[M17 PS 1101]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

ADVANCED POWER SYSTEM OPERATION AND CONTROL

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Explain the gradient approaches hydro-thermal scheduling. ? 7M
   b) Discuss the base point & participation factors method of economic dispatch. 7M

2. a) Obtain the solution of an optimal unit commitment problem with dynamic programming method? 7M
   b) Write the advantages of dynamic programming method over priority list scheme? 7M

3. a) Describe the application of Optimal power flow. 7M
   b) Explain the flow diagram of Security constrained OPF. 7M

4. a) Two generators of rating 100MW and 200MW are operated with a droop characteristic of 6% from no load to full load. Find the load shared by each generator, if a load of 270MW is connected across the parallel combination of those generators? 7M
   b) Find the static frequency drop if the load is suddenly increased by 25MW on a system having the following data: Rated capacity is 500MW, operating load is 250MW, inertia constant is 5s, governor regulation R= 2Hz/ p.u MW, frequency is 50Hz. Also find the additional generation? 7M

5. a) Explain the static response of two area system for un controlled case? 7M
   b) Find the frequency of oscillations of the tie line power deviation for a two identical area system given the following data: R=3.0Hz/p.u; H=5s; f^{o}=60Hz. The tie line has a capacity of 0.1p.u and is operating at a power angle of 45^{o}? 7M

6. a) Explain about the optimal load flow control with an example? 7M
   b) What is meant by performance index? Explain its importance? 7M

7. a) Derive the composite generation protection cost function? 7M
   b) Explain how the fuel scheduling is done by linear programming? 7M

8. a) Explain the concept of power pools with an example? 7M
   b) Explain about the economy inter change evaluation with an example? 7M

[M17 PS 1102]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

HVDC TRANSMISSION

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Briefly explain the power handling capabilities of HVDC lines. 7M
   b) Mention the advantages of HVDC technical economical reliability aspects. 7M

2. a) Write the special features of converter transformers. 7M
   b) Draw the equivalent circuit of converter and explain it. 7M

3. Mention the reasons for generation of harmonics in HVDC transmission. 14M

4. Write short notes on the following terms

   a) Individual phase control 7M
   b) Constant extinction angle 7M

5. a) Explain the significance of DC power modulation. 7M
   b) What are the advantages of Multi-terminal DC links? 7M

6. a) Give the comparison between series and parallel MTDC systems. 7M
   b) Draw and explain the rectifier characteristics by voltage limiting control method. 7M

7. a) Discuss about the over voltages due to disturbances on DC side. 7M
   b) What are the uses of circuit breakers in HVDC systems? 7M

8. a) Explain briefly about surge arrester and their application? 7M
   b) Discuss about over current protection. 7M

[M17 PS 1103]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

REACTIVE POWER COMPENSATION & MANAGEMENT

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) What are reactive characteristics of ideal load compensator? Discuss its objectives. 7M
   b) Explain the method of phase balancing and power factor correction of unsymmetrical loads. 7M
2. a) Explain the reactive power biasing is obtained with inductive and capacitive systems. 7M
   b) Explain the compensation in transmission lines using synchronous condensers. 7M

3. Discuss in detail about dynamic shunt compensation in transmission lines. 14M
4. a) Discuss about the four characteristic time periods of a transient state in a compensated transmission line. 7M
   b) Explain how shunt compensation is obtained by means of Mid-point shunt reactor or capacitor in transmission lines 7M
   .
5. Define reactive power management and explain the mathematical modeling of reactive power dispatching strategy. 14M

6. a) Discuss the effects of under voltage on the performance of induction motor with necessary diagrams. 7M
   b) What is electromagnetic interference? Explain sources of EMI and methods to minimize it. 7M

7. a) Explain the various system losses and the loss reduction methods used in distribution side reactive power management. 7M
   b) Explain kVAR requirements for domestic appliances in User side reactive power management. 7M

8. a) Give the layout of electric traction system and discuss reactive power requirements of the same. 7M
   b) Explain the power factor of an electric arc furnace. 7M

[M17 PS 1103]

[M17 PS 1104]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

ANALYSIS OF POWER ELECTRONICS CONVERTERS

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Discuss the operation of ac voltage controller with PWM control. 7M
   b) A single-phase full-wave ac voltage controller controls power flow from a 230V, 60Hz ac source into a resistive load. The maximum desired output power is 10kW. Calculate
   i) The maximum rms current rating of thyristors
   ii) The peak current of thyristors iii) the peak value of thyristor voltage. 7M
2. a) Give examples for resistive –inductive loads. 7M
   b) What are full converters? With a neat diagram and waveforms, explain the operation of a single phase full converter with RL load. 7M
3. Single phase full converter connected to a 120 V, 60 Hz supply. The load current Ia is continuous and its ripple content is negligible. The turns ratio of the transformer is unity.
   a) Express the input current in a Fourier series; also determine the harmonic factor of the input current, Displacement factor, and input power factor
   b) If the delay angle is $\alpha = \pi/3$, calculate V_{dc}, V_n, V_{rms}, harmonic factor, Displacement factor, and power factor. 14M
4. (a) List the main advantages and applications of power factor correction converters. 7M
   (b) With a neat schematic diagram, discuss the operation of a Single-phase single stage boost power factor corrected rectifier. 7M
5. (a) Describe the working of single phase half bridge inverter with RL load. What is its main drawback? 9M
   (b) List the few industrial applications of inverters. 5M
6. With an appropriate power diagram discuss the principle of working of a three phase inverter. Draw the waveforms on the each thyristor conduct for 1800 and the resistive load is star connected. 14M
7. (a) What is multilevel inverter? List different types of multilevel inverters and explain its principle of operation. 7M
   (b) Compare different multilevel inverters based on the requirement of number of power electronic devices. 7M
8. With a neat schematic diagram, explain the operation of a three-phase five level Cascaded Multilevel Inverter. Also list their merits. 14M

