, touch voltage and transferred voltage, tolerable step and touch voltages, ground resistance of a hemisphere and driven rod, IEEE Standard 80 formulae for ground resistance and step and mesh voltages of a grounding grids, limitations of the formulae
   Neutral grounding: ungrounded systems, resonant grounding, solid or effective grounding, reactance grounding, earthing transformer, neutral grounding practice

Text Book / Standards

Other Recommended Books
EE- 561
POWER SYSTEMS II LAB

Note: At least eight experiments / projects / technical reports relating to the following:
1. Measurement of soil resistivity and soil model evaluation
3. Grounding system design for a substation.
4. To study the characteristics of over current relay.
5. To study the characteristics of percentage differential relay.
6. To study the characteristics of distance relay.
7. To study current time characteristics of fuses.
8. Technical visit to a substation/generating station, Load Dispatch Centre and preparation of a technical report for the same
9. Conventional and renewable energy sources
10. Distribution system design
11. Digital relaying
12. Reactive compensation of lines

EE- 512
ELECTRICAL MACHINERY-II

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External: 100
Sessional: 50

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
Synchronous Machines:

Part-B
Parallel operation of alternators:
Synchronizing to infinite Bus-Bars, synchronoscope, parallel operation of alternators, Operating characteristics, generating Machine, motoring machine, power angle characteristic, operation at constant load with variable excitation, generating Machine, motoring machines, minimum excitation, observation, compounding curve, synchronous condenser, consideration of armature resistance, power flow (transfer) equations,
Special motors:

Brushless dc motors, schematic and operation, circuit model characteristics of brushless dc motor, PM
Brushless dc machine, universal motor and stepper motor, linear induction motor, Hysteresis motor, reluctance motors

Text Books:


Other Recommended Books:

1. Electrical Machinery and Transformers by Bhag S. Guru and Huseyin R. Hiziroglu

EE-562
ELECTRICAL MACHINERY-II LAB

External: 25
Sessional: 50

Note: At least eight experiments are to be performed.

1. To perform no load test on a 3 phase alternator (cylindrical rotor).
2. To perform short circuit test on a 3 phase alternator (cylindrical rotor). Measure the resistance of stator winding of alternator. Find out regulation of alternator at full load at (i) unity power factor (ii) 0.85 Power factor lagging (iii) 0.85 Power factor leading using synchronous impedance method.
3. To synchronize an alternator with the 3 phase supply.
4. To perform the parallel operation of two alternators.
5. To perform the slip test to determine the Xd and Xq.
6. To run a stepper motor in different modes with the help of microprocessor.
7. To analyze the power factor improvement of an industry and design the capacitor bank.
8. Computer aided transformer design
9. Computer aided induction machine design
10. Computer aided synchronous machine design
11. To obtain positive, negative and zero sequence impedances of a three phase synchronous generator
12. To obtain positive, negative and zero sequence impedances of a three phase transformer
EE- 513
Microprocessors and Interfacing

External: 100  
Sessional: 50  
**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**

**Microprocessor Architecture and Microcomputer Systems:** Microprocessor Architecture Memory, Input and Output Devices, The 8085 MPU, Example of an 8085-Based Microcomputer, Memory Interfacing.  
**Programming the 8085:** Introduction to 8085 Assembly Language Programming, The 8085 Programming Model, Instruction Classification, Instruction Format. Data Transfer (Copy) Operations, Arithmetic Operations, Logic Operations, Branch Operations, Writing Assembly Language Programs.  
**Programming Techniques:** Looping, Counting and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, Arithmetic Operations Related to Memory, Logic Operations.  

