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Seventh Semester B.E. Degree Examination, Jan./Feb. 2021
Operation Research

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART - A

- 1 a. Write a note on the scope and limitations of Operation Research. (06 Marks)
- b. A paper mill produces two grades of paper namely X and Y. Because of raw material restrictions, it cannot produce more than 400 tons of grade X and 300 tins of grade Y in a week. There are 160 production hours in a week. It requires 0.2 and 0.4 hours to produce a ton of products X and Y respectively with corresponding projects of RS 200 and Rs 500 per ton. Formulate the above as a LPP to maximize project and find the optimum product mix. (04 Marks)
- c. By graphical method solve the following LPP :
- Maximize $Z = 3x_1 + 4x_2$
 Subject to $5x_1 + 4x_2 \leq 200$
 $3x_1 + 5x_2 \leq 150$
 $5x_1 + 4x_2 \geq 100$
 $8x_1 + 4x_2 \geq 80$
 and $x_1, x_2 \geq 0$. (10 Marks)
- 2 a. Explain about degeneracy in linear programming problems. And explain how to resolve degeneracy in linear programming problems. (08 Marks)
- b. Use two-phase simplex method to solve the problem :
- Minimize $z = x_1 - 2x_2 - 3x_3$,
 Subject to the constraints : $2x_1 + x_2 + 3x_3 = 2$,
 $2x_1 + 3x_2 + 4x_3 = 1$
 and $x_1, x_2, x_3 \geq 0$. (07 Marks)
- c. Give the outlines of simplex method of linear programming. (05 Marks)
- 3 a. Determine an initial basic feasible solution for the following TP using VAM.

		Destination				
		D ₁	D ₂	D ₃	D ₄	Supply
Factory	F ₁	3	3	4	1	100
	F ₂	4	2	4	2	125
	F ₃	1	5	3	2	75
Demand		120	80	75	25	300

- b. Find the IBFS by LCM and check the optimal solution by stepping stone method.

	D	E	F	G	Capacity
A	4	6	8	6	700
B	3	5	2	5	400
C	3	9	6	5	600
Requirement	400	450	350	500	

(10 Marks)

- 4 a. Solve the assignment problem represented by the following matrix: (10 Marks)

	a	b	c	d	e	f
A	9	22	58	11	19	27
B	43	78	72	50	63	48
C	41	28	91	37	45	33
D	74	42	27	49	39	32
E	36	11	57	22	25	18
F	3	56	53	31	17	28

- b. Solve the travelling salesman problem given by the following data: $C_{12} = 20$, $C_{13} = 4$, $C_{14} = 10$, $C_{23} = 5$, $C_{34} = 6$, $C_{25} = 10$, $C_{35} = 6$, $C_{45} = 20$ where $C_{ij} = C_{ji}$ and there is no route between cities i and j if the value for C_{ij} is not shown? (10 Marks)

PART - B

- 5 a. Give Johnson's method for determining the optimal solution of sequence for processing 'n' jobs on two machines with an illustrative example. (14 Marks)
- b. List the principal assumptions made while dealing with sequencing problems. (06 Marks)
- 6 a. Explain the characteristics of Game theory. (05 Marks)
- b. Solve the following game by graphical method. Use the dominance rule to reduce the following game : (15 Marks)

		B			
		y_1	y_2	y_3	y_4
A	x_1	19	6	7	5
	x_2	7	3	14	6
	x_3	12	8	18	4
	x_4	8	7	13	-1

- 7 a. Explain with a neat sketch about queueing systems? (10 Marks)
- b. The rate of arrival of customers at public telephone booth follows Poisson distribution, with an average time of 10 mins between one customer and next. The duration of a phone call is assumed to follow exponential distribution, with mean time of 3 minutes :
- What is the probability that a person arriving at the telephone booth will have to wait?
 - What is the average length of the non-empty queues that form from time to time?
 - The Mahanagar telephone Nigam Ltd. will install a second booth when it is convinced that the customers would expect waiting for atleast 3 minutes for their turn to make a call. By how much time should the flow of customers increase in order to justify a second booth?
 - Estimate the fraction of a day that the phone will be in use. (10 Marks)
- 8 a. Write the differences between PERT and CPM. (04 Marks)
- b. The following table shows the jobs of a project with their duration in days. Draw the network and determine the critical path. Also calculate all the floats. (16 Marks)

Jobs	1-2	1-3	1-4	2-5	3-7	4-6	5-7	5-8
Duration	10	8	9	8	16	7	7	7

Jobs	6-7	6-9	7-10	8-10	9-10	10-11	11-12
Duration	8	5	12	10	15	8	5