[M17 PS 1104]

[M17 PS 1105]
I/II MTECH I SEMESTER REGULAR EXAMINATIONS
POWER SYSTEMS & AUTOMATION
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
MODERN CONTROL THEORY
MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS
ALL QUESTIONS CARRY EQUAL MARKS

1. a) Prove that similar matrices have the same characteristics polynomial and therefore the same eigen values? 7M
   b) Find the eigen values and Jordan form representation for the following matrices? 7M

$$\begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -2 & -4 & -3 \end{pmatrix}$$

2. a) Show that the solution to the homogenous state equation $\dot{X}(t) = AX(t)$ is unique. 7M
   b) The following facts are known about the linear system

$\dot{X}(t) = AX(t)$

If $x(0) = \begin{bmatrix} 1 \\ -2 \end{bmatrix}$, then $x(t) = \begin{bmatrix} e^{-2t} \\ -2e^{-2t} \end{bmatrix}$

f $x(0) = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$, then $x(t) = \begin{bmatrix} e^{-t} \\ -e^{-t} \end{bmatrix}$ Find e^{At} and hence A. 7M

3. a) Explain the general concept of observability? Explain the observability tests for continuous time invariant systems? 7M
   b) Consider the system described by

$$\begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ -4 & -1 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} + \begin{pmatrix} 1 \\ 1 \end{pmatrix} u$$

$$Y = (1 \quad 0) \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

   Is this system is controllable and observable? 7M

4. The block diagram of a system with hysteresis is shown in Figure.1 Using describing function method, determine whether limit cycle exists in the system. If limit cycles exists, determine their amplitude and frequency. 14M

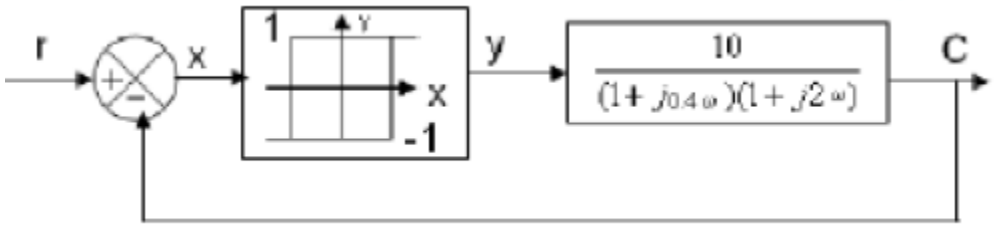


Figure.1

5. Linear second order servo is described by the equation $\ddot{e} + 2r\omega_n\dot{e} + \omega_n^2 e = 0$ where =0.15, ω_n = 1 rad/sec e(0)=1.5 and $\dot{e}(0)$ = 0. Determine the singular point. Construct the phase trajectory, using the method of isoclines. 14M

6. a) Explain the stability analysis of the linear continuous time invariant systems by Lyapunov second method. 7M
   b) Illustrate the generation of Lyapunov function by Krasooviski's method? 7M

7. a) Define the state observer? Deduce the expression for reduced order observer? 7M
   b) Consider the system defined by:

$$\dot{X} = \begin{pmatrix} 0 & 1 \\ -1 & 2 \end{pmatrix} X + \begin{pmatrix} 1 \\ 1 \end{pmatrix} u$$

   Show that this system cannot be stabilized by the state feedback control μ = −kx Whatever matrix k is chosen. 7M

8. Suppose that the system

$$\dot{x}_1(t) = x_2(t)$$

$$\dot{x}_2(t) = u(t)$$

   is to be controlled to minimize the performance measure

$$J(x,u) = \frac{1}{2}\int_0^2 u^2 dt$$

   Find a set of necessary conditions for solving optimal control using Hamiltonian formula of variational calculus. 14M

[M17 PS 1105]

[M17 PS 1106]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

POWER SYSTEM SECURITY

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Explain how short-circuit faults can be simulated using Super-position theorem and Thevenin's theorem. 7M

b) Explain how ac short circuit component variation with time is estimated using fixed impedance short-circuit analysis. 7M

2. a) Explain how general analysis technique can be used to calculate three-phase shortcircuit fault currents and voltages.(fault at two different locations). 9M

b) Discuss the need for Probabilistic short circuit analysis. 5M

3. a) Explain how a permanently connected series reactor acts as a current limiter. 7M

b) Discuss the effect of Opening of unloaded delta-connected transformer tertiary windings `on the short-circuit levels. 7M