**Part-B**

**Counters and Time Delays:** Counters and Time Delays, Hexadecimal Counter, Modulo Ten, Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs.  
**Stack and Subroutines:** Stack, Subroutine, Conditional Call and Return Instructions.  
**Interrupts:** The 8085 Interrupt, 8085 Vectored interrupts.  
**Interfacing Data Converters:** Digital- to- Analog (D/A) Converters, Analog- to- Digital (A/D) Converters, stepper motor interfacing.  
**General –Purpose Programmable Peripheral Devices:** The 8255A Programmable Peripheral Interface, Illustration: Interfacing Keyboard and Seven- Segment Display, Illustration : Bi- directional Data Transfer between Two Microcomputers. The 8254 Programmable Interval Timer, The 8259 A Programmable Interrupt Controller, Direct Memory Access (DMA) and the 8257 DMA Controller, serial communication, Programmable communications interface 8251,RS 232C.  

**TEXT BOOK**

Ramesh S.Gaonkar, “Microprocessor Architecture, Programming and Applications with the 8085” 5th edition 2003, TMH.

**OTHER RECOMMENDED BOOKS:**

Douglas V. Hall, “Microprocessors and Interfacing programming and Hardware” 2nd editionTMH.
1. Study of 8085 Microprocessor kit
2. Write Assembly Language Program to add n given numbers with and without carry.
3. Write Assembly Language Program to count positive & negative numbers in given n numbers.
4. Write Assembly Language Program to de-assemble 8-bit number in two nibbles.
5. Write Assembly Language Program to reassemble two nibbles in 8-bit number.
6. Write Assembly Language Program to sort given n numbers in ascending & descending order using subroutine.
7. Write Assembly Language Program to relocate the given numbers in same & reverse order.
8. Write Assembly Language Program to Flash different letters using your own delay subroutine.

Interfacing of Microprocessor 8085:

1. To obtain a square wave on CRO
2. To interface A to D converter
3. To interface D to A converter
4. To interface stepper motor with μp to control its step size and direction of rotation
5. To develop a traffic light controller program and interface using Input/Output Module.
EE- 514
Instrumentation systems

L T P
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External: 100
Sessional: 50

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

1) Transducers & Standards
   Standards of Instrumentation Systems and Their Classification: Emf, Current, Resistance and Capacitance Standards. Sensors and Transducers: Primary Sensing Elements; Characteristics; Classification.
   Passive-Transducers-Resistive, Inductive, Capacitive; Types, Features, Configurations, Analysis, Applications.
   Active Transducers- Thermoelectric, Electromagnetic, Piezo-Electric, Photoelectric; Types-Principle, Construction, Analysis and Applications.

2) Digital - Analog Instruments and Recording Systems

Part - B

3) Signal Conditioning:
   Analog Conditioning- Instrumentation and Logarithmic Amplifiers.
   (Data Display and Recording Devices: Principle, Operation and Use of -LEDs, LCDs, Recorders-Paper Chart, Magnetic Tape, Semi-Conductor;

4) Virtual Instrumentation
   Introduction to lab VIEW Front Panel, Block Diagram, Tools And Palettes, Menus, Code Debugging, Creating Sub-Vis, For Loop, While Loop, Structures, Arrays And Clusters, Graphs And Charts, File Input And Output , Data acquisition and applications.

TEXT-BOOK
2. A.K Sahnwey “Electronic and Electrical Instrumentation”2ND EDITION 1976, DHANPAT RAI.

References:

EE- 564
Instrumentation systems Lab

L T P
0 0 3

External: 25
Sessional: 50

Note: At least eight experiments are to be performed.
1) Displacement measurement using LVDT
2) To study the operation of Instrumentation Amplifier.
3) Measurement of flow using electromagnetic and positive displacement parameters.
4) Measurement of level using capacitance probe differential pressure transducer.
5) Design of linearization circuit for thermistor.
6) Experiments based on Lab VIEW.
Marketing Management
IBM 501

External: 100
Sessional: 50

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.

Objectives: (i) To understand the nature, tasks and the environment under which marketing operates. (ii) To study the theory, principles and practical aspects of various marketing functions. (iii) To learn to take marketing decisions.

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:
2. Ramaswamy, V.S. & Namukumari, S: Marketing management, planning, implementation and control, 2nd edition Mcmillan
10. Saxena, R: Marketing Management, 2nd edition TMH.
Human Resource Management
IBM 502

External: 100
Sessional: 50

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.

