SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
M.Com. - END SEMESTER EXAMINATIONS APRIL - 2024
SEMESTER - II
23PCOET2002 - Operations Research

Total Duration : 2 Hrs. 30 Mins.   Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks$)$

1. State and explain characteristics of Operation Research.

2. A company is producing a single product and is selling it through five agencies situated in different cities. All of a sudden, there is a demand for the product in other 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 despatch the product to needy cities in such a way that the travelling distance is minimized. The distances (in kms) between the surplus and deficit cities are given in the following distance matrix:

Surplus Cities \ Deficit Cities	I	II	III	IV	V
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	155	170	185
D	50	50	80	80	110
E	55	35	70	80	105

Compute the optimal assignment schedule.

3. Draw an arrow diagram showing the following relationships:

Activity	A	B	C	D	E	F	G
Immediate predecessor	-	-	A	A	B	C	D, E

4. Seven jobs go first over machine 1 and then over machine 2. Processing time in hours are given as:

Job	A	B	C	D	E	F	G
Machine 1	6	24	30	12	20	22	18
Machine 2	16	20	20	12	24	2	6

Find the optimal sequence in which jobs should be processed?

5. Explain North-West corner method.

Contd...

6. An air lines has drawn a new flight schedule involving five flights. To assist in allocating five pilots to the flights, it has asked them to state their preference scores by giving each flight a number out of 10. The higher the number, the greater the preference is. Certain of these flights are unsuitable to some pilots owing to domestic reasons. These have been marked with a $\times$.

Pilot	1	2	3	4	5
A	8	2	$\times$	5	4
B	10	9	2	8	4
C	5	4	9	6	$\times$
D	3	6	2	8	7
E	5	6	10	4	3

What should be the allocation of the pilots to flights in order to meet as many preferences as possible?

7. Describe advantages and drawbacks of CPM.

8. For the following payoff matrix for firm A, determine the optimal strategies for both firm A and firm B and the value of the game (using maximin-minimax principle)

$$\text{Firm A} \quad \begin{array}{c} \textbf{Firm B} \\ \begin{bmatrix} 3 & -1 & 4 & 6 & 7 \\ -1 & 8 & 2 & 4 & 12 \\ 16 & 8 & 6 & 14 & 12 \\ 1 & 11 & -4 & 2 & 1 \end{bmatrix} \end{array}$$

Section C

I - Answer any **TWO** questions $(2 \times 10 = 20$ Marks$)$

9. Solve the following LPP by Graphical method.
   Maximise Z $= 3x_1 + 2x_2$
   subject to the constraints
   $$-2x_1 + x_2 \leq 1$$
   $$x_1 \leq 2$$
   $$x_1 + x_1 \leq 3$$
   and $x_1, x_2 \geq 0$

10. Predict the value of an initial basic feasible solution to the following Transportation problem:

Warehouse \ Stores	I	II	III	IV	Supply
A	7	3	5	5	34
B	5	5	7	6	15
C	8	6	6	5	12
D	6	1	6	4	19
Demand	21	25	17	17	80

11. Solve the adjoining unbalanced assignment problem of minimizing total time for doing all the jobs.

Operators ↓	Jobs				
	1	2	3	4	5
1	6	2	5	3	6
2	2	5	8	7	7
3	7	8	6	9	8
4	6	2	3	4	5
5	9	3	8	9	7
6	4	7	4	6	8

12. A construction company is preparing a PERT network for laying the foundation of a new art museum. Given the following set of activities. Their predecessor requirement and three times estimates of completion time:

Activity	Predecessors	Times estimates (days)		
		Optimistic likely	Pessimistic	Most
A	None	2	4	3
B	None	8	8	8
C	A	7	11	9
D	B	6	6	6
E	C	9	11	10
F	C	10	18	14
G	C, D	11	11	11
H	F, G	6	14	10
I	E	4	6	5
J	I	3	5	4
K	J	1	1	1

Contd...

(i)   Draw the PERT network

(ii)   Compute the slack for each activity and determine the critical path

(iii) The contract specifies a Rs.5,000 per day penalty for each day. The completion of the project extends beyond 37 days. What is the probability that this company will have to pay a maximum penalty of Rs.15,000?

II - Compulsory question $(1 \times 10 = 10$ Marks$)$

13. Following is the payoff matrix for player A:

Player A \ Player B	I	II	III	IV	V
I	2	4	3	8	4
II	5	6	3	7	8
II	6	7	9	8	7
IV	4	2	8	4	3

Using dominance property, obtain the optimal strategies for both the players and determine the value of the game.

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