

2056
B.E. (Mechanical Engineering)
Eighth Semester
MEC-802: Operation Research

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit. For any missing data, make the suitable assumptions.

x-x-x

1. (a) What is use of Interdisciplinary team in OR?
(b) What are differences between feasible solution & optimal solution?
(c) Show that dual of the dual is primal.
(d) What are different restrictions on assignments in assignment problem?
(e) What are different time estimates in PERT system? (5x2)

UNIT - I

2. (a) What are different phases of scientific method in operations research? Explain briefly.
(b) What are different steps involved in the construction of OR model. (2x5)
3. The manager of an oil refinery has to decide upon the optimal mix of two possible blending processes, of which the inputs and outputs per production run are as follows:

Process	Input		Output	
	Crude A	Crude B	Gasoline X	Gasoline Y
1	5	3	5	8
2	4	5	4	4

The maximum amount available of crude A and B are 200 units and 150 units respectively. Market requirements show that at least 100 units of gasoline X and 80 units of gasoline Y must be produced. The profits per production run from process 1 and process 2 are Rs. 3 and Rs. 4 respectively. Formulate the problem as linear programming problem and solve using graphical method. (10)

4. Solve the Linear programming problem using Big M-method

Maximize $Z = 4x_1 + 5x_2 + 2x_3$

Subject to: $2x_1 + x_2 + x_3 \leq 10,$

$x_1 + 3x_2 + x_3 \leq 12,$

$x_1 + x_2 + x_3 = 6$

$x_1, x_2, x_3 \geq 0$ (10)

P.T.O.

UNIT - II

5. A company manufacturing air-coolers has two plants located at Bombay and Calcutta with a capacity of 200 units and 100 units per week respectively. The company supplies the air-coolers to its four show rooms situated at Ranchi, Delhi, Lucknow and Kanpur which have maximum demand of 75, 100, 100 and 30 units respectively. Due to the differences in raw material cost and transportation cost, the profit per unit in rupees differs which is shown in table below:

	Ranchi	Delhi	Lucknow	Kanpur
Bombay	90	90	100	110
Calcutta	50	70	130	85

Plan the production programme so as to maximize the profit. The company may have its production capacity at both plants partly or wholly unused. (10)

6. (a) Describe Shortest Cyclic Route models. What are different methods to solve them?
- (b) Customers arrive at a one window drive-in bank according to a Poisson distribution with mean 10 per hour. Service time per customer is exponential with mean 5 minutes. The space in front of the window, including that for the serviced car can accommodate a maximum of three cars. Other cars can wait outside the space. What is the probability that an arriving customer can drive directly to the space in front of the windows and also find the probability that an arriving customer will have to wait outside the indicated space. (4,6)

7. A Project has the following characteristics:

Activity	1-2	1-3	1-4	2-3	2-4	2-5	3-5	4-5
Time (weeks)	5	4	6	7	8	10	11	10

Construct the network and find the critical path, total float, free float and independent float. (10)

x-x-x