

(FOR THE CANDIDATES ADMITTED
DURING THE ACADEMIC YEAR 2021 ONLY)

21UMS511

REG.NO. :

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

END-OF-SEMESTER EXAMINATIONS : NOVEMBER-2023

COURSE NAME: B.Sc.-MATHEMATICS

MAXIMUM MARKS: 70

SEMESTER: V

TIME : 3 HOURS

PART - III
OPERATIONS RESEARCH-II

SECTION - A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

MULTIPLE CHOICE QUESTIONS.

(K1)

1. When maximin and maximax values of the game are same then _____.
 - a) There is a saddle point
 - b) Solution does not exist
 - c) Strategies are mixed
 - d) None
2. A sequencing problem involving six jobs and three machines requires evaluation of _____.
 - a) $(6!+6!+6!)$ sequences
 - b) $(6!)^3$ sequences
 - c) $(6 \times 6 \times 6)$ sequences
 - d) $(6 + 6 + 6)$ sequences
3. Queue can form only when _____.
 - a) Arrivals exceed service capacity
 - b) Arrivals equals service capacity
 - c) Service facility is capable to serve all the arrival at a time
 - d) There are more than one service facilities
4. If small orders are placed frequently rather than placing large orders infrequently then total inventory cost is _____.
 - a) Reduced
 - b) Increased
 - c) Either reduced or increased
 - d) Minimized
5. In critical path analysis the word CPM means _____.
 - a) Critical path method
 - b) Crash project management
 - c) Critical project management
 - d) Critical path management

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES.

(K2)

6. Define value of the goal.
7. Define total elapsed time.
8. What is a Queue?
9. Define ordering cost.
10. Define critical path.

SECTION – B (5 X 4 = 20 MARKS)**ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. (K3)**

11. a) Solve the game whose pay off matrix is given by

		Player B		
		B_1	B_2	B_3
Player A	A_1	1	3	1
	A_2	0	-4	-3
	A_3	1	5	-1

(OR)

b) Use dominance property, solve the following game :

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

12.a) Write the assumptions underlying a sequencing problem.

(OR)

b) In a factory there are six jobs to perform each of which should go through two machines A and B, in the order A, B. the processing timings (in hours) for the jobs are given here. You are required to determine the sequence for performing the jobs that would minimize the total elapsed time T. What is the value of T ?

Job	J_1	J_2	J_3	J_4	J_5	J_6
Machine A	1	3	8	5	6	3
Machine B	5	6	3	2	2	10

13.a) Write the operating characteristics of a queuing system.

(K3)**(OR)**

b) A tv repairmen finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in and if the arrival of sets is approximately poisson with an average rate of 10 per 8-hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?

14. a) An oil engine manufacturer purchases lubricants at the rate of Rs.42 per piece **(K3)** from a vendor. The requirement of these lubricants is 1800 per day. What should be the order quantity per order, if the cost per placement of an order is Rs.16 and inventory carrying charge per rupee per year is only 20 paisa.

(OR)

b) The demand for a certain item is 16 units per period. Unsatisfied demand causes a shortage cost of Rs.0.75 per unit per short period. The cost of initiating purchasing action is Rs.15.00 per purchase and the following cost is 15% of average inventory valuation per period. Item cost is rs.8.00 per unit. (Assume that the shortages are being back ordered at the above mentioned cost) find the minimum cost purchase quantity.

(CONTD.....3)

- 15.a) Write the rules of network construction. (K3)

(OR)

- b) Draw the network diagram for the following data : (K3)

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration	2	8	10	6	3	3	7	5	2	8

SECTION – C

(4X10= 40 MARKS)

ANSWER ANY FOUR OUT OF SIX QUESTIONS.

(16th QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS FROM Qn. No : 17 to 21)

16. For the game with following payoff matrix determine the optimum strategies and the value of the game: (K4)

$$P_1 \begin{matrix} & P_2 \\ \begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix} \end{matrix}$$

17. Solve the following 2 × 2 game graphically: (K5)

$$\begin{matrix} & \text{Player B} \\ \text{Player A} & \begin{matrix} B_1 & B_2 & B_3 & B_4 \end{matrix} \\ \begin{matrix} A_1 \\ A_2 \end{matrix} & \begin{bmatrix} 2 & 1 & 0 & -2 \\ 1 & 0 & 3 & 2 \end{bmatrix} \end{matrix}$$

18. Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information processing on the machine is given in hours and passing is not allowed: (K5)

Job	A	B	C	D	E	F	G
Machine M1	3	8	7	4	9	8	7
Machine M2	4	3	2	5	1	4	3
Machine M3	6	7	5	11	5	6	12

19. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time distribution is also exponential with an average 36 minutes. Calculate the following : (K5)
- The mean queue size (line length) and
 - The probability that the queue size exceeds 10.
20. A manufacturing company purchases 9000 parts of a machine for its annual requirements, ordering one month usage at a time. Each part costs Rs.20. the ordering cost per order is Rs.15 and the carrying charges are 15% of the average inventory per year. You have been assigned to suggest a more economical purchasing policy for the company. What advice would you offer and how much would it save the company per year? (K4)

21. The following table gives the activities in a construction project and time duration: (K5)

Activity	Preceding Activity	Normal Time (days)
1-2	-	20
1-3	-	25
2-3	1-2	10
2-4	1-2	12
3-4	1-3, 2-3	5
4-5	2-4, 3-4	10

- Draw the activity network of the project.
- Determine the critical path and the project duration
