Code: 9A02709 **1**

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

OPTIMIZATION TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 (a) Write brief notes on 'objective function surfaces'.
(b) Differentiate between Jocobian and Lagrangean methods of problem solving.

2 Determine the maximum and minimum values of the function f($\mathcal{X}$) = 12$\mathcal{X}^5$ – 45$\mathcal{X}^4$ + 40$\mathcal{X}^3$ + 5.

3 A xyz company produces both interior and exterior paints from two raw materials M_1 and M_2. The following table methods the basic data of the problem.

	Tons of raw material per ton of		Maximum daily availability (tons)
	Exterior	Interior	
Raw material, M_1	6	4	24
Raw material, M_2	1	2	6
Profit per ton	5	4	

Determine the optimum product mix that maximizes the total daily profit.

4 Solve the transportation problem shown below.

		Destination 1	2	3	
Source	1	1	2	1	20
	2	3	4	5	40
	3	2	3	3	30
		30	20	20	

5 Minimize f($\mathcal{X}$) = 0.65 – [0.75 / (1+ $\mathcal{X}^2$)] – 0.65x $\tan^{-1}\left(\frac{1}{x}\right)$. in the interval [0, 3] by Fibonacci method using n= 6.

6 Minimize f = $4\mathcal{X}_1^2 + 3\mathcal{X}_2^2 - 5\mathcal{X}_1\mathcal{X}_2 - 8\mathcal{X}_1$ starting from point (0, 0) using Powell's method. Perform fours interations.

7 (a) Write the characteristics of a constrained problem.
(b) Minimize f($\mathcal{X}_1, \mathcal{X}_2$) = $\frac{1}{3}(\mathcal{X}_1+1)^3 + \mathcal{X}_2$
Subject to $g_1(\mathcal{X}_1, \mathcal{X}_2) = -\mathcal{X}_1+1 \leq 0$
$g_2(\mathcal{X}_1, \mathcal{X}_2) = -\mathcal{X}_2 \leq 0$

8 It is proposed to build thermal stations at three different sites. The total budget available is 3 units (1 unit = Rs 10 million) and the feasible levels of investment on any thermal station are 0, 1, 2, or 3 units. The elective power obtainable (return function) for different investments are given below.

Return function $R_i(x)$	Thermal station, i		
	1	2	3
R_i (0)	0	0	0
R_i (1)	2	1	3
R_i (2)	4	5	5
R_i (3)	6	6	6

Find the investment policy for maximizing the total electric power generated.

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Code: 9A02709 **2**

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

OPTIMIZATION TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Write brief notes an importance of objective function in optimization.
(b) Explain various classical optimization techniques for solving constrained problems.

2 Find the second order Taylor's series approximation of the function
$f(x_1, x_2, x_3) = x_2^2 x_3 + x_1 e^{x_3}$
about the point $X^* = \begin{Bmatrix} 1 \\ 0 \\ 2 \end{Bmatrix}$

3 (a) Write simplex algorithm.
(b) Determine the optimum solution for the following L.P.P.
Maximize $Z = 2x_1 - 4x_2 + 5x^3 - 6x_4$
Subject to $x_1 + 4x_2 - 2x_3 + 8x_4 \le 2$
$-x_1 + 2x_2 + 3x_3 + 4x_4 \le 1$
$x_1, x_2, x_3, x_4 \ge 0$

4 For the transportation problem shown below find optimal solution.

		Destination 1	2	3		
Source	1	5	1	7	10	Availability
	2	6	4	6	80	
	3	3	2	5	15	
	Demand	75	20	50		

5 Find the minimum of $f = \lambda^5 - 5\lambda^3 - 20\lambda + 15$.

6 Minimize $f = 2x_1^2 + x_2^2$ by using the steepest descent method with the starting point (1, 2) (two iterations only).

7 Minimize $f(x) = x_1^3 - 6x_1^2 + 11x_1 + x_3$
Subject to $x_1^2 + x_2^2 - x_3^2 \le 0$
$4 - x_1^2 - x_2^2 - x_3^2 \le 0$
$x_3 - 5 \le 0$
$-x_1 \le 0,\ i = 1, 2, 3$

8 Four types of machine tools are to be installed (purchased) in a production shop. The costs of the various machine tools and the number of jobs that can be performed on each are given below.

Machine tool type	Cost of machine tool (Rs)	Number of jobs that can be performed
1	3500	9
2	2500	4
3	2000	3
4	1000	2

If the total amount available is Rs. 10,000, determine the number of machine tools of various types to be purchased to minimize the number of jobs performed.

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Code: 9A02709 **3**

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

OPTIMIZATION TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Discuss on 'importance of statement of optimization problem'.
(b) Classify optimization problems.

2 Find the solution of following problem using the Lagrange multipler method.
Maximize $f(x,y) = k\,x^{-1}\,y^{-2}$
Subject to
$$g(x,y) = x^2 + y^2 - a^2 = 0.$$

3 (a) What are steps involved in writing a standard form of lines programming problem?
(b) A company manufactures three products whose unit profits are Rs 2, Rs 5 and Rs 3, respectively. The company has budgeted 80 hours of labour time and 65 hours of machine time for the production of three products. The labour requirements per unit of products 1, 2, and 3 are 2, 1 and 2 hours respectively. The corresponding machine time requirements per unit are 1, 1 and 5 hours. The company regards the budgeted labour and machine hours as goals that may be exceeded, if necessary but at the additional cost of Rs 15 per labour hours and Rs 10 per machine hour. The respective unit profits for the three products are Rs 2, Rs 5 and Rs 3. Formulate the problem as a linear program and determine all its basic feasible solution.

4 The demand for a perishable item over the next 4 months is 400, 300, 420 and 380 tons respectively. The supply capacities for the same months are 500, 600, 200 and 300 tons. The purchase price per ton varies from month to month and is estimated at Rs 100, Rs 140, Rs 120 and Rs 150 respectively. Because the item is perishable, a current month's supply must be consumed within 3 months (including the current month). The storage cost per ton per month is Rs 3. The nature of the item does not allow bale-ordering. Solve the problem as a transportation model and determine the optimum delivery schedule for the item over the next 4 months.