4. a) Explain different steps in security constrained optimal power flow. 7M

b) Draw the flow-chart for carrying out contingency analysis of a given power system. 7M

5. Explain in detail with the help of a block diagram different operating states of a Power System and discuss the need for real-time control. 7M

6. a) Explain the effects of location of fault with respect to short-circuit sources. 7M

b) Explain how solid state current limiters work. 7M

7. Define sensitivity factors used for contingency analysis of a power system. Also discuss with the help of a flow-chart how contingency analysis is carried out using sensitivity factors. 14M

8. a) Explain how ac and dc fault currents be estimated for a synchronous generator connected through a radial network to short-circuit fault location. 7M

b) Explain how a resistor or reactor connected to the neutral of a transformer acts as a current limiter. 7M

[M17 PS 1107]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

OPTIMIZATION TECHNIQUES

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) State an optimization problem. Give any five Engineering applications of optimization. 7M
b) Find minimum value of the function $f(X_1, X_2) = X_1^2 + X_2^2 - 10X_1 - 10X_2$ satisfying the constraints $X_1+X_2 \leq 9$, $X_1-X_2 \geq 6$ and $X_1, X_2 \geq 0$ using Lagrangian multipliers. 7M

2. An advertising company has to plan their advertising strategy through the different media, namely TV, Radio and Newspaper. The purpose of advertising is to reach maximum number of potential customers. The cost of an advertisement in TV, Radio and Newspaper are Rs 3000/-, Rs2000/- and Rs2500/- respectively. The average expected potential customers reached per unit by 20000 of which 15000 are female customers. These figures with Radio are 60000 and 40000 and with Newspaper 25000 and 12000 respectively. The company has a maximum budget for advertising is Rs50000/- only. It is proposed to advertise through TV or Radio between 6 and 10 units and atleast 5 advertisements should appear in Newspaper. Further it decides that atleast 100000 exposures should take place among female customers. Budget of advertising by Newspaper is limited to Rs25000/- only. Formulate into linear programming problem and solve it by using simplex method. 14M

3. Minimize $Z= X_1-X_2+2X_1^2 + 2X_1X_2+ X_2^2$ with the starting point (0,0) using the univariate method. 14M

4. a) What is Two-Phase simplex method? Explain the same with necessary steps. 7M
b) Solve the following linear programming problem 7M
Minimize $Z= 2X_1+9X_2+24X_3 + 8X_4+ 5X_5$
Subject to $X_1+X_2+ 2X_3-X_5-X_6=1$
$-2X_1+X_3+ X_4+X_5-X_7 = 2$ And
$Xi \geq 0$, i= 1,2,3,4,5,6,7

5. a) State Kuhn- Tucker conditions. 7M
b) Minimize $f(X_1, X_2) = (X_1-1)^2 + (X_2-5)^2$
Subject to $-X_1^2 + X2 \leq 4$
$-(X_1-2)^2 + X_2 \leq 3$ by Kuhn- Tucker conditions. 7M

6. Solve the following problem by Powell's method (Use pattern search directions) Minimize $f(X_1, X_2) = 4X_1^2 + 3X_2^2 - 5X_1X_2 - 8X_1$ from starting point (0, 0). 14M

7. a) While solving the linear programming problem, explain how you would select a basic variable that should become a non- basic variable? 7M
b) Solve the following Linear Programming Problem by Revised simplex method.

Maximize $Z = 5X_1 + 3X_2$

Subject to $4X_1 + 5X_2 \geq 10$ 7M

$5X_1 + 2X_2 \leq 10$

$3X_1 + 8X_2 \leq 12$ And

$X_1, X_2 \geq 0$

8. a) Minimize $f(X1, X2) = 2X1^2 + X2^2$ by using the Steepest Descent Method with the starting point (1, 2). 7M

b) Write any Two of the following 7M

(i) Broyden- Fletcher- Goldfarb- Shanno method (ii) Zoutendijk's method (iii) Marquardt method (iv) Fibonacci method

[M17 PS 1107]

[M17 PS 1108]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

GENERATION AND MEASUREMENT OF HIGH VOLTAGES

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Explain with neat diagrams the procedure to control electric field intensity in high voltage equipment. 7M

   b) Starting with Laplace's equation in two dimension explain the Finite Difference Method for Evaluation of field distribution. Discuss its advantages and disadvantages. 7M

2. a) Explain the principle of operation of electrostatic generators with a neat diagram. 7M

   b) Derive an expression for ripple voltage of a multistage Cockcroft-Walton Circuit. 7M

3. a) Define ripple voltage. Show that the ripple voltage in a rectifier circuit depends upon the load current and the circuit parameters. 7M

   (b) Explain the series-parallel resonant circuit and discuss its advantages and disadvantages. 7M

4. (a) Draw a typical impulse current generator circuit and explain its operation and application. 7M

   (b) A ten-stage impulse generator has 0.250μF condensers. The wave front and wave tail resistances are 75 ohms and 2600 ohms respectively. If the load capacitance is 2.5 nF, determine the wave front and wave tail times of the impulse wave. 7M

