



THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (2nd Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

Backlog Arrear Examination, March 2021

MAT/MAS 3616/3402/334/3402/3634

OPERATIONS RESEARCH II

Time: 3 Hrs

Marks: 75

Answer any Five questions

(5×15=75)

1. Given the LPP. Maximize $Z = 3x_1 + 5x_2$

Subject to: $x_1 \leq 4$, $3x_1 + 2x_2 \leq 18$, $x_1, x_2 \geq 0$.

If a new variable x_5 is introduced with $c_5 = 7$ and $a_5 = [1, 2]$, discuss the effect of adding the new variable and obtain the revised solution, if any.

2. Solve the following integer linear programming problem using cutting plane algorithm

$$\text{Max } z = 3x_1 + x_2 + 3x_3$$

Subject to

$$-x_1 + 2x_2 + x_3 \leq 4, \quad 4x_2 - 3x_3 \leq 2, \quad x_1 - 3x_2 + 2x_3 \leq 3 \quad x_1, x_2, x_3 \text{ are all non-negative integer.}$$

- 3 A company operating 50 weeks in a year is concerned about its stocks of copper cable. This costs Rs.240 a metre and there is a demand for 8000 metres a week. Each replenishment costs Rs.1050 for administration and Rs.1650 for delivery, while holding costs are estimated at 25 percent of value held a year. Assuming no shortages are allowed, what is the optimal inventory policy for the company? How would this analysis differ if the company wanted to maximize profit rather than minimize cost? What is the gross profit if the company sell cable for Rs.360 a metre?

- 4 A manufacturing company needs 2500 units of a particular component every year. The company buys

it at the rate of Rs.30 per unit. The order processing cost for this part is estimated at Rs.15 and the cost of carrying a part in stock comes to about Rs.4 per year. The company can manufacture this part internally. In that case, it saves 20% of the price of the product. However, it estimates a set-up cost of Rs.250 per production run. The annual production rate would be 4800 units. However, the inventory holding costs remain unchanged.

- (i) Determine the EOQ and the optimal number of orders placed in a year.
- (ii) Determine the optimum production lot size and the average duration of the production run.
- (iii) Should the company manufacture the component internally or continue to purchase it from the supplier?

5.

Activity	Predecessor	Duration		
		O	M	P
A	-	1	1	7
B	-	1	4	7
C	-	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D,E	3	6	15
H	F,G	1	2	3

- (i) Draw PERT network and find the duration, mean, variance.
- (ii) Find the critical path.
- (iii) What duration will have 95% confidence for project completion?

6. (a) Write forward pass calculation.

(b) A small project consists of seven activities for which the relevant data are given below

Activity	Predecessor	Activity Duration
A	-	4
B	-	7
C	-	6
D	A,B	5
E	A,B	7
F	C,D,E	6
G	C,D,E	5

Draw the network and find the project completion time

7. The rate of arrival of customers at a public telephone booth follows Poisson distribution, with an average time of 10 minutes between one customer and the next. The duration of a phone call is assumed to follow exponential distribution, with mean time of 3 minutes.

- (i) What is the probability that a person arriving at the booth will have to wait?
- (ii) What is the average length of the non-empty queues that from time to time?
- (iii) The Mahanagar Telephone Nigam Ltd will install a second booth, when it is convinced that the
customers would expect waiting for at least 3 minutes for their turn to make a call. By how
much
time should the flow of customers increase in order to justify second booth?
- (iv) Estimation the fraction of a day that the phone will be in use.
- (v) What is the probability that it will take him more than 10 minutes al together to wait for
phone and
complete his call?