5 Find the minimum of the function
$$f(x) = 0.65 = \frac{0.75}{1+x^2} - 0.65\,x\,tan^{-1}\,\frac{1}{x}.$$

6 Minimize $f(x_1,\ x_2) = x_1 - x_2 + 2x_1^2 + 2x_1\,x_2 + x_2^2$ from the starting point $X_1 = \begin{Bmatrix}0\\0\end{Bmatrix}$ using Powell's method.

7 Determine whether the following optimization problem is convex, concave or neither type.
Minimize $f = -4x_1 + x_1^2 - 2x_1\,x_2 + 2x_2^2$
Subject to
$$2x_1 + x_2 \le 6,$$
$$x_1 - 4x_2 \le 0,$$
$$i = 1,2.$$

8 (a) Explain principle of optimality.
(b) What is a multistage decision problem?

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Code: 9A02709 **4**

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

OPTIMIZATION TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 (a) Write brief notes on 'Design constraints'.
(b) Explain various classical optimization technique for solving unconstrained problems.

2 Find the extreme points of the function
$f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6.$

3 (a) Enumerate various terminology of L.P.P.
(b) Consider the following L.P.P
Maximize $z = x_1 + 3x_2$
Subject to $x_1 + x_2 \leq 2$
$-x_1 + x_2 \leq 4$
x_1 unrestricted
$x_2 \geq 0$
Solve the problem using simplex method.

4 Jo shop wants to assign four different categories of machines to five types of tasks. The number of machines available in the four categories are 25, 30, 20, and 30. The number of jobs in the five tasks are 20, 20, 30, 10 and 25. The following table gives the unit cost (in rupees) of assigning a machine category to a task type. Determine the optimum number of machines in each category to be assigned to task type:

		Task type				
		1	2	3	4	5
Machine category	1	10	2	3	15	9
	2	5	10	15	2	4
	3	15	5	14	7	15
	4	20	15	13	-	8

5 Find the minimum of:
$f = \lambda^2 - 5\lambda^3 - 20\lambda + 5.$

6 Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1 x_2 + x_2^2$ starting from the point $X_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$.

7 Minimize $f(x_1, x_2) = \frac{1}{3}(x_1 + 1)^3 + x_2$
Subject to
$g_1(x_1, x_2) = 1 - x_1 \leq 0$
$g_2(x_1, x_2) = -x_2 \leq 0.$
Solve the problem.

8 State two engineering problem, examples that can be solved by dynamic programming.

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Code: 9A04603

1

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 The impulse response of the five point moving average system is

$h(n) = 1/5 \quad 0 \le n \le 4$

Determine magnitude and phase spectrum, also sketch the response.

2 (a) The first five points of the eight-point DFT of a real-valued sequence are {0.25, 0.125 – j0.3018, 0, 0.125 – j0.0518, 0}. Determine the remaining three points.

(b) Compute DFT of x(n) = {0, 1, 2, 3}.

3 Determine the DFT of two real sequences using only one FFT flow graph:

$x_1(n) = \{1, 1, 1, 1\}$

$x_2(n) = \{2, 1, 2, 1\}$

4 Determine the causal signal having the z-transform:

(a) $X(z) = 1/(1 + z^{-1})(1 - z^{-1})^2$.

(b) $X(z) = (1+z^{-1})/ (1 - z^{-1} + 0.5z^{-2})$.

5 Convert the following analog filter transfer function using backward difference method and impulse invariant method.

$H(s) = 1/(s + 0.8)^2 + 9$.

6 Consider the following specifications for a band pass filter:

$|H_d(e^{j\omega})| \le 0.01 \quad 0 \le |\omega| \le 0.2\pi$

$0.92 \le |H_d(e^{j\omega})| \le 1.02 \quad 0.3\pi \le |\omega| \le 0.7\pi$

$|H_d(e^{j\omega})| \le 0.02 \quad 0.8\pi \le |\omega| \le \pi$

Design a linear phase FIR filter to meet these specifications using Hanning window.

7 (a) Discuss the applications of multi rate signal processing.

(b) Sketch the following signals:

$x_1(n) = 2n \quad n > 0$

$= 0 \quad$ otherwise

Also sketch decimated and interpolated version of above signal with factor of '2'.

8 (a) Explain the effect of DFT length in spectral analysis.

(b) With necessary block diagrams explain about discrete multi tone receiver.

*****

Code: 9A04603

2

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Check the periodicity of the following signals, and compute the common period N if periodic.
(i) x(n) = Cos(nπ /2).
(ii) x(n) = 4 - Sin(7nπ /4).
(iii) x(n) = Cos(8nπ /3) + Cos(8n/3).

2 (a) Compute the 4-point DFT of the sequence x(n) = Cos (nπ/4).
(b) Compute inverse DFT of X(k) = {1,2,3,4}.

3 (a) Discuss how N-point DFT can be decomposed into two N/2 point DFT's in DIT-FFT. Assume radix-2 decimation.
(b) Find the 4-point DFT of the sequence, x(n) = cos(nπ/4) using DIF – FFT algorithm.

4 Determine z-transform, ROC and pole-zero locations of:
(i) α^n u(n).
(ii) $-\alpha^n$ u(-n-1).

5 Determine the H(z) for a Butter worth filter satisfying following frequency specifications.

$(0.5)^{1/2} \leq |H(e^{j\omega})| \geq 1 \quad 0 \leq \omega \leq \pi/2$

$|H(e^{j\omega})| \geq 0.1 \quad 3\pi/4 \leq \omega \leq \pi$

Assume T = 1 sec. Use Bilinear transformation method.

6 A low pass filter has the desired frequency response as given by:

$H_d(e^{j\omega}) = e^{-j3\omega} \quad 0 \leq \omega \leq \pi/3$

$= 0 \quad \pi/3 \leq \omega \leq \pi$

Determine the filter coefficients h(n) for M = 9, using type-I frequency sampling technique.

7 Let x(n) = {-1, 2, 6, -1}
↑
Generate and sketch:(i) x(3n)
(ii) Zero interpolated of x(n) i.e. x(n/2).
(iii) Step interpolated of x(n) i.e. x(n/2).
(iv) Linearly interpolated of x(n) i.e. x(n/2).

8 Discuss the following:
(a) DFT length in spectral analysis.
(b) Musical sound processing.

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Code: 9A04603

3

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the concept digital signal processing.

(b) Sketch following signal and find its energy or power whichever is appropriate $x(n) = 8(0.5)^n u(n)$.

2 Compute the DFT of each of the following finite length sequences considered to be of length N (where N is even).

(i) $x(n) = \delta(n)$.

