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NEW SCHEME

Seventh Semester B.E. Degree Examination, May 2007
Electrical and Electronics Engineering
Operations Research

Time: 3 hrs.]

[Max. Marks:100

Note : 1. Answer any FIVE full questions.
 2. Normal distribution tables permitted.

- 1 a. What is operations research? Briefly discuss the scope of OR. What are the limitations of OR? (10 Marks)
- b. Three grades of coal A, B, and C contain ash and phosphorus as impurities. In a particular industrial process, a fuel obtained by blending the above grades containing not more than 25% ash and 0.03% phosphorous is required. The maximum demand of the fuel is 100 tons. Percentage impurities and costs of the various grades of coal are shown below. Assuming that there is an unlimited supply of each grade of coal and there is no loss in blending, formulate this blending problem as a linear programming problem to minimize the cost.

Coal grade	% Ash	% Phosphorous	Cost per ton in Rs.
A	30	0.02	240
B	20	0.04	300
C	35	0.03	280

(10 Marks)

- 2 a. Define slack and surplus variables. (04 Marks)
- b. Using Big. M. Method, solve the following LPP,
 Minimize $Z = 5x_1 + 3x_2$
 Subject to the constraints, $2x_1 + 4x_2 \leq 12$
 $2x_1 + 2x_2 = 10$
 $5x_1 + 2x_2 \geq 10$
 and $x_1, x_2 \geq 0$. (16 Marks)

- 3 a. Explain the stepping stone solution method of transportation problems. (04 Marks)
- b. Determine the optimal solution of the transportation problem for which the unit transportation costs, demands and supplies are given in Table Q3(b). Use Vogel's approximation method to obtain the initial basic feasible solution.

Destination \ Source	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	6	1	9	3	70
S ₂	11	5	2	8	55
S ₃	10	12	4	7	70
Demand	85	35	50	45	

Table Q3(b)

(16 Marks)

- 4 a. Give the mathematical formulation of traveling salesman problem. (06 Marks)
 b. A pharmaceutical company is producing a single product and is selling it through five agencies located in different cities. All of a sudden, there is a demand for the product in another five cities not having any agency of the company. The company is faced with the problem of deciding on how to assign the existing agencies to dispatch the product to needy cities in such a way that the traveling distance is minimized. The distance between the surplus and deficit cities (in km) is given in the following Table Q4(b). Determine the optimum assignment schedule.

		Deficit cities				
		a	b	c	d	e
Surplus cities	A	85	75	65	125	75
	B	90	78	66	132	78
	C	75	66	57	114	69
	D	80	72	60	120	72
	E	76	64	56	112	68

Table Q4(b)

(14 Marks)

- 5 a. List and explain different types of costs in inventory system. (08 Marks)
 b. The annual demand for a component is 7,200 units. The carrying cost is Rs.500 / unit / year, ordering cost is Rs.1500 / order and shortage cost is Rs.2,000 / unit / year. Find the optimum values of economic order quantity, maximum inventory, maximum shortage quantity, cycle time (t), inventory period (t₁), and shortage period (t₂). (12 Marks)
- 6 a. Describe the phases of project management. (06 Marks)
 b. How CPM differs from PERT? (04 Marks)
 c. A project has the following time schedule. Each activity and the corresponding time estimates, optimistic (t_o), most likely (t_m), and pessimistic (t_p), are given in table Q6(c). Draw the network for this project and determine the critical path. What is the probability that the project will be completed in 20 days? (10 Marks)

Activity	1-2	2-3	2-4	3-4	3-5	3-6	4-5	4-6	5-6
t _o	2	1	0.5	0	1	1	6	3	4
t _m	2	1.5	1	0	2.5	2	7	4	6
t _p	8	11	7.5	0	7	3	8	11	8

Table Q6(c)

- 7 a. What is the replacement policy when value of money changes with time? (06 Marks)
 b. A firm is considering replacement of a machine, whose cost price is Rs.12,200 and the scrap value is Rs.200. The running costs in rupees are found from experience to be as follows:

Year :	1	2	3	4	5	6	7	8
Running cost :	200	500	800	1,200	1,800	2,500	3,200	4,000

When should the machine be replaced?

(14 Marks)

- 8 a. Explain Maximin – Minimax principle. (04 Marks)
 b. Determine the range of values of p and q that will make the payoff element a₂₂ a saddle point for the game whose payoff matrix (a_{ij}) is given below: (06 Marks)

		Player B		
		1	2	3
Player A	1	2	4	7
	2	10	7	q
	3	4	p	8

- c. A T.V. repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 – hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought in? (20 Marks)