Objectives: The objective of the paper is to make student aware of the various functions and importance of the HR department in any organization. It is basically concerned with managing the human resources, whereby the underlying objective is to attract retain and motivate the human resources in any organization, which is the most challenging and daunting look for any organization today.

Part A

Introduction: [5]
Meaning, scope, objectives and functions of HRM; Importance of Human Resource Management; HRM & HRD a comparative analysis;

Environment of HRM: [5]
Role of government, internal and external forces; Human Resource Management practices in India.

Definition, objectives, process and importance; Job analysis, description, specification & job evaluation; Recruitment, selection, placement and induction process;

Human Resource Development: [6]
Concept, Employee training & development; Career Planning & development; Promotions, demotions, transfers, separation, absenteeism & turnover;

Part B

Job Compensation: [6]
Wage & salary administration, incentive plans & fringe benefits.

Performance Management: [6]
Concept & process, performance appraisal, Potential appraisal;

Quality of work life (QWL): [6]
Meaning, techniques for improving QWL.

Industrial Relations: [6]
Concept and theories, trade unions; Health, Safety & Employee welfare measures; Employee grievances and discipline, participation & empowerment; Introduction to collective bargaining.

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Sessional: 50  
**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**

**Introductory Concepts:** Open loop and closed loop control systems, Servomechanisms, feedback and effects of feedback, linear and non-linear systems, time variant & invariant, continuous and sampled data control systems, illustrative examples.

**Modelling:** Mathematical models of linear electrical, mechanical, translational, rotational, gear, thermal, pneumatic and hydraulic systems, electrical and mechanical analogies. Laplace transform, Transfer function, Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

**State Space Analysis:** Concepts of state variable, state vector and state space, State space representation, solution of state equation for LTI and LTV systems, state transition matrix.

**Time Domain Analysis:** Typical test-input signals, Transient response of the first and second order systems. Time domain specifications, Dominant closed loop poles of higher order systems. Steady state error and error co-efficient.

**Stability:** Concepts of absolute and relative stability, pole –zero location, Routh-Hurwitz stability criterion.

**Part-B**

**Root Locus Technique:** The extreme points of the root loci for positive gain. Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain & sketch of the root locus plot. Rules for construction of root locus, root contours, root sensitivity, generalized root locus.

**Frequency Domain Analysis:** Closed loop frequency response, Relation between time and frequency response for second order systems. Frequency response specification, Bode plots, stability and loop transfer function. Polar Plot, Nyquist criterion, Gain Margin and Phase Margin, Nichol’s chart, M and N circles.

**Control Components:** Error detectors- potentiometers and synchros, a.c. and d.c. servo motors, brushless d.c. motors, A.C. and D.C. techogenerators, stepper motors.

**RECOMMENDED BOOKS:**

Control System Engineering by I.J. Nagrath & Gopal, New Age International (P) Limited, New Delhi, 3rd edition, 2004


EE-661                  CONTROL ENGINEERING LAB.

External: 25
Sessional: 50

Note: At least eight experiments are to be performed.

1. To study the input-output characteristics of a potentiometer and to use a potentiometer as an error detector.
2. To study transmitter - receiver characteristics of a synchros set and to use the set as control component.
3. To study the operation of d.c. position control system.
4. To study the operation of d.c. speed control system.
5. To design different compensating networks for the given cut off frequency response.
6. To study PID controller and to obtain the effect of proportional, Integral and derivative control action.
7. To study the MATLAB Programming for controls systems related to steady state and transfer function conversions.
8. To obtain the step and ramp input response for the various transfer functions using MATLAB.
9. To obtain the root locus response for different systems using MATLAB.
10. To obtain response of basic control system problems in SIMULINK and tune them in MATLAB.
11. To run and use SIMULINK based models in MATLAB. To analyze and simulate the models of following real time applications in MATLAB:
   12. Missile System.
   13. Sun-seeker System
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

**Thyristor and Semiconductor Power Switching Devices** (12)
Devices of Thyristor family and their V-I characteristics: Thyristor, Diac, Triac, GTO, MOSFET, IGBT, Principle of operation of SCR. Turn on methods of a Thyristor, Switching characteristics of Thyristor during turn-on and turn-off, Gate characteristics, Thyristor triggering and commutation circuits
Series and parallel operation of SCR’s, Thyristor specifications (latching current and holding current, dv/dt and di/dt etc.), Thyristor Protection circuits, UJT: characteristics and as a relaxation oscillator.