(ii) $x(n) = \delta(n - n_0)$.

(iii) $x(n) = 1$ n even, $0 \le n \le N-1$

$= 0$ n odd, $0 \le n \le N-1$.

3 (a) Explain how many real computations are required to compute N – point DFT.

(b) Find DFT of sequence using DIF-FFT

$x(n) = \{1/2, 1/2, 0, 0\}$.

4 (a) Determine the system function and the unit sample response of the system described by the difference equation $y(n) = (1/2)\, y(n - 1) + 2x(n)$.

(b) Determine the inverse z-transform of:

$X(z) = \log(1 + az^{-1})$ $|z| > |a|$

5 (a) Compare Butter worth and Chebyshev filter approximations.

(b) Use Bilinear transformation method to find H(z) for:

$H(s) = 1/ (s + 0.5)^2$.

6 The desired response of low pass filter is:

$H_d(e^{j\omega}) = e^{-j\omega}$ $-3\pi/4 \le \omega \le 3\pi/4$

$= 0$ $3\pi/4 \le |\omega| \le \pi$

Determine $H(e^{j\omega})$ for M = 7 using Bartlett window.

7 Consider x(n) = tri (n/6). Sketch the following signals and describe how they differ.

(i) x(3n/2), using step interpolation followed by decimation.

(ii) x(3n/2), using decimation followed by step interpolation.

8 With necessary block diagrams explain about discrete multi tone transmitter and receiver.

*****

Code: 9A04603

4

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

DIGITAL SIGNAL PROCESSING

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks
*****

1 Check the following systems for time invariance.
(i) $y(n) = 3^n x(n)$
(ii) $y(n) = e^{in\pi} x(n)$
(iii) $y(n) = e^{x(n)}$
(iv) $y(n) = \cos(0.5n\pi) x(n)$

2 Determine the 8-point DFT of the signal:
$x(n) = \{1, 1, 1, 1, 1, 1, 0, 0\}$ and sketch its magnitude and phase.

3 Given the sequences $x_1(n)$ and $x_2(n)$ below, compute the circular convolution using DIT-FFT algorithm:
$x_1(n) = \{2, 1, 1, 2\}$ $x_2(n) = \{1, -1, -1, 3\}$

4 (a) Explain the advantages and disadvantages of Direct form-II realization over Direct form-I.
(b) Realize following system with difference equation in cascade form:
$y(n) = (3/4)\, y(n-1) - (1/8)\, y(n-2) + x(n) + (1/3)x(n-1)$.

5 Design a digital Butter worth filter to meet following requirements:

$0.85 \le |H(e^{j\omega})| \ge 1$ $0 \le \omega \le 0.2\pi$

$|H(e^{j\omega})| \ge 0.1$ $0.3\pi \le \omega \le \pi$

Assume T = 1 sec. Use impulse invariant method.

6 (a) Explain the type – I frequency sampling method of designing FIR filter.
(b) Explain the Gibb's phenomenon.

7 The spectrum of a signal x(n) is symmetrical triangular pulse with amplitude of '2' and frequency boundaries are -0.35 to 0.35. Sketch the spectrum and sketch spectrums of:
(i) The zero interpolated signal $y(n) = x(n/2)$.
(ii) The decimated signal $d(n) = x(2n)$.
(iii) The signal g(n) that equals to x(n) for even n, and zero for odd n.

8 Write short notes on the following:
(a) Entropy.
(b) Single echo filter.
(c) Musical sound processing.

*****

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations, December/January 2013/14

DISTRIBUTION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Define load factor and loss factor. Also derive the relation between load factor and loss factor.

(b) A 120 MW substation delivers 120 MW for 4 Hrs, 60 MW for 10 Hrs and shut down for rest of each day. It is also shut down for the maintenance for 30 days each year. Calculate its annual load factor.

2 (a) Make a comparison between DC and AC systems.

(b) Discuss the requirements and design features of distribution systems.

3 (a) Explain the basic design practice of secondary distribution system.

(b) Discuss the design consideration of loop type primary feeders.

4 (a) Explain the various factors to be considered to decide the ideal location of substation.

(b) How do you analyze a substation service area with 'n' primary feeders?

5 (a) Write short notes on any two methods of voltage control.

(b) A synchronous motor improves the power factor of a load of 250 kW from 0.8 lagging to 0.9 lagging. Simultaneously the motor carries a load of 100 kW. Determine (i) The leading kVAR taken by the motor. (ii) kVA rating of the motor. (iii) Power factor at which the motor operates.

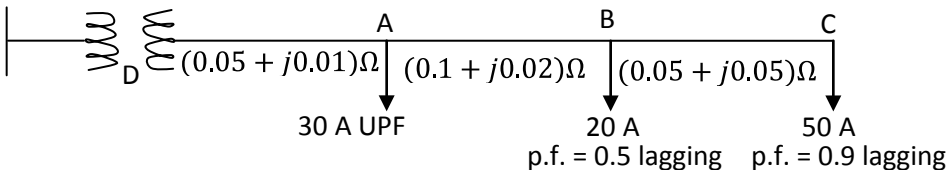
6 Consider a three phase, 3 wire, 440 V secondary system with balanced loads at A, B and C shown in figure. Determine:

(i) Total voltage drop.

(ii) Real power / phase for each load.

(iii) Reactive power / phase for each load.

(iv) The kVA output and load p.f. of the distribution transformer.



7 (a) Write down the procedure to determine the best capacitor location.

(b) Explain the effect of shunt capacitors in improving power factor.

8 (a) Explain the principle of operation of (i) fuse (ii) line sectionalizer.

(b) Explain the objectives of distribution system protection.

*****

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations, December/January 2013/14

DISTRIBUTION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the classification of loads with their characteristics.

(b) The annual peak load input to a primary feeder is 1500 KW. The voltage drop and losses shows that the total loss at the time of peak load is 200 KW. The total annual energy supplied to the sending end of the feeder is 5.5×10^6 KWh.
(i) Determine the annual loss factor.
(ii) Calculate the total annual energy loss and the annual cost if the unit charge is Rs.2.00.

2 (a) Make a comparison between underground and overhead distribution systems.

(b) Discuss the requirements and design features of distribution systems.

3 (a) List the design and operational aspects affected by the primary feeder voltage level.

(b) Explain completely the radial type primary feeders.

