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(FOR THE CANDIDATES ADMITTED **20UBC4A4**

DURING THE ACADEMIC YEAR 2020 ONLY) **REG.NO.**

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

END-OF-SEMESTER EXAMINATIONS: JULY 2022

B.C.A **MAXIMUM MARKS: 70**

SEMESTER: IV **TIME: 3 HOURS**

PART - III

MATHEMATICS III: COMPUTER BASED OPTIMIZATION TECHNIQUES

SECTION - A **(10 X 1 = 10 MARKS)**

ANSWER THE FOLLOWING QUESTIONS.

MULTIPLE CHOICE QUESTIONS. **(K1)**

1. ---------- is a technique for determining optimum schedule of interdependent activities in view of the available resources.
   a) Linear programming b) Non-Linear programming
   c) Big-M method d) sequencing problem
2. A balanced transportation problem will always have a ---------- solution
   a) infeasible b) optimal solution c) feasible d) degenerate
3. If EOQ is 5000 units and buffer stock is 500 units then maximum inventory is _____.
   a) 550 b) 5500 c) 500 d) 4000
4. The Birth–death model is called ----------.
   a) M / M / 1 b) M / M / N c) M / M / ∞ d) M / M / 2
5. The least time is called ----------in PERT.
   a) Optimistic time b) Pessimistic time c) Most likely time d) Normal time

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

6. State the characteristics of the standard form.
7. What is meant by triangular basis?
8. State any two types of inventories.
9. Define Queuing system.
10. What are the three types of PERT?

SECTION –B **(05 X 04= 20 Marks)**

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

11.a) Express the following LPP in Standard form.

Maximize Z = $4x_1 + 2x_2 + 6x_3$

Subject to the constraints:

$2x_1 + 3x_2 + 2x_3 \geq 6$

$3x_1 + 4x_2 = 8$

$6x_1 - 7x_2 + x_3 \leq 10$

and $x_1, x_2, x_3 \geq 0$

(or)

(CONTD…2)

b) Use simplex method to solve following LPP.

Maximize Z = $4x_1 + 10x_2$

Subject to the constraints:

$2x_1 + x_2 \leq 50$

$2x_1 + 5x_2 \leq 100$

$2x_1 + 3x_2 \leq 90$

and $x_1, x_2 \geq 0$

12. a) Determine basic feasible solution to the following transportation problem using North west Corner Rule:

		Sink				
	A	B	C	D	E	Supply
P	2	11	10	3	7	4
origin Q	1	4	7	2	1	8
R	3	9	4	8	12	9
Demand	3	3	4	5	6	

(or)

b) Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows:

	Job				
	1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
From C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

Determine the optimum assignment schedule.

13. a) Explain various types of inventory.

(or)

b) A certain item costs Rs 250 per ton.The monthly requirements are 10 tons,and set up cost is Rs 1000.The cost of carrying inventory has been estimated at 12 % of the average inventory per year. What is the optimum order quantity?.

14. a) In a railway Marshalling yard, goods train arrives at a rate of 30 Trains per day. Assuming that inter arrival time follows an exponential distribution and the service time distribution is also exponential, with an average of 36 minutes. Calculate the following:

(i) The mean Queue size (line length)

(ii) The probability that Queue size exceeds 10

(iii) If the input of the train increases to an average 33 per day, what will be the changes in (i), (ii)? (K3)

(or)

b) A machine costs Rs.6000. The running cost and salvage value at the end of the year is given in the table below

Year	1	2	3	4	5	6	7
Running cost Rs.	1200	1400	1600	1800	2000	2400	3000
Salvage value Rs.	4000	2666	2000	1500	1000	600	600

If the interest rate is 10% year, find when the machine is to be replaced.

15. a) Draw the event network for the following data:

Event No :	1	2	3	4	5	6	7
Immediate Predecessors:	-	1	1	2,3	3	4,5	5,6

(or)

b) Draw the network and find the critical path of the project given below.

Activity	1-2	2-3	3-4	3-7	4-5	4-7	5-6	6-7
Duration	3	4	4	4	2	2	3	2

SECTION – C **(4 X 10 = 40 MARKS)**

ANSWER ANY FOUR OUT OF SIX QUESTIONS

(16th Question is compulsory and answer any three questions From Qn:17 to21)

16. Find the initial basic feasible solution for the following transportation problem by Least Cost Method.(**compulsory question)**(K4)

		To			Supply
From	1	2	1	4	30
	3	3	2	1	50
	4	2	5	9	20
Demand	20	40	30	10	

17.Use Big- M \method to solve,

Min Z = $4x_1 + 3x_2$

Subject to the constraints,

$2x_1 + x_2 \geq 10$

$-3x_1 + 2x_2 \leq 6$

$x_1 + x_2 \leq 6$ and $x_1, x_2 \geq 0$

18. Find the initial basic feasible solution for the following transportation problem by VAM. (K4)

		Distribution centres				
		D_1	D_1	D_1	D_1	Availability
Origin	S_1	11	13	17	14	250
	S_2	16	18	14	10	300
	S_3	21	24	13	10	400
Requirements		200	225	275	250	

(CONTD…4)

19. Find the optimal order quantity for a product for which the price – break is as follows:

Quantity	unit cost	(K5)
	$0 \leq Q_1 < 50$	Rs. 10
	$50 \leq Q_1 < 100$	Rs. 9
	$100 \leq Q_3$	Rs. 8

The monthly demand for the product is 200 units, the cost of the storage is 25% of the unit cost and ordering cost is Rs. 20.00 per order.

20. A machine owner finds from his past records that the costs per year of maintaining a machine whose purchase price is Rs. 6000 are as given below:

Year :	1	2	3	4	5	6
Maintenance Cost (Rs)	1000	1200	1400	1800	2300	2800
Resale Value (Rs)	3000	1500	750	375	200	200

Determine at what age is replacement due? (K5)

21. A project consists of the following activities and time estimates: (K4)

Activity	*Least time (days)*	*Greatest time (days)*	*Most likely time (days)*
1 – 2	3	15	6
2 – 3	2	14	5
1 – 4	6	13	12
2 – 5	2	8	5
2 – 6	5	17	11
3 – 6	3	15	6
4 – 7	3	27	9
5 – 7	1	7	4
6 – 7	2	8	5

(a) Draw the network

(b) What is the probability that the project will be completed in 27 days?

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