Register No: ……

M.E. DEGREE EXAMINATIONS: JUNE 2011

Second Semester

POWER ELECTRONICS AND DRIVES

PED505: Operation Research

Statistical Tables are permitted

Time: Three Hours **Maximum Marks: 100**

Answer All Questions:-

PART A (10 x 2 = 20 Marks)

1. State two limitations of the graphical method of solving a LPP.
2. Define corner point feasible solution.
3. Find the dual of the following LPP.

$$\text{Max } Z = 3x_1 - x_2 + x_3$$
$$4x_1 - x_2 \leq 8$$
$$8x_1 + x_2 + 3x_3 \geq 12$$
$$5x_1 - 6x_3 \leq 13$$
$$x_1, x_2, x_3 \geq 0$$

4. Define Integer programming problem.
5. What is the use of dummy activity in a network?.
6. If there are five activities P, Q, R, S and T such that P, Q, R have no immediate predecessors but S and T have immediate predecessors P, Q, and Q, R respectively. Represent this situation by a network.
7. Define parallel critical paths.
8. What do you understand by present worth factor?
9. Write the formula for length of system (M/M/S: ∞ / FCFS)
10. Define total elapsed time.

PART B (5 x 16 = 80 Marks)

11. a) Solve the LPP Maximize $Z = 5x_1 - 2x_2 + 3x_3$

Subject to
$$2x_1 + 2x_2 - x_3 \geq 2$$
$$3x_1 - 4x_2 \leq 3$$
$$x_2 + 3x_3 \leq 5$$
$$x_1, x_2, x_3 \geq 0.$$

(OR)

b) Solve the transportation problem with unit transportation costs in rupees, demands and supplies as given below:

		Destination D_1	D_2	D_3	Supply (units)
Origin	A	5	6	9	100
	B	3	5	10	75
	C	6	7	6	50
	D	6	4	10	75
Demand (units)		70	80	120	

12. a) Use REVISED simplex method to solve the following LPP.

$$\text{Max } Z = x_1 + x_2$$
$$\text{Subject to } 2x_1 + 5x_2 \leq 6$$
$$x_1 + x_2 \geq 2$$
$$x_1, x_2 \geq 0$$

(OR)

b) Use dual simplex method to solve the following LPP.

$$\text{Min } Z = 5x_1 + 6x_2$$
$$\text{Subject to } x_1 + x_2 \geq 2$$
$$4x_1 + x_2 \geq 4$$
$$x_1, x_2 \geq 0$$

13. a) (i) The following table gives the weights of various edges in a graph with 6 vertices and 12 edges. Draw the connected weighted graph and also find the shortest spanning tree in the graph. (10)

	v_1	v_2	v_3	v_4	v_5	v_6
v_1	-	20	32	22	20	43
v_2	20	-	19	∞	∞	39
v_3	32	19	-	14	∞	24
v_4	22	∞	14	-	13	14
v_5	20	∞	∞	13	-	18
v_6	43	39	24	14	18	-

(ii) Construct the network for each of projects whose activities and their precedence relationships are as given below: (6)

A < C, D, I ; B < G, F ; D < G, F ; F < H, K ; G, H < J ; I, J, K < E

(OR)

b) The following table shows the jobs of a network along with their time estimates. The time estimates are in days:

Job	1-2	1-6	2-3	2-4	3-5	4-5	5-8	6-7	7-8
a	3	2	6	2	5	3	1	3	4
m	6	5	12	5	11	6	4	9	19
b	15	14	30	8	17	15	7	27	28

(i) Draw the project network.

(ii) Find the critical path.

(iii) Find the probability that the project is completed in 31 days.

14. a) The following time-cost table (time in days, cost in rupees) applies to a project. Use it to arrive at the network associated with completing the project in minimum time at minimum cost.

Activity	**Normal**		**Crash**	
	Time	**Cost**	**Time**	**Cost**
1-2	2	800	1	1400
1-3	5	1000	2	2000
1-4	5	1000	3	1800
2-4	1	500	1	500
2-5	5	1500	3	2100
3-4	4	2000	3	3000
3-5	6	1200	4	1600
4-5	3	900	2	1600

(OR)

b) Assume that the present value of one rupee to be spent in a year's time is Re 0.9 and C = Rs. 3000, capital cost of equipment and the running costs are given below. When should the machine be replaced?

Year:	1	2	3	4	5	6	7
Ung. cost (Rs.)	500	600	800	1000	1300	1600	2000

15. a) A petrol station has two pumps. The service time follows the exponential distribution with mean 4 minutes and cars arrive for service in a Poisson process at the rate of ten cars per hour. Find the probability that a customer has to wait for service. What proportion of time the pump remains idle?

(OR)

b) A Machine operator has to perform three operations turning, threading and knurling on a number of different jobs. The time required to perform these operations (in minutes) for each jobs known. Determine the order in which the jobs should be processed in order to minimize the total time required to turn out all the jobs. Also find the minimum elapsed time.

Job	1	2	3	4	5	6
Turning	3	12	5	2	9	11
Threading	8	6	4	6	3	1
Knurling	13	14	9	12	8	13

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