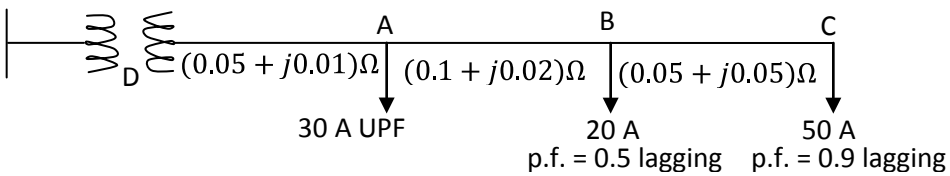
4 (a) Discuss the benefits which are derived through the optimal location of substations.

(b) Make a comparison between indoor and outdoor substations.

5 (a) Why the voltage control and the power factor correction are necessary in distribution systems? What are the disadvantages of low voltage and low power factor of the system?

(b) A single phase system supplies the following loads: (i) Light load of 25 kW at unity power factor (ii) Induction motor load of 125 kW at power factor 0.707 lagging. (iii) Synchronous motor load of 75 kW at power factor 0.9 leading. Determine the total kW and kVA delivered by the system and power factor at which it works.

6 Consider a three phase, 3 wire, 400 V secondary system with balanced loads at A, B and C shown in figure. Determine:
(i) Total voltage drop.
(ii) Real power / phase for each load.
(iii) Reactive power / phase for each load.
(iv) The kVA output and load p.f. of the distribution transformer.



7 (a) What is mean by 'Compensation'? Explain in detail.

(b) Explain how do you determine the best capacitor location.

8 (a) Explain the principle of operation of (i) circuit reclosure (ii) circuit breaker.

(b) Discuss the common faults that occur in a distribution system.

*****

Code: 9A02701

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations, December/January 2013/14

DISTRIBUTION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Define and explain load factor, coincidence factor, contribution factor and loss factor.
(b) A 120 MW substation delivers 120 MW for 3 Hrs, 60 MW for 8 Hrs and shut down for rest of each day. It is also shut down for the maintenance for 15 days each year. Calculate its annual load factor.

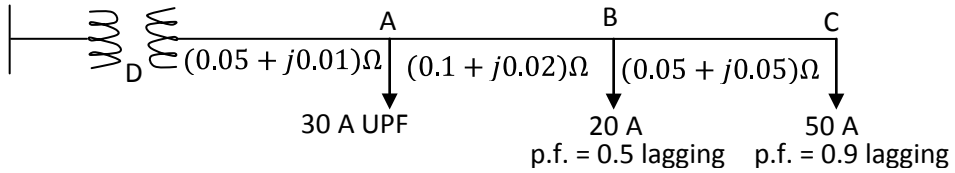
2 (a) Write short notes on ring main distributor.
(b) Make a comparison between underground and overhead distribution systems.

3 (a) Derive the approximate voltage drop and power loss equation of primary feeder of a uniformly distributed load.
(b) A single phase feeder circuit has total impedance $(0.5 + j\ 0.2)\Omega$, $V_r = 230\ V$ and $I_r = 5\ \angle -30°\ A$, determine.
(i) p.f. of load.
(ii) Load p.f. for which impedance angle is maximum and
(iii) Find and derive the expression for load p.f. for which the drop is maximum.

4 (a) Compute the percentage voltage drop of substation service area supplied with 'n' primary feeders.
(b) Write the benefits derived through the optimal location of substations.

5 (a) Briefly write the various methods adapted for voltage control.
(b) A synchronous motor having a power consumption of 50 kW is connected in parallel with a load of 200 kW having a lagging power factor of 0.8. If the combined load has a power factor of 0.9. What is the value of leading reactive kVA supplied by the motor and at what power factor is it working?

6 Consider a three phase, 3 wire, 220 V secondary system with balanced loads at A, B and C shown in figure. Determine:
(i) Total voltage drop.
(ii) Real power / phase for each load.
(iii) Reactive power / phase for each load.
(iv) The kVA output and load p.f. of the distribution transformer.



7 (a) Explain the economic justification of power factor correction.
(b) Write short notes on effect of shunt capacitors on power factor improvement.

8 (a) Explain the principle of operation of (i) fuse (ii) circuit reclosures.
(b) Explain the objectives of distribution system protection.

*****

Code: 9A02701

4

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations, December/January 2013/14

DISTRIBUTION OF ELECTRIC POWER

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Write short notes on load modeling and its characteristics.

(b) The annual peak load input to a primary feeder is 1500 KW. The voltage drop and losses shows that the total loss at the time of peak load is 100 KW. The total energy supplied to the sending end of the feeder is 5.5×10^6 KWh.
(i) Determine the annual loss factor.
(ii) Calculate the total annual energy loss and the annual cost if the unit charge is Rs.2.50.

2 (a) Discuss the requirements and design features of distribution systems.

(b) Write short notes on ring main distributor.

3 (a) Derive the approximate voltage drop and power loss equation of primary feeder of a non-uniformly distributed loads.

(b) Explain the basic design practice of a secondary distribution system.

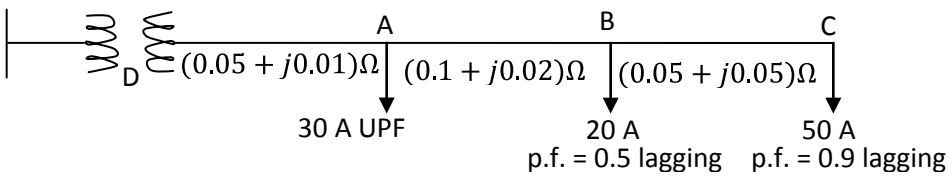
4 (a) Explain how to decide the rating of distribution substation.

(b) Mention the various factors that are to be considered in selecting the ideal substations.

5 (a) Write notes on need for maintaining good voltage profile in power systems and need to improve power factor.

(b) A 3-phase, 5 kW inductions motor has a power factor of 0.85 lagging. A bank of capacitor is connected in delta across the supply terminal and power factor raised to 0.95 lagging. Determine the kVAR rating of the capacitor in each phase.

6 Consider a three phase, 3 wire, 240 V secondary system with balanced loads at A, B and C shown in figure. Determine:
(i) Total voltage drop.
(ii) Real power / phase for each load.
(iii) Reactive power / phase for each load.
(iv) The kVA output and load p.f. of the distribution transformer.



