(6 pages)

DECEMBER 2022 **U/ID 46515/UCC5C**

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer any TEN questions.

1. What is Artificial variable?
2. When an Assignment problem is unbalanced?
3. State any two network techniques.
4. What is transportation problem?
5. What is LPP?
6. Define PERT.
7. What is pay-off matrix?
8. Define Game theory.
9. What is Dummy Activity?
10. What is optimal solution?
11. What is critical path?
12. What is Random Number?

SECTION B — (5 × 5 = 25 marks)

Answer any FIVE questions.

13. Describe the steps in the CPM.

14. Solve the following Assignment problem

		Men			
		A	B	C	D
Jobs	I	10	25	15	20
	II	15	30	5	15
	III	35	20	12	24
	IV	17	25	24	20

15. Consider the game G with the following pay off.

		Player B	
		B1	B2
Player A	A1	2	6
	A2	–2	λ

(a) Show that G is strictly determinable. Whatever λ may be

(b) Determine the value of G.

16. Write down the dual of

Min $Z = 7x_1 + 10x_2$

S.t $10x_1 + 13x_2 \geq 50$

$7x_1 + 9x_2 \leq 40$

$3x_1 + 5x_2 = 20$

$x_1, x_2 \geq 0$

17. Four jobs can be processed on four different machines. One job on one machine. Resulting times in minutes vary with Assignments

		Machines			
		A	B	C	D
Jobs	I	42	35	28	21
	II	30	25	20	15
	III	30	25	20	15
	IV	24	20	16	12

Find the optimum Assignment of jobs to Machines and for corresponding profit.

18. You are given the following pay-off of three acts A1, A2 and A3 and the states of nature. S1, S2 and S3.

States of Nature	A1	A2	A3
S1	25	–10	–125
S2	400	440	400
S3	650	740	750

The probabilities of the states of nature are respectively 0.1, 0.7 and 0.2. Calculate the EMV and conclude which of the Act can be chosen as the best?

19. Solve the game whose pay-off matrix is given by

(a)

	B1	B2	B3
A1	–3	–2	6
A2	2	0	2
A3	5	–2	–4

(b)

	B1	B2	B3
A1	–2	15	2
A2	–5	–6	–4
A3	–5	20	–8

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

20. A firm makes two types of furnitures namely chairs and tables. The contribution for each product as calculated by the accounting department is Rs. 20 per chair and Rs. 30 per table. Both products are processed on three machines M1, M2 and M3. The time required by each product and total time available per week on each machine are as follows.

Machine	Chair	Table	Available Hrs
M1	3	3	36
M2	5	2	50
M3	2	6	60

How should the manufacturer schedule his production in order to maximize contribution?

21. Find out the optimum solution for transporting the products at a minimum cost for the following transportation problem with cost structure as follows:

		Warehouse			
		W1	W2	W3	Supply
Factory	F1	16	20	12	200
	F2	14	8	18	160
	F3	26	24	16	90
Demand		180	120	150	

22. Consider the data of the project find its critical path and project duration.

Activity :	A	B	C	D	E	F	G	H	I
Predecessor :	–	–	A	B	C,D	B	E	E	F,G
duration (days) :	4	7	2	9	6	5	2	10	4

23. Find the minimum cost solution for the following transportation problem which has cost structure as

	To			Availability
From	16	19	12	14
	22	13	19	16
	14	28	8	12
Requirements	10	15	17	

24. A project has the following characteristics

Jobs	Duration (days)		
i – j	t_o	t_m	t_p
1 – 2	3	6	15
1 – 6	2	5	14
2 – 3	6	12	30
2 – 4	2	5	8
3 – 5	5	11	17
4 – 5	3	6	15
6 – 7	3	9	27
5 – 8	1	4	7
7 – 8	4	19	28

Draw the Network using the nodes relation with expected timing and find the critical path using CPM.

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