(FOR THE CANDIDATES ADMITTED

DURING THE ACADEMIC YEAR 2020-21 ONLY)

REG.NO.

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : DECEMBER – 2022

B.Com. – P.A.   MAXIMUM MARKS: 70

V SEMESTER   TIME : 3 HOURS

PART – III

OPERATIONS RESEARCH

SECTION - A   (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

MULTIPLE CHOICE QUESTIONS.   (Qn. No. 1 - 5)   (K1)

1. If there exists atleast one basic variable whose value is zero, then the basic solution X_B is said to be _____ solution.

    (a) degenerate   (b) non degenerate   (c) non feasible   (d) optimal

2. A balanced transportation problem has ____ total supply and total demand.

    (a) finite   (b) infinite   (c) equal   (d) unequal

3. In sequencing problem the order of completion of jobs is called _____

    (a) completion sequence   (b) job sequence   (c) processing order   (d) job order

4. PERT analysis is based on _____

    (a) optimistic time   (b) pessimistic time   (c) most likely time   (d) All the above

5. When maximin and minimax values of the game are same, then _____

    (a) no solution exists   (b) solution is mixed   (c) saddle point exists (d) none of these

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES   (K2)

6. Define Pivotal element.

7. When do you say that the occupied cell is in independent position?

8. How do you convert the unbalanced assignment problem into a balanced one?

9. What is the difference between CPM network and PERT network?

10. Define zero sum game.

SECTION – B   (5 X 4 = 20 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)

11. a) A company manufactures two products A and B. These products are processed in the same machine. It takes 10 minutes to process one unit of product A and 2 minutes for each unit of product B and the machine operates for a maximum of 35 hours in a week. Product A requires 1 kg and B requires 0.5 kg of raw material per unit, the supply of which is 600 kg per week. Market constraint on product B is known to be minimum of 800 units every week.

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Product A costs Rs.5 per unit and sold at Rs.10, Product B costs Rs.6 per unit and can be sold in the market at a unit price of Rs.8. Determine the number of units of A and B per week to maximize the profit.

(OR)

b) Solve the following LPP graphically. Min $Z = 200x + 500y$ subject to, $x + 2y \geq 10$, $3x + 4y \leq 24$, $x, y \geq 0$

12. a) Determine an initial basic feasible solution to the following transportation problem using Least cost method.

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	1	4	30
O_2	3	3	2	1	50
O_3	4	2	5	9	20
Required	20	40	30	10	100

(OR)

b) Determine an initial basic feasible solution to the following transportation problem using Vogel's Approximation method.

	1	2	3	4	Supply
1	2	3	11	7	6
2	1	0	6	1	1
3	5	8	15	9	10
Required	7	5	3	2	17

13. a) Strong Book Binder has one printing machine, one binding machine, and the manuscripts of a number of different books. Processing times are given in the following table:

Book	Time In Hours	
	Printing	**Binding**
A	5	2
B	1	6
C	9	7
D	3	8
E	10	4

Determine the order in which books should be processed on the machines, in order to minimize the total time required.

(OR)

b) From the following cost matrix, establish (a) optimal job assignment (b) the cost of assignments.

Job

	1	2	3	4	5
A	10	3	3	2	8
B	9	7	8	2	7
Machine C	7	5	6	2	4
D	3	5	8	2	4
E	9	10	9	6	10

14. a) Determine the optimum project duration and cost for the following data.

	Normal		Crash	
	Time	Cost	Time	Cost
Activity	(days)	(Rs)	(days)	(Rs)
1-2	8	100	6	200
1-3	4	150	2	350
2-4	2	50	1	90
2-5	10	100	5	400
3-4	5	100	1	200
4-5	3	80	1	100

Indirect cost is Rs.70 per day.

