



Seventh Semester B.E. Degree Examination, June/July 2019
Operations Research

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting atleast TWO questions from each part.

PART – A

- 1 a. Define operations research (OR). Outline the application areas of OR. (10 Marks)
- b. outline the characteristics of OR with limitations. (10 Marks)

- 2 a. Define linear programming. Formulate linear programming for the following problem. The Hutti Gold mines company produces three different mineral inprocess of washing gold of mineral processing plant. These minerals are processed on three different machines. The time required to manufacture one unit of each of the three minerals and daily capacity of three machines is given in below table :

Machine	Time per unit (min)			machine capacity (minutes/day)
	Mineral 1	Mineral 2	Mineral 3	
M1	2	3	2	440
M2	4	–	3	420
M3	2	5	–	430

It is required to determine daily number of units to be manufactured for each mineral. The profit per unit for minerals 1, 2 and 3 are Rs. 4, Rs.3 and Rs. 6 respectively. It is assumed that all quantities produced consumed in market. (06 Marks)

- b. Solve Max $Z = 3x_1 + 5x_2$ by graphical method subject to

$$x_1 + 2x_2 \leq 2000$$

$$x_1 + x_2 \leq 1500$$

$$x_2 \leq 600$$

$$x_1, x_2 \geq 0.$$
 (14 Marks)

- 3 a. Differentiate between primal and dual solution. (10 Marks)
- b. Convert the following LPP to dual solution and find the solution to the primal.

$$\text{Max } Z = 4x_1 + 2x_2$$
 such that $x_1 + x_2 \geq 3$
 $x_1 - x_2 \geq 2$
 $x_1, x_2 \geq 0.$ (10 Marks)

- 4 a. Outline the application of transportation model. (06 Marks)
- b. The Singareni Collierier's limited has underground at A, B and C which supply core material to processing plant P, Q and R respectively. Weekly underground supply capacity are 70, 30 and 50 tons. Weekly processing plant requirement are 65, 42 and 43 tons respectively. Tons shipping cost (in rupees) are as follows : Determine initial basic fusible solution by using VAM.

		Processing plant		
		P	Q	R
Undergrounds	A	5	7	8
	B	4	4	6
	C	6	7	7

(14 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

PART – B

- 5 a. Outline the characteristics of the queueing theory. (06 Marks)
- b. Mine works drive at a gate checking office window for entering into underground mine. The gate checking office window is being managed by single individual, at a rate of 25 per hour. The average time that a mine worker takes to be serviced is 120 seconds. Assume that mine workers arrival follows a poisson distribution while the service rate is exponential. Compute the mean arrival rate and mean service rate and solve the below :
- i) What is the traffic intensity
 - ii) Probability that mine worker need not wait in queue.
 - iii) What is the probability that exactly 3 units in system
 - iv) What is the mean queue length?
 - v) What is the expected waiting time in queue?
 - vi) What is the expected number of units?
 - vii) What is the probability that an arrival will have to wait for more than 10 minutes in queue? (14 Marks)

- 6 An R and D activity has 7 activities for which three time estimates are given below along with its precedence activities.

Activity	Preceding	Optimistic time	Most likely time	Pessimistic time
A	none	4	6	8
B	A	6	10	12
C	A	8	18	24
D	B	9	9	9
E	C	10	14	18
F	A	5	5	5
G	D, E, F	8	10	12

- i) Draw PERT network ii) Find EST, LST and slack of each node iii) Find critical path and expected project duration. (20 Marks)

- 7 A project schedule has following characteristics :

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time	4	1	1	1	6	5	4	8	1	2	5	7

- i) Construct network diagram
- ii) Compute EST, EFT, LST and LFT of all floats
- iii) Find critical path and project duration. (20 Marks)

- 8 a. Outline the characteristics features of a competitive game. (06 Marks)
- b. Following is the pay off matrix for players A and B.

		Player B				
		B ₁	B ₂	B ₃	B ₄	B ₅
Player A	A ₁	2	4	3	3	4
	A ₂	5	6	3	7	8
	A ₃	6	7	9	8	7
	A ₄	4	2	8	4	3

Find the optimum strategies for both players by using dominance property and determine the value of game. (14 Marks)