7 (a) Write short notes on capacitive compensation for power factor control.

(b) Write down the procedure to determine the best capacitor location.

8 (a) Explain the principle of operation of (i) line sectionalizers (ii) circuit breaker.

(b) Briefly discuss the general coordination procedure.

*****

Code: 9A02702

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

FUNDAMENTAL OF HVDC & FACTS DEVICES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Draw schematic diagram of a typical HVDC converter station and explain the functions of various components available.

(b) Prove that insulation required for a bipolar D.C. system is 0.866 times that required for 3-phase, 3 wire A.C. system. Assume that power transmitted, percentage losses and size of conductors are same for both systems.

2 (a) Explain in detail the converter control characteristics of HVDC systems.

(b) Explain the effect of source inductance on HVDC systems.

3 (a) Discuss about characteristic and non-characteristic harmonics generated in HVDC systems.

(b) What are the adverse affects of harmonics produced by the HVDC converters?

4 (a) Explain the sequential method for AC-DC power flow.

(b) Derive the mathematical model of a HVDC converter.

5 Explain the basic types of the FACTS controllers and their applications.

6 (a) Explain how the shunt compensation is useful in prevention of voltage instability and improvement of transient stability.

(b) Explain the basic operating principle of TCR and its characteristics.

7 Explain the operation and characteristics of GTO thyristor – controlled series capacitor.

8 (a) Explain the basic operating principles of UPFC.

(b) Explain how the UPFC can control real and reactive power flow in the transmission line.

*****

Code: 9A02702

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

FUNDAMENTAL OF HVDC & FACTS DEVICES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Prove that the average valve rating of a 3-phase, two way bridge rectifier is 2.094 Pd with the help of a relevant waveforms, where Pd is the D.C. power. Mention the assumptions made.

(b) What are the merits & demerits of HVDC power transmission?

2 (a) Explain the principles of DC link control in HVDC system.

(b) Explain clearly the procedure for start up of a DC link.

3 Explain the different methods of compensation of reactive power in HVDC substation with neat single line schematics.

4 Derive and explain the solution of AC/DC load flow problem using simultaneous method.

5 (a) Explain the concept of power flow n parallel paths and meshed systems.

(b) Explain the loading capability limits.

6 (a) Explain the operation of TCR and TSR with their characteristics.

(b) Explain how the TCR and TSR can eliminate the harmonics in the system.

7 Explain the basic control schemes for GSC, TSSC and TCSC using block diagrams.

8 Explain the illustration of conventional transmission control capabilities of the UPFC and derive the necessary expressions.

*****

Code: 9A02702

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

FUNDAMENTAL OF HVDC & FACTS DEVICES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Explain in detail, the different types of HVDC links available with the help of neat sketches.

2 (a) Explain the hierarchical control structure of a DC link with the help of a neat block diagram.
(b) Explain the constant extinction angle control with a neat block diagram.

3 Explain different sources of reactive power to meet the reactive power requirement of converters.

4 (a) Write a short note on DC load flow analysis.
(b) Derive the mathematical model of DC converter and DC network.

5 (a) Explain the basic types of FACTS controllers.
(b) Explain various benefits from the FACTS controllers.

6 Explain the objectives of shunt compensation.

7 How the series compensators are used for improvement of transient stability and power oscillation damping? Explain.

8 (a) Draw and explain the overall control structure of UPFC.
(b) Explain the basic control scheme for P and Q control by UPFC.

*****

4

Code: 9A02702

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

FUNDAMENTAL OF HVDC & FACTS DEVICES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the principle of operation of a 6-pulse Graetz's circuit with a neat diagram. Draw the relevant waveforms.

(b) For a fixed power of transmission explain how the economic choice of voltage level is selected in D.C. transmission system.

2 Draw the complete converter control characteristics and explain the principle of power control in a DC link.

3 (a) Discuss about the alternate converter control strategies for reactive power control.

(b) Discuss how shunt capacitors can be used to meet reactive power requirement of a converter.

4 Derive and explain the solution of AC/DC load flow problem using simultaneous method.

5 Explain the description and definitions for FACTS controllers.

6 (a) Explain the operation and characteristics of FC-TCR.

(b) Explain the functional control scheme of FC-TCR with necessary waveforms.

7 Explain various objectives of series capacitive compensation.

8 Explain the basic hybrid scheme of UPFC with a fixed phase shifting transformer.

*****

Code: 9A02703

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

SWITCH GEAR AND PROTECTION

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain how an arc is imitated and sustained is a circuit breaker when the circuit breaker contacts separate.

(b) How its circuit breaker rating and specifications are fixed? Explain in detail.

2 (a) Explain the process of current chopping is SF_6 circuit breaker.

(b) Describe the constructions, principle of operations and applications of vacuum circuit breaker.

3 (a) Explain the characteristics of distance relay.

(b) Explain the constructions and operation of induction up relay.

4 (a) Explain the advantages and disadvantages of microprocessor based relay over static relay.

(b) What is comparator? Explain any one type of plane comparator in detail.

5 (a) What are the various types of faults that occur is an alternator? What are the abnormal conditions is an alternator.

(b) Explain the restricted earth fault protection with neat diagram.

6 Explain the protection of transformers using the percentage differential protection method with neat diagram.

7 What is meant by 3-zone protection? Give such schemer of protection for (i) short length lines (ii) medium length lines (iii) long lines give schematic diagram of contract circuits and explain their principles of operation for their schemer.

8 (a) Explain valve type lightening arrester with neat diagram.

(b) Write short notes on insulation coordination.

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Code: 9A02703

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

SWITCH GEAR AND PROTECTION

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) What is current chopping? Explain in detail.

(b) In a short circuit test on a 132 KV 3-phase system, the breaker gave its following results: p.f of the fault 0.4, recovery voltage 0.95 of full line voltage, the breaking current is symmetrical and the restricing transient had a natural frequency of 16 KHz. Determine the rate of rise of restricing voltage. Assume that the fault in grounded.

2 (a) Describe the construction, principle of operation and application of air blast circuit breakers.

(b) Compare the performance of and characteristics of (i) minimum oil breaker and air blast C.B. (ii) air blast C.B and bulk oil C.B.

3 (a) What is protective relay? Discuss the basic requirements of relay.

(b) Explain the constructional details and operation of attracted armatures relay.

4 Explain in detail the distance relay with flow charts.

5 What is restricted earth fault protection for alternators? Why is their form of protection used for alternators even though it does not provide protection for the complete winding?

