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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEAR 2021 ONLY) **21PCC206**

REG.NO. :

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

END-OF-SEMESTER EXAMINATIONS: JULY-2022

M.COM.-CA **MAXIMUM MARKS: 70**

II SEMESTER **TIME : 3 HOURS**

OPERATIONS RESEARCH

SECTION - A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

MULTIPLE CHOICE QUESTIONS. (K1)

1. The values of the decision variables which satisfy the constraints are called _____ solution.

a. Optimal b. Feasible c. Objective d. Graphical

2. A basic solution is called a _____ solution if it minimizes the transportation cost.

a. Optimal b. Feasible c. Objective d. Graphical

3.The number of customers in the queue plus the number of customers receiving the service is called the _____ of the system.

a. Length b. Waiting time c. Number d. Transient

4. _____ is a stock allowance to cover errors in forecasting the lead time on the demand during the lead time.

a. Buffer Stock b. Demand c. Lead time d. Maximum

5. _____ float is the amount of time an activity can be delayed without affecting the commencement of a subsequent activity at its earliest start time, but may affect the float of a previous activity.

a. Independent b. Total c. Free d. Last

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

6.Give an outline on Slack variable.

7.Define Non-degenerate feasible solution.

8.Interpret on Transient state of the queuing system.

9.Define stock out costs.

10. What is Pessimistic time estimate in PERT?

SECTION – B (5 X 4 = 20 MARKS)

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

11. a) A farmer has 1,000 acres of land on which he can grow corn, wheat or soyabeans. Each acre of corn costs Rs.100 for preparation, requires 7 man-days of work and yields a profit of Rs.30. An acre of wheat costs Rs.120 to prepare, requires 10 man-days of work and yields a profit of Rs.40. An acre of soya beans costs R.70 to prepare, requires 8 man-days of work and yields a profit of Rs.20. if the farmer has Rs.1,00,000 for preparation and can count on 80,000 man-days work, formulate the mathematical model.

(OR)

(CONTD …. 2)

b) A firm produces three products A,B and C. it uses two types of raw materials I and II of which 5,000 and 7,500 units respectively are available. The raw material requirements per unit of the products are given below:

Raw material	**Requirement Per Unit Product**		
	A	**B**	**C**
I	S	4	5
II	5	3	5

The labour time for each unit of product A is twice that of product B, three times that of product C. The entire labour force of the firm can produce the equivalent of 3,000 units. The minimum demand of the three product is 600, 650 and 500 units respectively. Also the ratios of the number of units produced must be equal to 2:3:4. Assume the profits per unit of A,B and C are Rs.50, 50 and 80 respectively, formulate the problem as a linear programming model in order to determine the number of units of each product which will maximize the profit.

12. a) Solve the following assignment problem. The data given in the table refer to production in certain units.

Operators	**Machines**			
	A	**B**	**C**	**D**
1	10	5	7	8
2	11	4	9	10
3	8	4	9	7
4	7	5	6	4
5	8	9	7	5

(OR)

b) Solve the following transportation problem.

	A	B	C	a_i
F1	10	9	8	8
F2	10	7	10	7
F3	11	9	7	9
F4	12	14	10	4
b_j	10	10	8	

13. a) At an one man barber shop customers arrive according to Poisson distribution with a mean arrival rate of 5 per hour and his hair cutting time is exponentially distributed with an average hair cut taking 10 minutes. It is assumed that because of his excellent reputation, customers are willing to wait. Calculate the following

i) Average number of customers in the shop and the average number of customers waiting for a haircut.

ii) The probability that customers have to wait prior to getting into the barber's chair

(OR)

b) Western national bank is considering opening a drive in window for customer service. Management estimates that the customers will arrive for service at the rate of 15 per hour. The teller whom it is considering to staff the window can service customers at the rate of one every three minutes. Assuming Poisson arrivals and exponential service time find (i) utilization of the teller (ii) average number in the waiting line (iii) average number in the system (iv) average waiting time in the line (v) average waiting time in the system.

14. a) Company buys in lots 500 boxes which is a 3 month supply. The cost per box is Rs. 125 and the ordering cost is Rs. 150. The inventory carrying cost is estimated at 20% of unit value.

(CONTD …. 3)

(i) What is the total annual cost of the inventory policy?
(ii) How much money could be saved by employing the economic order quantity?

(OR)

b) (i) Compute EOQ and
(ii) total variable cost for the following

Annual demand	= 25 units
Unit price	= Rs. 2.5
Order cost	= Rs. 400
Storage cost	= 1% per year
Interest rate	= 12% per year
obsolescence rate	= 7%

(iii) Compute the order quantity and the total variable cost that would result in the incorrect price of Rs. 1.60 were used for the item.

15. a) The following data are the characteristics of a project.

Activity	Immediate Predecessors	Duration (in days)
A	----	2
B	A	3
C	A	4
D	B, C	6
E	----	2
F	E	8

Draw the network diagram for the above project
Find the minimum project completion time and the critical path.

(OR)

b) A project has fourteen activities A through M. the relationships which obtain among these activities are given below. Construct the network and number them.

A is the first operation
B and C can be performed in parallel and are immediate successor to A.
D, E, F follow B
G follows E
H follows D, but it cannot start until E is completed.
I and J succeed G.
F and J precede K.
M succeeds L and K.
The last operation N succeeds M and C.

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. No : 17 to 21) (K4 (Or) K5)

16. A company produces two types of pens, say A and B. pen A is a superior quality and pen B is a lower quality. Profits on pen A and pen B are Rs. 5 and Rs. 3 per pen respectively. Raw materials required for each pen A is twice as that of pen B. the supply of raw materials is sufficient only for 1000 pens of B per day. Per A requires a special clip and only 400 clips are available per day. For pen B only 700 clips are available per day. Find graphically the product mix so that the company can make maximum profit.

(CONTD …. 4)

17. Solve the following LPP using Simplex method

$$\text{Max } Z = 45x_1 + 80x_2$$

Subject to $5x_1 + 20x_2 \leq 400$

$10x_1 + 15x_2 \leq 450$

$X_1, x_2 \geq 0.$

18. Six jobs go first over machine I and then over machine II. The order of the completion of jobs has no significance. The following table gives the machine time in hours for six jobs and the two machines:

Job No.	:	1	2	3	4	5	6
Time on machine I (A_i)	:	5	9	4	7	8	6
Time on machine II B_i	:	7	4	8	3	9	5

Find the sequence of jobs that minimizes the total elapsed time to complete the jobs. Find the minimum time by using Gnatt's chart.

19. A bank has one drive-in counter. It is estimated that cars arrive according to poisson distribution at the rate of 2 every 5 minutes and there is enough space to accommodate a line of 10 cars. Other arriving cars can wait outside this space, if necessary. It takes 1.5 minutes on an average to serve a customer, but the service time actually varies according to an exponential distribution. Find:

(i) the proportion of time, the facility remains idle;

(ii) the expected number of customers waiting but currently not being served at a particular time;

(iii) the expected time a customer spends in the system.

20. Anil company buys its annual requirement of 36,000 units in six installments. Each unit costs Rs. 1 and ordering cost Rs. 25. The inventory carrying cost is estimated at 20% of unit value. Find the total annual cost of the existing inventory policy. How much money can be saved by using EOQ?

21. A project has the following time schedule

Activity	**Time in months**	**Activity**	**Time in months**
1-2	2	3-7	5
1-3	2	4-6	3
1-4	1	5-8	1
2-5	4	6-9	5
3-6	8	7-8	4
		8-9	3

(i) Construct the network

(ii) Find the total float for each activity

(iii) Find the critical path and the project duration.

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