(OR)

b) Determine the early start and late start in respect of all node points and identify critical path for the following network.
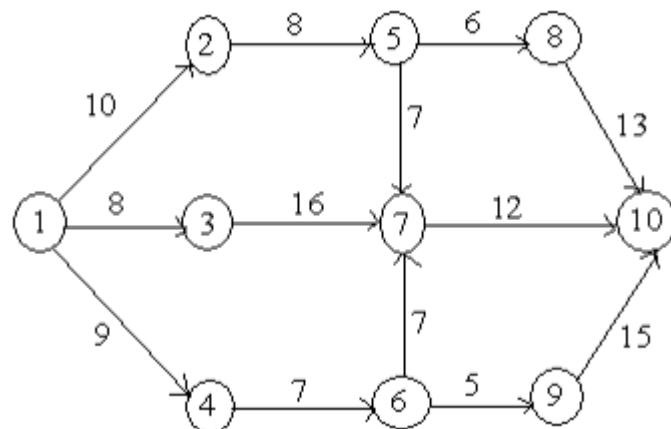
15. a) Solve the following pay-off matrix. Also determine the optimal strategies and value of the game.

$$B$$
$$A\begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix}$$

(OR)

(CONTD………4)

b) For What value of λ, the game with following payoff matrix is strictly determinable?

		Player B		
		B$_1$	B$_2$	B$_3$
Player A	A$_1$	λ	6	2
	A$_2$	-1	λ	-7
	A$_3$	-2	4	λ

SECTION - C (4 X 10 = 40 MARKS)

ANSWER ANY 4 OUT OF 6 QUESTIONS (K4 (Or) K5)

(16th QUESTION IS COMPULSORY AND ANSWER ANY THREE FROM 17 to 21)

16. Solve the following LPP using Simplex method. Max $Z = 30x_1 + 20x_2$ subject to,

$$10x_1 + 8x_2 \leq 800, x_1 \leq 60, x_2 \leq 75, x_1, x_2 \geq 0$$

17. Solve the following Transportation problem

		Destination					
		W$_1$	W$_2$	W$_3$	W$_4$	W$_5$	Supply
Source	F$_1$	7	6	4	5	9	40
	F$_2$	8	5	6	7	8	30
	F$_3$	6	8	9	6	5	20
	F$_4$	5	7	7	8	6	10
	Demand	30	30	15	20	5	100

18. The owner of a small machine shop has four mechanics available to assign jobs for the day. Five jobs are offered with expected profit for each mechanic on each jobs, which are as follows.

$$
\begin{array}{c}
\text{Job} \\
\begin{array}{ccccc}
1 & 2 & 3 & 4 & 5
\end{array} \\
\text{Mechanic}
\begin{array}{c}
1 \\ 2 \\ 3 \\ 4
\end{array}
\begin{bmatrix}
62 & 78 & 50 & 111 & 82 \\
71 & 84 & 61 & 73 & 59 \\
87 & 92 & 111 & 71 & 81 \\
48 & 64 & 87 & 77 & 80
\end{bmatrix}
\end{array}
$$

By using the assignment method, find the assignment of mechanics to the job that will result in maximum profit. Summarize which job should be declined?

(CONTD………5)

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19. Find the solution of processing 5 jobs through 4 machines problem.

Job	1	2	3	4	5
Machine-1	11	13	9	16	17
Machine-2	4	3	5	2	6
Machine-3	6	7	5	8	4
Machine-4	15	8	13	9	11

20. A small project consisting of eight activities has the following characteristics:

Time – Estimates (in weeks)

Activity	Preceding activity	Most optimistic time (a)	Most likely time (m)	Most Pessimestic time (b)
A	None	2	4	12
B	None	10	12	26
C	A	8	9	10
D	A	10	15	20
E	A	7	7.5	11
F	B,C	9	9	9
G	D	3	3.5	7
H	E,F,G	5	5	5

(i) Draw the PERT network for the project.

(ii) Prepare the activity schedule for the project.

(iii) Determine the critical path.

(iv) If a 30- week deadline is imposed, what is the probability that the project will be finished within the time limit?

21. Reduce the following game by Dominance and find the game value.

	I	II	III	IV
I	3	2	4	0
II	3	4	2	4
III	4	2	4	0
IV	0	4	0	8

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