5. (a) An impulse generator has eight stages, each stage having a capacitor rated 0.16 μF; and 125 kV. The load capacitor is l nF. Find the values of the wave shaping resistors needed to generate a 1.2/50 μs lightning impulse wave. What is the maximum output voltage of the generator if the charging voltage is120kV? What is the energy rating of the generator? 7M

   (b) Explain one method of controlled tripping of impulse generators. Why is controlled tripping necessary? 7M

6. (a) Draw a neat schematic diagram of a generating voltmeter and explain its principle of operation. Discuss its application and limitations. 7M

   (b) Discuss the different methods of measuring high DC voltages. What are the limitations in each method? 7M

7. (a) Explain with neat diagram how rod gaps can be used for measurement of high voltages. Compare its performance with a sphere gap. 7M

   (b) Give the schematic arrangement of an impulse potential divider with an oscilloscope connected for measuring impulse voltages. Explain the arrangement used to minimize errors. 7M

8. (a) What are the problems associated with measurement of very high impulse voltages? Explain how these can be taken care of during measurements. 7M

(b) Draw Chubb-Fortescue Circuit for measurement of peak value of AC voltages discuss its advantages over other methods. 7M

[M17 PS 1108]

[M17 PS 1109]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

RENEWABLE ENERGY SYSTEMS

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) List various conventional and Non conventional energy sources. 7M
   b) Explain the role of renewable energy sources with respect to Indian scenario. 7M

2. a) With a neat schematic explain about nuclear power generation . 7M
   b) Derive an expression for power produced by wind from fundamentals. 7M

3. a) Draw the characteristics of a P-V cell. 7M
   b) What is wave power? 7M

4. a) With a neat diagram explain the Hydroelectric power plant. 7M
   b) Write a brief note on surge absorber and penstock. 7M

5. a) What is meant by dynamic frequency control and why it is needed? 7M
   b) How does the reliability of system is affected by use of renewable energy sources? 7M

6. Write short note on following
   a) Distributed generation 7M
   b) Various issues related with embedded generation. 7M

7. a) What are various costs associated with electricity generation. 7M
   b) Discuss about electric trading? 7M

8. What is the future of various renewable energy sources in India? 14M

[M17 PS 1109]

[M17 PS 1110]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

ADVANCED DIGITAL SIGNAL PROCESSING

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) What is multi rate signal processing? Explain any two applications of multi rate signal processing? 7M

b) Derive the frequency domain transfer function of a decimator. 7M

2. a) Give a brief account of poly phase filter structures. 7M

b) Discuss clearly the process of sampling rate conversion of band pass signals. 7M

3. a) Discuss in brief about Bartlett method of power spectrum estimation. 7M

b) Determine the frequency resolution of Bartlett, Welch and Blackman-Tukey methods of power spectrum estimates for a quality factor Q=10. Assume that overlap in Welch method is 50% and length of sample sequence is 1024. 7M

4. a) Derive the mean and variance of the power spectral estimate of the Blackman Tuckey method. 7M

b) Discuss the procedure for the design of IIR filters and what are the constraints in the design of IIR filters using analog structures. 7M

5. a)Write a brief notes on lattice structures. Mention the advantages of lattice structures. 7M

b) Draw and explain the lattice ladder structure for realization of pole zero system. 7M

6. a)What is the basic principle of parametric methods in power spectral estimation? Discuss various techniques in parametric method. 7M

b) Obtain the relation between model parameters and the Auto Correlation coefficients in AR model spectral estimation. 7M

7. a) What are the quantization errors in FFT algorithm? Explain them. 7M

b) Explain about the errors result that from the truncation and rounding with an example. 7M

8. Determine the mean and the auto correlation of the sequence x(n) generated by the MA(2) process described by the difference equation. X(n) = w(n) -2 w(n-1) + w(n-2) Where w(n) is the white noise process with variance σ^2 w. 14M

[M17 PS 1111]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

POWER SYSTEM RELIABILITY

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. A Power System contains four generating units, where units 1, 2 and 3 have a capacity of 20MW and unit four has a capacity of 40 MW. The failure rate and the repair rate of each unit is 0 .4 per year and 9.6 per year respectively. Develop the combined capacity outage probability table. 14M

2. A generating unit consists of 2×25 & 1×50 MW units with a failure rate of 0.01 failures per day and repair rate 0.49 per day. Obtain the Cumulative Probability and Cumulative frequency of all the possible states. 14M

3. a) Explain Common mode failure of a power system network. 7M

   b) What is the importance of security function and Explain its model with respect to reliability studies of power system? 7M

4. a) Define: (a) SAIFI (b) SAIDI(c)CAIDI and (d) ENS of a distribution system. 4M
   b) With the help of state diagrams, explain the probability array method in two interconnected systems. 8M

5. a) What do you meant by overlapping forced outages and give two examples. 4M
   b) Explain transient, active and passive failures in a distribution system with the help of state space & sequence diagrams. 8M

