CBCS SCHEME

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15ME81

Eighth Semester B.E. Degree Examination, July/August 2022
Operations Research

Time: 3 hrs. Max. Marks: 80

Note: **1.** ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Use of SQL tables is permitted.***

Module-1

1 a. List and explain the phases of operations research. **(08 Marks)**

b. A manufacturing Company is producing two products A and B. Each of the products A and B requires the use of two machines P and Q. Product A requires 4 hours of processing in Machine P and 3 hours of processing in Machine Q. Product B requires 3 hours of processing on Machine P and 6 hours of Processing on Machine Q. The unit profits of product A and B are Rs.20 and Rs.30 respectively. The available time in a given quarter on Machine P is 1000 hours and on Machine Q is 1200 hours. The market survey has predicted 250 units of product A and 300 units of product B can be consumed in a quarter. The company is interested in deciding the product mix to maximize the profits. Formulate the LPP model of this problem. **(08 Marks)**

OR

2 a. Discuss the applications of Operation research techniques. **(08 Marks)**

b. Solve the following LPP using graphical method:

Maximize $z = 6x_1 + 8x_2$

Subject to $5x_1 + 10x_2 \le 60$

$4x_1 + 4x_2 \le 40$

$x_1, x_2 \ge 0$ **(08 Marks)**

Module-2

3 Solve the following LPP by simplex method.

Maximize $z = 10x_1 + 20x_2$

Subject to $3x_1 + 2x_2 \le 1200$

$2x_1 + 6x_2 \le 1500$

$x_1 \le 350$

$x_2 \le 200$

where $x_1, x_2 \ge 0$ **(16 Marks)**

OR

4 a. Define the following:

(i) Unbounded solution (ii) Degenerate solution. (iii) Slack variable

(iv) Surplus variable (v) Basic variable. **(10 Marks)**

b. Write the dual of the following LPP:

Maximize $Z = 4x_1 + 10x_2 + 25x_3$

Subjected to $2x_1 + 4x_2 + 8x_3 \le 25$

$4x_1 + 9x_2 + 8x_3 \le 30$

$6x_1 + 8x_2 + 2x_3 \le 40$

where x_1, x_2 and $x_3 \ge 0$ **(06 Marks)**

Module-3

5 a. What is balanced and unbalanced transportation problem? How unbalanced transportation problem is converted into balanced transportation problem is converted into balanced Transportation Problem, show with example. **(06 Marks)**

b. Find the initial basic feasible solution for Transportation Problem by VAM method. **(10 Marks)**

		Market 1	2	3	4	5	Supply
Plant	1	10	2	16	14	10	300
	2	6	18	12	13	16	500
	3	8	4	14	12	10	825
	4	14	22	20	8	18	375
	Demand	350	400	250	150	400	

OR

6 a. For the given Transportation Problem with initial basic solution optimize the solution using MODI method. **(10 Marks)**

	1	2	3	4	Supply
1	250 (3)	50 (1)	7	4	300
2	2	300 (6)	100 (5)	9	400
3	8	3	300 (3)	200 (2)	500
Demand	250	350	400	200	

b. Solve the assignment problem and find optimal assignment and total processing time. **(06 Marks)**

		Operator A	B	C	D	E
Job	1	10	12	15	12	8
	2	7	16	14	14	11
	3	13	14	7	9	9
	4	12	10	11	13	10
	5	8	13	15	11	15

Module-4

7 Consider the table with details shown below of a project involving 14 activities:

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Immediate Predecessor	-	-	-	B	A	A	B	C, D	C, D	E	F,G,H	F,G,H	I	J,K
Duration(months)	2	6	4	3	6	8	3	7	2	5	4	3	13	7

(i) Construct CPM network.
(ii) Determine critical path and project completion time.
(iii) Compute time schedules : EST, EFT, LST, LFT and Total floats, Free floats. **(16 Marks)**

OR

8 a. Briefly describe the characteristics of Queueing system. **(06 Marks)**

b. Patients arrive at a hospital reception counter at an average inter arrival rate of 2 min. The receptionist in duty takes an average of one minute per patients.
(i) What is the chance that paitent will straight way meet the receptionist?
(ii) For what portion of time the receptionist is busy.
(iii) What is the average queue length?
(iv) What is the average numbers of patients in the system?
(v) What is the average waiting time of a patient?
(vi) What average time a patient spends in system. **(10 Marks)**

Module-5

9 a. Explain (i) Pay off matrix (ii) MAXIMIN – MINIMAX principle (iii) Saddle point (08 Marks)

b. Solve the game, for two players A and B are playing a game of tossing a coin simultaneously ; Player A wins 1 unit of value when there are two heads, wins nothing when there are two tails and looses $\frac{1}{2}$ unit of value when there is one head and one tail. Find the pay off matrix, the best strategies for each player and the value of game. (08 Marks)

OR

10 a. State the assumptions of sequencing problems. (06 Marks)

b. A machine operator has to perform three operations turning, threading and knurling on a six jobs in that order. Determine the optimal schedule (sequence), total elapsed time and Idle times for the three machines.

Jobs	Turning machines (min)	Threading machine (min)	Knurling Machine (min)
1	3	8	13
2	12	6	14
3	5	4	9
4	2	6	12
5	9	3	8
6	11	1	13

(10 Marks)

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