**Phase controlled Rectifiers** (5)

**Choppers** (5)
Principle of chopper operations, Control strategies, types of chopper (A, B, C, D, and E), and voltage commutated chopper or classical Jones chopper, Morgan chopper.

Part-B

**Inverters** (5)
Single-phase and three phase inverters, 180-degree and 120-degree conduction, PWM inverters, Series and parallel inverters, Mc-Murray Bedford inverters.

**Cycloconverters** (3)
Single phase bridge cycloconverter. Three phase to single phase, single phase to single phase cycloconverter. Advantages disadvantages of cycloconverter.

**D C and A C Drives** (6)

**Facts Devices** (4)
FACTS Technology, objectives, types of controllers, FACTS Devices: STATCOM, SSG, SVG, UPFC and SSSC.

**Text Books**

**Other Recommended Books**
Mohammed H. Rashid, power Electronics- circuits, Devices and applications, 3rd edition PHI New Delhi, 2001
External: 25
Sessional: 50
Note: At least eight experiments are to be performed.

1. To plot the V-I characteristics of the SCR.
2. To draw V-I characteristics of Triac.
3. Study of SCR triggering circuits and check the performance of UJT as triggering device.
4. Study of SCR commutation circuits and check the performance of one commutation circuit.
5. Study of Jones chopper or any chopper circuit to check the performance.
7. Speed Control of induction motor using Thyristor.
8. Study of series inverter and Mc Murray half-bridge inverter and check their performance.
10. Design and simulation of following Thyristor circuits using PSCAD / MATLAB software.
    i. commutation,
    ii. chopper,
    iii. invertors,
    iv. rectifier
    v. UJT as triggering circuit
    vi. Speed control of motors.
EE- 613
Computer Aided Power Systems Analysis

External: 100
Sessional: 50

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

1. Power Flow Studies
   10 h

2. Power System Controls
   Generator-Voltage Control, Turbine-Governor Control, Load-Frequency Control (single area and two area case), Economic Dispatch, Introduction to Optimal Power Flow. 10h

Part- B

3. Transient Stability Studies
   18 h

Text Book

Other Recommended Books

EE- 663
Computer Aided Power Systems
Analysis Laboratory

External: 25
Sessional: 50

Note: At least four design / analysis projects relating to the following.
   1. Power flow analysis.
   2. Power flow control
   3. Economic dispatch
   4. Transient stability studies.
   5. Load frequency control
EE-614
Microcontroller, PLCs and Applications

L T P
3 1 0

External: 100
Sessional: 50

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: Microcontroller, Comparison of Microprocessor and Microcontroller, micro controller and embedded processors.  
2 h

The 8051 Architecture: 8051 Microcontroller hardware, Input/Output Pins, Ports, and Circuits, External memory, Counter & timers, Serial Data Input/Output, Interrupts  
6 h

8051 Assembly Language Programming: Introduction to 8051 Assembly programming, Assembling and running an 8051 program. Data Types and directives. Addressing modes and accessing memory using various addressing modes. Arithmetic instructions and programs, Logic instructions and programs, Single bit instructions and programming, Jump loop and call instructions, I/O Port programming, Timer/clock programming in the 8051  
8 h

Serial Communication: 8051 connection to RS 232, 8051 serial communication Programming.  
3 h

Part-B

Real World Interfacing: LCD, ADC and sensors, Stepper motor, keyboard, DAC and external memory  
7 h

5 h

General PLC programming: Introduction, Programming Equipment, Program Format, Construction of Ladder Diagrams  
4 h

Programming ON-OFF Inputs to produce ON-OFF Outputs: PLC Input Instructions, Outputs Coil Indicators & others, Operational procedures, Contact & Coil Input/Output Programming Examples, Industrial Process Example.  
5 h

Recommended Books:
The 8051 Microcontroller Architecture, Programming & application, by Ayala, 2004, west publishing company.
An embedded software primer, David e Simon, Pearson Education, 1st edition

EE-664
Micro Controller, PLCs and Applications Lab

L T P
0 0 3

External: 25
Sessional: 50

List of Experiments:
Note: At least eight experiments to be done selecting at least two from the last experiment.