6 Explain the Buchholz relay protection with neat diagram.

7 Give the scheme of protection for a ring main having three substations and fed from one end. Explain whether the same scheme could be used of the ring main were fed from more than one end.

8 What are the basic requirements of lightening Arrestors? Explain value types and zinc-oxide lightening Arrestors with neat diagram.

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Code: 9A02703

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

SWITCH GEAR AND PROTECTION

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain in detail the arc-interruptions theories.

(b) In a short circuit test on a 3-pole, 132 KVCB, the following observations are made: p.f of fault 0.4, the recovery voltage 0.90 times full line voltage, the breaking current symmetrical, the frequency of oscillations of restricting voltage 16 KHz. Assume that the neutral is grounded and the fault does not involve ground, determine the average RRRV.

2 (a) What are the requirements of the contact material for a vacuum circuit breaker? Why is the current chopping not a serious problem with such circuit breaker?

(b) Describe the construction, principle of operations and application of minimum oil circuit breakers.

3 (a) Explain what primary protection is and what is backup protection.

(b) Explain the construction and operations of balanced beam relay.

4 Explain in detail the over current relay with neat block diagram.

5 What is inter-turn fault protection? Explain with neat diagram.

6 Explain the percentage differential protection method against the protection of transformers with neat diagram.

7 What is carrier current protection? Explain in detail with neat diagram.

8 (a) Explain with neat sketches the mechanism of lightening discharge.

(b) Write short notes on insertions coordination.

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4

Code: 9A02703

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

SWITCH GEAR AND PROTECTION

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the terms restricting voltage, recovery voltage and RRRV. Derive the expression for the restricting voltage.

(b) A circuit breaker is rated at 1500 Amp, 2000 MVA, 33 KV, 3 sec, 3-phase, oil circuit breaker. Determine the rated normal current, breaking current, making current and short time rating current.

2 (a) Compare the performance of SF_6 gas with air when used for circuit breaking.

(b) Discuss the principle of arc interruptions in (i) an oil CB and (ii) air blast circuit breaker.

3 (a) What is universal torque equation? Using this equations derives the following characteristics:
(i) Impedance relays (ii) reactance relay (iii) mho relay.

(b) Explain differential relay in detail.

4 (a) What are static relays? Discuss the advantages and disadvantages of static relay.

(b) What is comparator? Explain anyone type of amplitude comparator in detail.

5 What are the abnormal conditions that are involved is the alternator. Explain how the protection is provided against them.

6 Describe constructions, principle of operation and applications of Buchholz relay. Why is this form of protection an ideal protection scheme?

7 Explain in detail the protection of bus bars.

8 (a) Explain how the overhead lines are protected from lighting shocks.

(b) Explain zinc-oxide lighting arresters with neat diagram.

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Code: 9A02706

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

RENEWABLE ENERGY SOURCES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) What are the advantages and limitations of renewable energy sources?
(b) Write short notes on extraterrestrial and terrestrial solar radiations.

2 (a) Why the flat plate collectors are clarified as low temperature collectors? Explain with neat diagram.
(b) Explain the classifications of concentrating collectors.

3 (a) Write short notes on solar distillation.
(b) Explain the different methods of storing solar energy.

4 (a) What are the various characteristics of wind? Discuss them in detail.
(b) Discuss the advantages and disadvantages of horizontal and vertical axis wind mills.

5 (a) Explain in detail about aerobic digestion and different phases and the process involved in it.
(b) Explain the combustion characteristics of bio-gas.

6 (a) Explain the various methods to extract geothermal energy.
(b) What are the advantages and disadvantages of geothermal energy over other energy forms?

7 (a) Write short notes on OTEC plants. What are the advantages and limitations involved in OTEC plants?
(b) What is mini-hydel development? Explain in detail.

8 (a) Write short notes on Carnot cycle.
(b) Explain the need of direct energy conversion.

*****

Code: 9A02706

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

RENEWABLE ENERGY SOURCES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) With neat diagram, explain the working of sun-shine recorder.
(b) Write short notes on renewable energy sources.

2 (a) Draw and explain the power generating system illustrating the use of concentrating collectors.
(b) Briefly discuss the flat plate collectors.

3 (a) Write short notes on photo voltaic energy conversion.
(b) How the solar energy is stored? Explain different methods of storing solar energy.

4 (a) Explain the working of vertical axis wind mill mentioning the specific arrangement of the blades.
(b) Discuss the performance characteristics of wind.

5 (a) Explain the principles of bio-conversion.
(b) Explain the different types of bio-gas digesters.

6 (a) Write short notes on geothermal energy and explain different types of wells.
(b) Briefly discuss the potential of geothermal energy resources in India.

7 (a) What is mini-hydel development? Classify mini hydel power stations.
(b) What are the advantages and disadvantages of ocean wave energy?

8 (a) Explain the principles of direct energy conversion.
(b) Briefly discuss Carnot cycle.

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Code: 9A02706

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

RENEWABLE ENERGY SOURCES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain extraterrestrial and terrestrial solar radiations.
(b) Explain how the solar radiation is measured with neat diagram.

2 (a) Explain the concentrating collectors with neat diagram.
(b) Write short notes on flat plate collectors.

3 (a) Explain the different methods of storing solar energy.
(b) With a neat sketch explain the process of drying food grain.

4 (a) Explain the working of horizontal axis wind mills with neat diagram.
(b) Explain the various characteristics of wind.

5 (a) Explain in detail about anaerobic digestion and different phases and the process involved in it.
(b) Explain the types of bio-gas digesters in detail.

6 (a) Explain the potential of geothermal energy resources in India.
(b) What are the specific environmental effects of the geothermal source of energy used for the power generation?

7 (a) Write short notes on mini-hydel power plants.
(b) Explain with a neat sketch the potential and conversion techniques form tidal waves.

8 (a) What is direct energy conversion? Explain the need of direct energy conversion.
(b) Explain the limitations and principles of direct energy conversion.

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Code: 9A02706

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

RENEWABLE ENERGY SOURCES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) What are the renewable energy sources and why they are seriously thought throughout the world?

(b) Explain how the sun shine is measured with neat diagram.

2 (a) Draw and explain the power generating system illustrating the use of flat plate collector.

(b) Briefly discuss the classifications of concentrating collectors.

