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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2020 ONLY)

20UMS511 / 20UMA511

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS : DECEMBER-2022
COURSE NAME: B.Sc-MATHEMATICS (Aided & SF) MAXIMUM MARKS: 70
SEMESTER: V TIME : 3 HOURS

PART – III

OPERATION RESEARCH -II

SECTION-A **($10 \times 1 = 10\ marks$)**

ANSWER THE FOLLOWING QUESTIONS:
MUTIPLE CHOICE QUESTIONS. **K1**

1. Each player has a number of choices, finite or infinite, called_____.
   a) Strategies b) competitive game c) maximin d) minimax
2. In sequencing problems involving 6 jobs and 3 machines require evaluation of_____ sequences.
   a) $3(6!)$ b) $(6!)^3$ c) $6 \times 6 \times 6$ d) 18
3. Distribution of arrivals is _____process.
   a) Poisson b) Exponential c) Pure birth d) Pure death
4. When an item cannot be supplied on the customer's demand is_____cost.
   a) Setup b) ordinary c) Revenue d) Shortage
5. The total float of an activity is a critical path is_____.
   a) Positive b) Negative c) Unique d) Zero

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

6. Define saddle point.
7. What is meant by "no passing rule" in a sequencing problems?
8. What are the properties of queueing theory?
9. What are the types of inventory cost?
10. What is the difference between PERT and CPM?

SECTION-B **($5 \times 4 = 20$ MARKS)**

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

11. a) Determine which of the following two-person zero sum games are strictly determinable and fair. Give optimum Strategies for each player in this strictly determinable games,

$$\begin{bmatrix} 0 & 2 \\ -1 & 4 \end{bmatrix}.$$

(OR)

b) Solve the game whose payoff matrix is given by:

$$\begin{array}{cc} & \text{B} \\ & \begin{matrix} B_1 & B_2 & B_3 \end{matrix} \\ \text{Player A} & \begin{matrix} A_1 \\ A_2 \\ A_3 \end{matrix} \begin{bmatrix} 1 & 3 & 1 \\ 0 & -4 & -3 \\ 1 & 5 & -1 \end{bmatrix} \end{array}$$

ETHICAL PAPER

(CONTD.....2)

12. a) We have five jobs, each of which must go through the two machines A and B in the order AB. Processing time in hours is given in the table below:

Job :	1	2	3	4	5
Machine A (A_i):	5	1	9	3	10
Machine B (B_i)	2	6	7	8	4

Determine a sequence for the five jobs that will minimize the elapsed.

(OR)

b) Find the sequence that minimizes the total elapsed time required to complete the following jobs:

Jobs	1	2	3	4	5
Processing Time Machine A	5	7	6	9	5
(in hours) Machine B	2	1	4	5	3
Machine C	3	7	5	6	7

13. a) A supermarket has 2 girls serving at the counters. The customers arrive in a Poisson fashion at the rate of 2 per hour. The service time for each customer is exponential with mean 6 minutes. Find

(i) the probability that an arriving customer has to wait for service.

(ii) The average number of customers in the system.

(OR)

b) 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 with an average 36 minutes, Calculate the following:

(i) The mean queue size (line length) and

(ii) The probability that the queue size exceeds 10.

14. a) A ship building firm uses rivets at a constant rate of 20,000 numbers per year. Ordering cost is Rs. 30 per year. The rivets cost Rs. 1.50 per number. The holding cost of rivets is estimated to be 12.5 % of unit cost per year. Determine EOQ.

(OR)

b) The demand for an item in a company is 18,000units per year and the company can produce the item at a rate of 3,000 per month. The cost of one setup is Rs. 500 and the holding cost of 1 unit per month is 15 paise. The shortage cost of 1 unit is Rs. 20 per month. Determine the optimum production batch quantity and the number of storages.

15. a) A project scheduled has the following characteristics

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time	4	1	1	1	6	5	4	8	1	2	5	7

(i) Construct a PERT network.

(ii) Find the Critical path.

(OR)

b) The following table gives the activities of a constructions project and durations (in days):

Activity	1-2	1-3	2-3	2-4	3-4	4-5
Durations	20	25	10	12	6	10

Draw the network diagram and find the critical path.

ETHICAL PAPER

(CONTD.....3)

SECTION-C **$4 \times 10 = 40$ MARKS**

ANSWER ANY FOUR OUT OF SIX QUESTIONS:

(16) th QUESTION IS COMPULSORY AND ANSWER ANY THREE QUESTIONS: K4&K5

16. Draw the network, find the critical path and also calculate the probability of completing the project within 48 days for the following activities.

Activity:	10-20	20-30	30-50	20-40	40-50	40-60	50-70	50-80	60-100	70-90	80-90	90-100
Time (t_0, t_m, t_p)	4,8,12	1,4,7	3,5,7	8,12,16	0,0,0	3,6,9	3,6,9	4,6,8	4,6,8	4,8,12	2,5,8	4,10,16

17. Solve the 2×2 game graphically

Player B

Player A $\begin{bmatrix} 2 & 1 & 0 & -2 \\ 1 & 0 & 3 & 2 \end{bmatrix}$

18. There are 4 jobs, each of which has to go through the machine $M_j, j = 1,2, \ldots .6$ is the order $M_1, M_2, \ldots . M_6$.
Processing time (in hours) is given below:

	Machines					
	M_1	M_2	M_3	M_4	M_5	M_6
Job A:	18	8	7	2	10	25
Job B:	17	6	9	6	8	19
Job C:	11	5	8	5	7	15
Job D:	20	4	3	4	8	12

Determine a sequence of these four jobs that minimize the total elapsed time T.

19. Customers arrive at a box office window, being manned by single individual, according to a Poisson input process with a mean rate of 30 per hour. The time required to serve a customer has an exponential distribution with a mean of 90 seconds. Find the average waiting time of a customer. Also determine the average number of customers in the system and average queue length.

20. The demand for a particular item is 18,000 units per year. The holding cost per unit is Rs.1.20 per year, and the cost of one procurement is Rs.400. No shortages are allowed, and the replacement rate is instantaneous. Determine:
    (i) Optimum order quantity
    (ii) Number of orders per year
    (iii) Time between orders and
    (iv) Total cost per year when the cost of one unit is Rs.1.

21. Draw the network for the data given below and compute.
    (i) Critical path
    (ii) Early start and late start time each activity and
    (iii) Total slack for each activity

Activity	A	B	C	D	E	F	G	H	I
Predecessor	-	-	-	A	B	CD,E	BH,F	-	-
Estimated time (weeks)	3	5	4	2	3	9	8	7	9

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