

**Exam. Code : 108505**

**Subject Code : 8086**

**B.Com. 5<sup>th</sup> Semester (Old Syll. 2017)**

**OPERATION RESEARCH**

**Paper : BCG-505**

Time Allowed—3 Hours] [Maximum Marks—50

**SECTION—A**

**Note :—** Attempt any ten parts. Each part carries 1 mark.

1. (a) How can we detect multiple solution of L.P.P. in simplex method ?
- (b) Explain steps of Vogel's approximation method.
- (c) Discuss the Dominance rule in Game theory.
- (d) Describe the term 'Crashing' in Network Analysis.
- (e) Discuss various operating characteristics of queueing theory.
- (f) Write any four characteristics of Operations research.
- (g) Explain M/M/1 model of queueing theory.
- (h) Differentiate slack and surplus variables.
- (i) Explain steps of graphical method of solving L.P.P.

- (j) How is problem of maximization transportation solved ?
- (k) What do you mean by 2\*n games ?
- (l) Write the characteristics of PERT.

### SECTION—B

**Note :—** Attempt any **two** questions. Each question carries **10** marks.

2. A company is determining how to advertise a product nationally on television and in a newspaper. Each television ad is expected to be seen by 15 million viewers, and each newspaper ad is expected to be seen by 3 million readers. The company has the constraints below :
- (i) The company has budgeted a maximum of Rs. 600,000 to advertise the product.
- (ii) Each minute of television time costs Rs. 60,000 and each one-page newspaper ad costs Rs. 15,000.
- (iii) The company's market research department recommends using at least 6 television ads and at least 4 newspaper ads.
- (iv) How should the company allocate its advertising budget to maximize the total audience ? What is the maximum audience ?

3. Define Operations research and discuss its scope.
4. A firm owns facilities at seven places. It has manufacturing plants at places A, B and C with daily output of 500, 300 and 200 units of an item respectively. It has warehouses at places P, Q, R and S with daily requirements of 180, 150, 350 and 320 units respectively. Per Unit shipping charges on different routes are given below :

To From	P	Q	R	S
A	12	10	12	13
B	7	11	8	14
C	6	16	11	7

5. The firm wants to send the output from various plants to warehouses involving minimum transportation cost. A company plans to assign 5 salesmen to 5 districts in which it operates. Estimates of sales revenue in thousands of rupees for each salesman in different districts are given in the following table. In your opinion

what should be the placement of salesmen if the objective is to maximise the expected sales revenue ?

Salesman	District				
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>
S <sub>1</sub>	40	46	48	36	48
S <sub>2</sub>	48	32	36	29	44
S <sub>3</sub>	49	35	41	38	45
S <sub>4</sub>	30	46	49	44	44
S <sub>5</sub>	37	41	48	43	47

### SECTION—C

**Note :—** Attempt any two questions. Each question carries 10 marks.

6. Suppose the two firms are competing for a market share of the sales for a particular product. Each firm is considering what promotional strategy to employ for the coming sales period. Assume that the following payoff matrix describes the increase in market share for firm A and the decrease in market share for

Firm B. Determine the Optimal strategies for each firm :

**Firm B**

<b>Firm A</b>	<b>No Promotion</b>	<b>Moderate Promotion</b>	<b>Extensive Promotion</b>
<b>No Promotion</b>	5	0	-10
<b>Moderate Promotion</b>	10	6	2
<b>Extensive Promotion</b>	20	15	10

7. Write notes on each of the following :
- Steps of preparing network analysis.
  - Applications of queueing theory.
8. Consider the following schedule of activities and related information for the construction of a new plant :

<b>Activity</b>	<b>Months</b>	<b>Variance</b>	<b>Expected Cost (Rs. 0,000's)</b>
1—2	4	1	5
2—3	2	1	3
3—6	3	1	4

Activity	Months	Variance	Expected Cost (Rs. 0,000's)
2—4	6	2	9
1—5	2	1	2
5—6	5	1	12
4—6	9	5	20
5—7	7	8	7
7—8	10	16	14
6—8	1	1	4

You should assume that the cost and time required for one activity are not dependent upon the cost and time of any other activity and variations are expected to follow a normal distribution. You are required to calculate :

- (i) The critical path.
- (ii) Expected cost of construction of the plant.
- (iii) Expected time required to build the plant.
- (iv) The standard deviation of the expected time.

9. Each airline passenger and his or her luggage must be checked to determine whether he or she is carrying weapons onto the plane. Suppose that at City Airport, an average of 10 passengers per minute arrive (inter arrival times are exponential). To check passengers for weapons, the airport must have a checkpoint consisting of a metal detector and baggage X-Ray machine. Whenever a checkpoint is in operation, two employees are required. A checkpoint can check an average of 12 passengers per minute (the time to check a passenger is exponential). Under the assumption that the airport has only one check point :

- (a) What is the probability that a passenger will have to wait before being checked for weapons ?
- (b) On the average how many passengers are waiting in line to enter the check point ?
- (c) On the average, how long will a passenger spend at the check point ?
- (d) What is the probability of no passenger at the check point ?
- (e) Calculate traffic intensity.