3 (a) Write short notes on solar pond.

(b) Explain the working of photo voltaic energy conversion with neat diagram.

4 Discuss the advantages and disadvantages of horizontal and vertical axis wind mills. And explain the generation of any one type with neat diagram.

5 (a) Discuss the economic aspects of biogas.

(b) What are the advantages of anaerobic digestion? Explain.

6 (a) Explain the different methods of harnessing the geothermal energy.

(b) Write short notes on potential of geothermal energy resources in India.

7 (a) Explain with a neat sketch the energy extraction techniques from tidal waves.

(b) What are the advantages, limitations and operational difficulties encountered in OTEC plants?

8 What is direct energy conversion? Explain in detail the need, limitations and principles of direct energy conversion.

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Code: 9A02707

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

SOFT COMPUTING TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Explain in detail the basic architectural details and operation of “Biological neuron” and ‘Artificial neuron’.

2 (a) Explain in detail about various ‘ANN’ activation functions.
(b) Discuss in detail the classification taxonomy of ‘ANN’.

3 Derive output equations and weight update equations for a multilayer feed forward neural network using back propagation algorithm.

4 (a) Explain the architecture and training algorithm of “BAM” network.
(b) State and explain “BAM” energy theorem.

5 (a) Consider the universe of discourse: $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ and $'A' = \{(1, 0.3)(2, 0.5)(3,1)(4, 0.7)(5, 0.2)\}$. Then find cardinality and relative cardinality of ‘A’.
(b) Find α - level set and strong α – level set of
$A = \{(1, 0.2)(2, 0.5)(3, 0.8)(4, 1)(5, 0.7)(6, 0.3)\}$.

6 What are the basic components of a fuzzy logic system? Explain each of them in detail.

7 What are the basic operators of genetic algorithm? Explain the operational procedure of GA.

8 What is the role of ANN in short term load forecasting? Explain.

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Code: 9A02707

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

SOFT COMPUTING TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain in detail various characteristics of ANN.
(b) What are the applications of ANN? Explain about any two of them.

2 Explain the following learning rules in detail:
(a) Winner take all learning rule.
(b) Outstar learning rule.
(c) Boltzmann learning rule.

3 Explain the basic architecture of perceptron model and also explain the training algorithm of single layer continuous perceptron model.

4 Explain the concept of associative memory in ANN.

5 What is meant by membership function? Explain in detail various membership functions of fuzzy logic systems.

6 Explain the following components of fuzzy logic system:
(a) Fuzzification.
(b) Rule base.
(c) Defuzzification.

7 Explain in detail about various operators of GA and also explain GA evaluation procedure.

8 Explain, how genetic algorithm is useful for economic dispatch?

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Code: 9A02707

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

SOFT COMPUTING TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 Explain in detail the architecture of Mc Culloch – Pitts neuron model and also realize 3-input NAND gate, NOR gate using the above neuron model.

2 What is meant by “Learning”? Explain in detail about various supervised learning strategies.

3 (a) What are the limitations of “Perceptron” model? Explain.
(b) Explain the architectural details and algorithm of “ADALINE” model.

4 Explain the basic architecture and algorithm of discrete Hopfield networks.

5 (a) Find the algebraic product of two fuzzy sets ‘A’ and ‘B’, where, $A = \{(3, 0.8)(5, 0.6)(6, 0.9)\}$ and $B = \{(3, 0.7)(4, 0.8)(5, 0.3)\}$.
(b) Find the algebraic sum of two fuzzy sets: $A = \{(3, 0.5)(5, 1)(7, 0.6)\}$ and $B = \{(3, 1)(5, 0.6)\}$.
(c) Find bounded sum of two fuzzy sets: $A = \{(3, 0.5)(5, 1)(7, 0.6)\}$ and $B = \{(3, 0.3)(5, 0.6)\}$.

6 Explain in detail various components of “Fuzzy Logic System”.

7 Explain the basic operational procedure of GA with the help of its operators.

8 Explain how fuzzy logic is useful for unit commitment problem.

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Code: 9A02707

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

SOFT COMPUTING TECHNIQUES

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 What are the basic models of ANN based on connection topology? Explain each of them in detail.

2 Explain in detail the activation dynamics and synaptic dynamics of neural networks.

3 Explain the basic architecture of “MADALINE” model and also discuss about “MR-I & MR-II” algorithms.

4 Explain the basic architecture and algorithms of continuous – type Hopfield networks.

5 (a) For the fuzzy sets: $A = \{(0, 0.3)(1, 0.4)(2, 0.6)(3, 0.7)\}$ and $B = \{(0, 0.4)(1, 0.6)(2, 0.8)(3, 0.8)\}$ Find (i) Absolute complement of A and B (ii) Relative complement of A with respect to B.

(b) For the following fuzzy sets A and B, find disjunction and conjunction, where, $A = \{(4, 0.1)(6, 0.3)(8,0.6)(10, 1)\}$ $B = \{(0, 0.3)(2, 0.6)(4,1)(6, 1)(8, 0.6)(10, 0.3\}$.

6 With suitable example, explain membership value assignment and development of rule base.

7 Explain in detail, the following operators of GA.

(a) Reproduction.

(b) Crossover.

(c) Mutation.

8 Explain in detail the approach of ANN to load flow studies.

*****

Code: 9A02708

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

RELIABILITY ENGINEERING & APPLICATIONS TO POWER SYSTEMS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain rules of probability for different possible events.

(b) Consider the case in which the probability of success in a single trial is ¼ and 4 trials is to be made. Evaluate individual & cumulative probabilities of success & hence draw the probability functions.

2 (a) Discuss and derive the expression for reliability for series and parallel networks with suitable examples.

(b) A system consists of 4 components in parallel system requires that at least 3 out of 4 must function. Determine:
(i) What is the system reliability if each component has reliability of 0.9 and.
(ii) What is the system reliability if 5 components are there to perform the same function?

3 (a) Briefly Explain:
(i) MTTF. (ii) MTTR. (iii) MTBR.

(b) Derive the relationship between f(t), F(t), R(t), h(t).

4 Explain the concept of stochastic transitional probability matrix and also evaluate the limiting state probabilities of two component repairable model.

5 Derive the expressions for cumulative probabilities and cumulative frequencies for two component repairable model.

6 (a) With the help of load modeling discuss the reliability analysis.