1. Study of 8051/8031 Microcontroller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a program to check a number for being ODD or EVEN and show the result on display.
5. Write a program to split a byte in two nibbles and show the two nibbles on display.
6. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order.
7. Write a program to find a factorial of a given number.
8. Write a program to show the use of INT0 and INT1.
9. Write a program of Flashing LED connected to port 1 of the Micro Controller
10. Write a program to generate a Ramp waveform using DAC with micro controller.
11. Write a program to interface the ADC.
12. Write a program to control a stepper motor in direction, speed and number of steps.

Write Ladder programs (at least two) using PLC for control of simple industrial Processes.
Managerial Economics
IBM 601

External: 100
Sessional:50
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.

Objectives: To provide students with an understanding of basic economic principles of production & exchange-essential tools in making business decisions in today’s global economy. The object presents the foundation to understanding how the economy works, covering microeconomic description of business applications, including pricing for profit maximization, price elasticity, market structures and modeling of business in varying economic climates. The focus is on market economics, the organization that operation there and their business strategies.

Part A

Introduction to Managerial Economics:
Nature Scope and Importance of Managerial Economics, opportunity costs, incremental principle, time perspective, discounts and equi marginal principles.

Demand Concepts and Analysis: [4]
Individual Demand, Market Demand, Kinds of Demand, Determinants of Demand, Demand Functions, Functions, Demand Schedule and Law of Demand.

Theory of Consumer Behavior: [4]
Cardinal Utility Approach and Ordinal Utility (Indifference Curves) Approach;

Elasticity of Demand: [4]
Concept, Types, Measurement and importance.

Demand Forecasting: [5]
Sources of Data-Expert Opinions, Surveys and Market Experiments; Time Series Analysis-Trend Projection; Barometric Forecasting-Leading Indicators, Composite and diffusion Indices.

Part B

Production Function: [4]
Concept and types, Returns to Factor and Returns to Scale, Law of Variable Proportions.

Cost concepts and Analysis: [4]
Concept of Cost, Short run and Lung-run Cost Curves, Relationships among various costs, Break-even Analysis.

Revenue Curves: [4]
Concept and Types.

Perfect Competition: [4]
Characteristics, Equilibrium Price, Profit Maximizing output in Short Run and Long Run;

Monopoly: [4]
Characteristics, Equilibrium Price, Profit Maximizing output in Short Run and Lung Run; Price Discrimination;

Imperfect Competition: [4]
Monopolistic Competition, oligopoly and Barriers to Entry.

References:
3. Dr. V.Panduranga Rao: Microeconomics-IBS Publication
8. Mote, Paul Gupta: Managerial Economics, Vikas Publisher, New Delhi, 2001 TMH
Objective: Corporate legal environment represents that external environment in which the organization has to work. The course covers the basic laws which a student must be aware of.

Part A
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

Company Law:
Definition and nature of a company, kinds of companies, formation of a company, memorandum of association, articles of association, prospectus, membership in a company, shares, transfer and transmission of shares, meetings and proceedings.

Part B
Patents Law:

Consumer Protection Act 1986:
Definitions under the act: complaint, consumer, defect, deficiency, unfair trade practice, consumer protection councils, redressal machinery under the act, district forum, state commission, national commission

References:
Panjab University

Scheme and Syllabus of

B.E. MBA (Electrical and Electronics)
3\textsuperscript{rd} to 6\textsuperscript{th} Semester

2010- 2011