6. a) A system consists of two 4 MW units and one 6 MW unit with forced outage rates of .02. Develop the capacity outage probability table. 7M
   b) Draw and explain the state space representation of a two-level load model. 7M

7. a) Discuss the effect of weather on the reliability of a transmission lines. 7M
   b) Explain the modeling of generator using STPM approach. 7M

8. Write short notes on:
   a) Active and Passive failures. 7M
   b) Effects of limited and unlimited tie capacities on reliability of interconnected system. 7M

[M17 PS 1111]

[M17 PS 1112]

I/II MTECH I SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

ELECTRICAL DISTRIBUTION SYSTEMS

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Explain briefly about the different types of distribution sub transmission system 7M
   b) Write briefly about factors affecting the primary feeder loading. 7M

2. a) Explain the following terms: 7M
   (i) Utilization Factor (ii) Contribution factor (iii) Diversity Factor
   b) Write briefly about factors effecting the primary feeder rating 7M

3. a) Explain detail description of the distribution transformer loading. 7M
   b) Explain the modelling of delta and star connected loads. 7M

4. a) Explain the forward sweep distribution load flow algorithm. 7M
   b) Explain the approximate line segment modelling in distribution system. 7M

5. a) Derive an expression for voltage drop and power loss for uniformly radial type distribution load. 7M
   (b) Consider a three phase, 3 wire 240V secondary system with balanced loads at A, B and C as shown in Figure (1) Determine: (i) The voltage drop in one phase of lateral (ii) The real power per phase for each load (iii) The reactive power per phase for each load. 7M

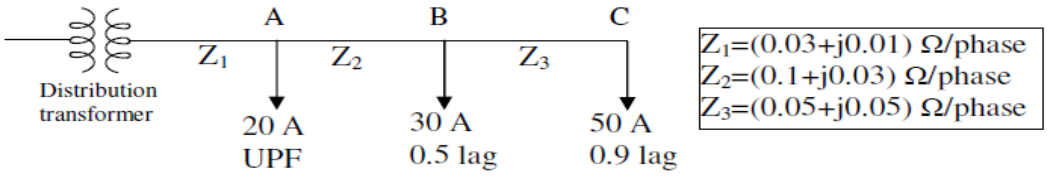


Figure (1)

6. a) Derive equations for the K constants in distribution load systems. 7M
   b) write briefly about radial feeder uniformly distributed loads. 7M

7. a) Explain different types of three phase capacitor bank connections. 7M
   b) Write briefly about the distribution feeder cost calculation methods. 7M

8. a) write brief note on 14M
   i) smart grid, ii) micro grid, iii) Nano grid with simple examples

[M17 PS 1201]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

POWER SYSTEM DYNAMICS AND STABILITY

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1		Explain the phasor representation and equivalent circuit used in the steady state analysis of synchronous machine in detail.	14M
2		Discuss the examination of dynamic stability of Routh's criterion.	14M
3	a)	State and explain the steady state stability.	7M
	b)	Derive an expression for the steady state stability power limit.	7M
4		Explain the analysis of transient stability using Modified Euler's Method?	14M
5	a)	Discuss direct solution method in analysing transient stability?	7M
	b)	Discuss the concept of multi machine stability.	7M
6	a)	Discuss the effect of governor action on Power system stability?	7M
	b)	Explain the effect of excitation on transient system stability?	7M
7	a)	Write short notes on brushless excitation system?	7M
	b)	Develop the stats space description of the excitation system.	7M
8		With neat sketch, explain rotating main and pilot exciters with Indirect acting Rheostatic type Voltage regulator?	14M

[M17 PS 1201]

[M17 PS 1202]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

REAL TIME CONTROL OF POWER SYSTEMS

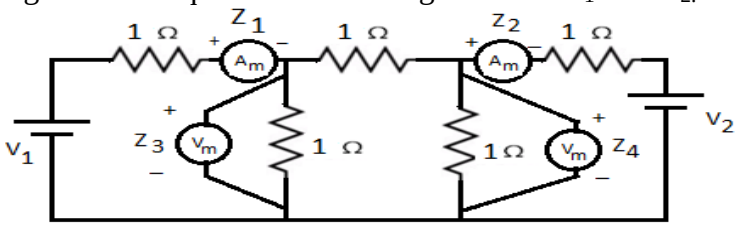
MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Explain different types of state estimations in detail. 7M
   b) In the DC circuit of figure below, the meter readings are z_1=9.01 A, z_2=3.02A, z_3=6.98V and z_4=5.01V. Assuming the ammeters are more accurate than the voltmeters, let us assign the measurement weights w_1=100, w_2=100, w_3=50 and w_4=50, respectively. Determine the weighted least squares of the voltage sources V_1 and V_2. 7M



2. a) How bad data is identified and eliminated? Explain. 7M
   b) What are the different non sequential methods to process measurements? Explain 7M

3. a) Explain in detail about security analysis and monitoring. 7M
   b) What is fast decoupled model? Describe in detail. 7M

4. a) Draw the block diagram for real time computer control of power systems and Explain different components. 7M
   b) What is energy control centre? Explain in detail. 7M

5. a) What is SCADA? Explain its applications in industry. 7M
   b) What are the different software requirements in power system controlling? Explain. 7M