(b) A generating station consists of two units of capacities 40 & 60 MW with forced outage rates 0.08 & 0.05 respectively. The mean time to repair of either unit is 20 days. Calculate LOLP, frequency of failure of the system if it has to deliver a steady load of 50 MW. Assume exposure factor e = 0.5/year.

7 (a) Write short notes on:
(i) System and.
(ii) Load point reliability indices for the composite system reliability analysis.

(b) Explain how the effect of changing weather conditions is modeled.

8 (a) Explain the evaluation of basic reliability indices and performance indices.

(b) Write short notes on:
(i) Customer oriented.
(ii) Loss and energy oriented indices.

*****

Code: 9A02708

2

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

RELIABILITY ENGINEERING & APPLICATIONS TO POWER SYSTEMS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Define and explain binomial distribution and also write down the properties of binomial distribution.

(b) An electric power system has 10 generating units each with a capacity of 30 MW and probability of failure is 0.05. Calculate the probability of the system failing to supply a steady load of 200 MW.

2 (a) Discuss reliability analysis for complex networks and explain decomposition method in brief.

(b) A system is designed with overall efficiency of 0.999. Using components having individual reliability of 0.7. What is the minimum number of components that must be connected in parallel?

3 (a) Discuss bath tub curve for reliability analysis.

(b) A component with an MTTF of 100 hours is known to have exponential distribution. Calculate the reliability of the component for a machine time of 10 hours.

4 (a) Explain the concept of Markov Chains.

(b) Evaluate the limiting state probabilities of two component repairable model by using STPM approach.

5 A generating station has three generators, two rated for 10 MW and the third one rated for 20 MW. The failure and repair rates of each unit are 0.35 failures/year and 9.65 repairs/year. Obtain the state diagram and mark the various equivalent transitional rates of equal capacity states combined. Hence evaluate the cumulative probability of various combined states.

6 (a) A power system contains three 40 MW and one 60 MW capacity unit each having a forced outage rate of 0.02. The annual daily peak load variation curve is a straight line from 100% to 40% points. Estimate LOLE for a peak load of 200 MW.

(b) Explain the recursive relation to be used for finding the cumulative probability when the unit is removal from the system.

7 (a) With the help of weighted average rate evaluate the composite system reliability analysis.

(b) A load is served by two independent transmission lines A and B under two weather environments. Draw the state diagram and explain how the probability failure of power supply to the load can be calculated.

8 (a) Discuss the various performance indices that are used for the distribution system.

(b) Explain the concept of load point and system reliability indices for distributed system reliability studies.

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Code: 9A02708

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

RELIABILITY ENGINEERING & APPLICATIONS TO POWER SYSTEMS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Explain the following terms with respect to binomial distribution.
(i) Mean value. (ii) Mode. (iii) Variance. (iv) Standard deviation.

(b) A factory gets electric power from a generator (G) driven by a diesel engine (E). If the probability of failure of the (G) is 0.1 and that of (E) is 0.2. What is the probability of the system working satisfactorily?

2 (a) By taking any one example derive the expression for system reliability using decomposition method.

(b) A system consists of 10 identical components in series. If the overall system reliability must not be less than 0.8, what is the minimum reliability of each component?

3 (a) Define and explain hazard function and derive the relation between reliability R(t) and hazard function h(t).

(b) Show that the mean time to failure is equals to the reciprocal of the constant hazard rate function for exponentially distributed failure component.

4 (a) Explain two-state Markov process (single component with repair) and derive the equations for steady state probabilities.

(b) Discuss the concept of limiting state probabilities using STPM method.

5 (a) Define mean cycle time, and how it can be calculated for one and two component repairable models.

(b) Find the cumulative probability and cumulative frequency of a three unit generating system having capacities of two units of 25 MW each and one unit of 50 MW with a failure rate 0.01 failure/day and repair rate of 0.49 repairs/day.

6 The percentage distribution of daily peak loads of a 2 x 30 MW generating station is shown below.

Daily peak load (MW)	Times the peak has occurred
50	40
40	30
30	10
20	20

If $\lambda = 0.2/yr$ and $\mu = 9.8/yr$ of each unit. Calculate LOLP and LOLE of the system.

7 (a) With the help of Markov model evaluate the composite system reliability analysis.

(b) Explain how the effect of changing weather conditions is modeled.

8 (a) Write short notes on load point and system reliability indices for distributed system.

(b) Discuss in detail about loss and energy oriented indices.

*****

Code: 9A02708

4

B.Tech IV Year I Semester (R09) Regular & Supplementary Examinations December/January 2013/14

RELIABILITY ENGINEERING & APPLICATIONS TO POWER SYSTEMS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

*****

1 (a) Discuss the Bernoulli's trails method for probability concept.

(b) Define and explain probability density and distribution functions.

2 (a) Explain about decomposition method for composite systems.

(b) A system consists of 10 identical components; all of them must work for system success. What is the system reliability if each component has a reliability of 0.95?

3 (a) Derive the expression for MTTF when the components are connected in series in terms of failure rates.

(b) Consider a system comprising of four identical units with having the failure rate of 0.1 F/year. Evaluate the probability of the system surviving 5 years, if at least 2 units must operate successfully.

4 (a) For the Markov process of a two state system determine the availability of each state as a function of time't'.

(b) Explain the significance of Markov process.

(c) Discuss time dependent probabilities evaluation using Laplace transform approach.

5 (a) Explain how cumulative probability and cumulative frequency evaluation is done for merged states by examples.

(b) A generating station has three generators, two rated for 15 MW and the third one rated for 25 MW. The failure and repair rates of each unit are 0.25 failures/year and 5.75 repairs per year. Obtain the state diagram and mark the various equivalent transitional rates of equal capacity states combined. Hence evaluate cumulative probability of various combined states.

6 (a) Explain LOLP, LOLE in generation system reliability analysis.

(b) A generating system consists of two 50 MW units and one 40 MW unit each having forced outage rate of 0.06. The peak load specified over a 100 hour period is 150 MW. The load duration curve for this period is a straight line from 100% to load points. What are LOLE and LOEE for this period?

7 (a) Explain two state weather modeling in the reliability evaluation of transmission lines.

(b) Discuss various indices suitable for composite system reliability analysis.

8 (a) Explain how reliability analysis performed for the radial networks in distribution systems.

(b) Define and explain:
(i) Customer oriented indices.
(ii) Basic reliability indices.
(iii) Load point reliability indices.

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