Exam. Code : 108506
Subject Code : 2218

B.Com. 6th Semester

OPERATIONS RESEARCH

Paper—BCG-603

Time Allowed—3 Hours] [Maximum Marks—50

SECTION—A

Note :—Attempt any **10** parts. Each part carries **1** mark.

1. (a) Write down the properties of a game.
   (b) Differentiate between PERT and CPM.
   (c) What is an infeasible Solution ?
   (d) Discuss need of Operations research.
   (e) Define idle time cost.
   (f) Discuss the need of artificial variables.
   (g) Define Big M method.
   (h) Write limitations of game theory.
   (i) Steps of Hungarian method of Assignment problems.
   (j) Define decision variables.
   (k) What do you mean by total float ?
   (l) Define multiple optimal solution.

SECTION—B

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

2. Earth Ltd. has two products sun and moon. To produce one unit of sun, 2 units of material X and 4 units of material Y are required. To produce one unit of moon, 3 units of material X and 2 units of material Y are required. As the raw material X is in short supply so not more than 16 units of material X can be used. At least 16 units of material Y must be used in order to meet the committed sales of Sun and Moon. Cost per unit of material X and material Y are Rs. 2.5 and Rs. 0.25 respectively. Solve L.P.P. for minimum cost.

3. Solve the following transportation problem for minimum cost :

Destinations	Origins				Requirements
	A	B	C	D	
1	7	4	3	4	15
2	3	2	7	5	25
3	4	4	3	7	20
4	9	7	5	3	40
Availabilities	12	8	35	25	

4. Elaborate meaning, scope and limitations of Operations Research.

5. (a) Write a note on Travelling Salesman problem.
   (b) Discuss applications of Linear programming problems.

SECTION—C

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

6. The activities involved in a PERT project are detailed below :

Job i–j	Duration (in weeks) A	M	B
1–2	3	6	15
2–3	6	12	30
3–5	5	11	17
7–8	4	19	28
5–8	1	4	7
6–7	3	9	27
4–5	3	6	15
1–6	2	5	14
2–4	2	5	8

a = optimistic, m = most likely and b = pessimistic.

You are required to :

(i) Draw a network diagram.

(ii) Find the critical path after estimating the earliest and latest event times for all nodes.

(iii) Find the probability of completing the project before 31 weeks.

(iv) What is the chance of project duration exceeding 46 weeks ?

(v) What will be the effect on the current critical path if the most likely time of activity 3-5 gets revised to 14 instead of 11 weeks given above ?

7. Arrivals at a bank counter are considered to be Poisson distributed at an average rate of 30 per hour. The window

man serves the arrivals by taking an average time being 0.025 hours (assume to be distributed exponentially) :

(i) The management of this bank is considering to install another window provided an arrival would expect waiting at least six minutes for the service. By how much should the flow of arrival be increased in order to justify a second window ?

(ii) The management will install another window when convinced that an arrival would have to spend 15 minutes waiting and being served at the window by how much, should the flow of arrivals be increased in order to justify a third window.

(iii) How much the service rate should be increased in order to serve 50 customers per hour at the given time for waiting and service ?

8. You are given the pay-off Matrix in respect of two person, zero-sum game, as follows :

A's Strategy	B's Strategy				
	B_1	B_2	B_3	B_4	B_5
A_1	8	10	–3	–8	–12
A_2	3	6	0	6	12
A_3	7	5	–2	–8	17
A_4	–11	12	–10	10	20
A_5	–7	0	0	6	2

(a) Write the maximin and minimax strategies.

(b) Is it a strictly determinable game ?

(c) What is the value of the game ?

(d) Is this game a fair one ?

9. Write notes on each of the following :

(i) Applications of Queuing theory.

(ii) Characteristics of Game theory.