6. a) What are the different problems associated with voltage stability? Explain. 7M
   b) Draw P-V curves and explain them in detail. 7M

7. a) What is voltage collapse? Explain the reasons. 7M
   b) Explain in detail about the long term voltage stability. 7M

8. a) What is Artificial intelligence? Explain their applications in power systems. 7M
   b) Discuss in detail about fault diagnosis. 7M

[M17 PS 1203]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

ARTIFICIAL INTELLIGENCE TECHNIQUES

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Compare Biological neuron model and Artificial neuron model and explain about ANN advantages. 7M
   b) Define learning and explain about error correction learning strategies of ANN. 7M

2. a) What is meant by pattern classification problem? Explain the training algorithm of continuous Perceptron model to solve classification problem. 7M
   b) What are the limitations of Perceptron model? Explain. 7M

3. Obtain output equations and weight update equations for a 3-layer feed forward neural network using Back propagation algorithm and also discuss about the limitations of Back propagation algorithm. 14M

4. a) What is the basic principle involved in the operation of Genetic Algorithm? Explain. 7M
   b) Discuss in detail about various methods involved in the reproduction operation. 7M

5. a) With the help of flow chart explain the computational process of GA. 7M
   b) Write short notes on Single point cross over, Multi point cross over and uniform cross over. 7M

6. a) With suitable examples explain in detail about various Fuzzy set properties. 7M
   b) Explain in detail about various Fuzzy set relations. 7M

7. What are the various components of Fuzzy logic system? Explain each of them in detail. 14M

8. What is meant by Load Frequency Control (LFC) problem? Explain the role of Fuzzy logic to solve LFC problem. 14M

[M17 PS 1204]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

FLEXIBLE AC TRANSMISSION SYSTEMS

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Compare between HVAC and HVDC transmission systems. 7M
   b) With examples, discuss the power flow through parallel transmission systems. 7M

2. What are the main advantages of FACTS controllers? Also list and explain different types of FACTS controllers. 14M

3. a) What are the advantages of three-phase converters over single-phase converters? 7M
   b) With a net circuit diagram and waveforms, explain the operation of full wave bridge converter. 7M

4. What is the importance of pulse number of a converter? Discuss the transformer connections for 12 pulse and 24 pulse operation of a converter. 14M

5. a) What are the main objectives of shunt compensation? 7M
   b) With phasor diagram and power-angle curves, discuss midpoint voltage regulation of a transmission line. 7M

6. What are static var generators? Explain the operation of variable impedance type static var generators. 14M

7. What is a STATCOM? What are its applications? Explain its operation. 14M

8. List different series FACTS converters. With neat circuit diagrams, discuss the operation of thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC). 14M

[M17 PS 1204]

[M17 PS 1205]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SMART GRID TECHNOLOGIES

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1 a) Difference between conventional Electric grid and smart grid. 7M
b) Explain the need and functions of smart grid. 7M

2. a) Explain briefly about the outage management system (OMS)? 7M
b) Write different types of smart meters and explain the Automatic meter reading (AMR). 7M

3. a) Explain briefly about Wide area measurement system (WAMS). 7M
b) Write briefly about smart substation and explain the substation automation. 7M

4. a) explain the need of microgrid and write the application of microgrid. 7M
b) write briefly about the issues of interconnection in microgrid. 7M

5. a) Explain the power quality conditioners for smart grid. 7M
b) Explain the power quality Audit in Smart grid. 7M

6. a) Explain the wide area networks (WAN) in smart grid. 7M
b) Explain the Advanced metering infrastructure (AMI) in smart grid. 7M

7. a) Explain briefly about the plug in hybrid electric vehicles (PHEV) in smart grid. 7M
b) Explain briefly about the feeder automation in smart grid. 7M

8. a) write briefly about the protection & control of Microgrid. 7M
b) Explain briefly about the integration of renewable energy sources in microgrid. 7M

[M17 PS 1205]

[M17 PS 1206]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

POWER QUALITY

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Explain characteristics of power quality events in short and long duration voltage variations. 7M
   b) Discuss in detail about transients with respect to power quality. 7M

2. Explain the following: 14M
   a) Voltage Unbalance
   b) Waveform Distortion
   c) Voltage fluctuation
   d) Power Frequency Variations

3. a) What are the main sources of transient over voltages. Explain the capacitor switching transient over voltages in detail. 7M
   b) Discuss the principles of over voltage protection of load equipment. 7M

4. Explain various devices used for the protection of equipment from the over voltages due to transients. 14M

5. a) Explain the following harmonic indices in detail: 7M
   (i) Total Harmonic Distortion
   (ii) Total Demand Distortion
   (b) Write a short note on power system quantities under non-sinusoidal conditions. 7M

6. a) What is the need of locating harmonic sources? Explain the power system response characteristics under the presence of harmonics. 7M
   b) Discuss the impact of harmonic distortion on transformers and capacitors. 7M

7. a) Explain how the utility voltage is regulated with distributed resources. 7M
   b) Discuss about various devices used for voltage regulation in long duration voltage variation. 7M

8. a) What are the problems that are noticed when the DG is interfaced to the utility system. Discuss the impact of DG interface to utility system. 7M
   b) Explain the power quality issues when the DG is integrated to utility system. 7M

[M17 PS 1207]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

ADVANCED POWER SYSTEM PROTECTION

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1	a)	Discuss how a phase comparator can be converted to an amplitude comparator and vice versa.	[9]
	b)	Write a short note on Schmitt Trigger Circuit.	[5]
2		Derive the generalized equations for amplitude and phase comparison techniques.	[14]
3	a)	Explain about rectifier bridge circulating and opposed voltage type amplitude comparators.	[9]
	b)	Write a short note on transistor integrating type phase comparison technique.	[5]
4		Draw the block diagram of Static time-current relay and explain various functional blocks with individual circuits.	[14]
5	a)	Explain about measurement of sequence impedances in distance relays.	[9]
	b)	How elliptical relay characteristics are realized using static circuits?	[5]
6		Draw practical scheme based on circulating current principle for wire pilot protection and explain its operation.	[14]
7	a)	What is carrier blocking scheme? Discuss its merits and demerits over other types of carrier-aided distance protection.	[9]
	b)	What are optical fiber channels? What is its future prospect?	[5]
8		Explain the Microprocessor implementation of digital distance relaying algorithms with the help of a block diagram.	[14]

[M17 PS 1207]

[M17 PS 1208]
I/II MTECH II SEMESTER REGULAR EXAMINATIONS
POWER SYSTEMS & AUTOMATION
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
EHVAC TRANSMISSION
MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

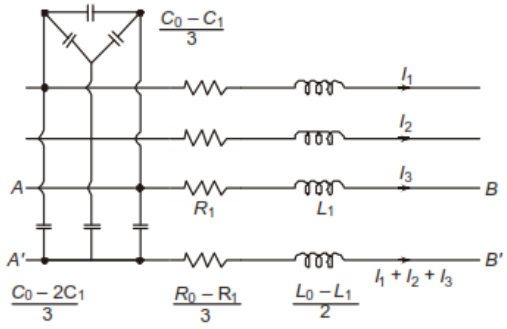
ANSWER ANY 5 QUESTIONS
ALL QUESTIONS CARRY EQUAL MARKS

1 A 3-phase 750 kV horizontal line has minimum height of 12 m, sag at midspan = 12 m. Phase spacing S = 15 m. Conductors are 4 × 0.035 m with bundle spacing of B = 0.4572 m. Calculate per kilometre:
a) The matrix of Maxwell's Potential coefficients for an untransposed configuration.
b) The inductance and capacitance matrices for untransposed and transposedconfigurations.
c) The zero-, positive-, and negative-sequence inductances and capacitances fortransposed line.
d) The ground-return resistance and inductance matrices at 750 Hz taking ρ*s* = 100 ohm-metre. For calculation take *H*av = *H*min + Sag/3. 14M

2 Consider the given figure. show that the voltage drop from A to B and B' to A add to

$$\{(R_c + R_g) + s(L_s + L_g)\}\, I_1 + (R_g + sL_m + sL_g)\, I_2 + (R_g + sL_m + sL_g)\, I_3.$$

where s = the Laplace-Transform operator. 14M



3 A sphere gap consists of two spheres with R = 0.25 m each. The gap between their surfaces is 0.5 m. Calculate (i) the charges and their locations to make the potentials 1 and 0 (ii). the voltage gradient at X = 0.25 m for the sphere gap (iii) the potential difference between the spheres for E = 30 kV/cm = 3000 kV/m, peak. 14M

4 Describe surface voltage gradient distributions on bundled conductors with N = 2, 4, 6 Sub-conductors. 14M

5 A transmission line is 300 km long and open at the far end. The attenuation of surge is 0.9 over one length of travel at light velocity. It is energized by (a) a step of 1000 kV, and (b) a sine wave of 325 kV peak when the wave is passing through its peak.

Calculate and plot the open-end voltage up to 20 ms. 14M

6 Compute the r.m.s. values of ground-level electrostatic field of a 400-kV line at its maximum operating voltage of 420 kV (line-to-line) given the following details. Single circuit horizontal configuration. H = 13 m, S = 12 m, conductor 2 × 3.18 cm diameter, B = 45.72cm. Vary the horizontal distance along ground from the line centre from 0 to 3 H. 14M

7 Describe and explain the following the cascade connection of components : Shunt, sub synchronous resonance in series – capacitor compensated lines. 14M

8 Explain how Harmonics injected into network by TCR under

a) Harmonic Injection by TCR in to high voltage system. 5M

b) Connection of TCR to delta and ´Y connected transformer windings. 5M

c) Voltage and current wave forms for $\alpha=90°$, $\alpha>90°$ for calculations of harmonics. 4M

[M17 PS 1208]

[M17 PS 1209]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

POWER SYSTEM DEREGULATION

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) What is deregulation? Explain the need and conditions required for a deregulated market. 7M
   b) Explain in detail the concepts of marginal cost of generation, least cost operation and incremental cost of generation. 7M

2. a) What are different structures and the forms of ownership and management? 7M
   b) brief explain deregulated models of power systems based on energy trading. 7M

3. What are bilateral and pool markets? Analyse and explain them in brief. 14M

4. a) discuss and list out the history of power system deregulation in India? 7M
   b) What is market power and discuss various transmissions pricing in power systems. 7M

5. a) What is the effect of congestion on LMPS country practices? 7M
   b) Explain 7M
   i) Purchasing agency model.
   ii) Wholesale competition model.
   iii) Retail completion model.

6. a) What meant by market structure, market architecture spot market, forward markets and settlements. 7M
   b) Explain in detail the synchronous generator as ancillary service providers. 7M

7. a) What is meant by ancillary service management? 7M
   b) What are various, technical, economic & regulatory issues involved in the deregulation of the power industry. 7M

8. a) Explain in detail power wheeling transactions and marginal costing, transmission costing? 7M
   b) Explain in detail different congestion management methods? 7M

[M17 PS 1209]

[M17 PS 1210]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

HIGH VOLTAGE TESTING TECHNIQUES

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1 a) Explain the operation of high voltage Schering bridge when the test specimen (i) is grounded (ii) has high loss factor. 7M

b) A 33 kV, 50 Hz high voltage Schering bridge is used to test a sample of insulation. The various arms have the following parameters on balance. The standard capacitance 500 pF, the resistive branch 800 ohm and branch with parallel combination of resistance and capacitance has values180 ohms and 0.15 μF. Determine the value of the capacitance of this sample its parallel equivalent loss resistance, the p.f. and the power loss under these test conditions. 7M

2 a) Discuss various types of transformer ratio arm bridges and give their application and advantages. 7M

b) Explain how the volume resistivity of a solid dielectric is determined. 7M

3 a) Briefly discuss the necessity of testing standards? 7M

b) Explain the different tests conducted on pin type glass insulators. 7M

4 Explain in detail the various artificial contamination tests? 14M

5 a) Explain in detail the over voltage tests on Isolators and Cables? 7M

b) With suitable example, compare Laboratory testing and In service performance? 7M

6 a) What is the significance of impulse tests? Briefly explain the impulse testing on insulators. 7M

b) Explain briefly impulse testing of power transformer. 7M

7 a) Develop and draw equivalent circuit of insulating material during partial discharge. 7M

b) Compare the performance of narrow band and wide band *PD* measuring circuits. 7M

8 a) Explain the importance of RIV measurement and discuss with a schematic diagram one method of measuring RIV of transmission line hardware. 7M

[M17 PS 1211]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

POWER SYSTEM TRANSIENTS

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Explain the transient analysis for series RLC circuit with relevant expressions? 7M
   b) Derive sequence components by considering an unbalanced impedance network of a 3phase system. 7M

2. a) Explain briefly Bewley lattice diagram. 7M
   b) Explain briefly about attenuation and distortion of electromagnetic waves. 7M

3. a) Explain briefly about transient recovery voltage during switching condition. 7M
   b) Write about arc interrupton in circuit breaker. 7M

4. a) Write about short circuit test duties based on IEC60056(1987). 7M
   b) Explain transient recovery voltage for different types of faults. 7M

5. a) Explain direct lighting stroke to transmission line towers. 7M
   b) Explain lighting protection schemes. 7M

6. a) Write about numerical simulations of electrical transients. 7M
   b) Explain about electro magnetic transient programming(EMTP) 7M

7. a) Explain about interruption of inverse currents. 7M
   b) Explain about interruption of capacitve currents. 7M

8. a)Derive an expression for propagation velocity and characteristic impedance of a travelling wave. 7M
   b)Explain the travelling wave phenomenon in multi conductor system. 7M

[M17 PS 1211]

[M17 PS 1212]

I/II MTECH II SEMESTER REGULAR EXAMINATIONS

POWER SYSTEMS & AUTOMATION

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

VOLTAGE STABILITY

MODEL QUESTION PAPER

TIME: 3 Hours **Max.Marks: 70**

ANSWER ANY 5 QUESTIONS

ALL QUESTIONS CARRY EQUAL MARKS

1. a) Define the following: i) Voltage Stability ii) Voltage Collapse iii) Voltage Security. 7M
   b) What are the factors affecting voltage collapse and insecurity. Explain the voltage stability relation with these factors. 7M

2. a) Explain the importance of PV and QV curves in the analysis of voltage stability. 9M
   b) Explain about angular stability. 5M

3. a) Develop a direct indicator of voltage stability of a single machine connected to infinite bus. What is its effect on voltage stability margin? 7M
   b) Explain how the following loads that influences the voltage stability
   (i) Discharge lights, (ii) Air conditioning and (iii) Electronic power supplies. 7M

4. Describe the analytical concept of voltage stability for a single machine connected to infinite bus 14M

5. Describe the method of shunt compensation? Explain how this can be achieved with devices available. 14M

6. Explain the effect of series compensation on voltage instability? What are the devices used for series compensation 14M

7. Discuss the stability margin of compensated and uncompensated system 14M

8. Discuss in detail, enhancement of voltage stability with various types of localized reactive power support. 14M