Code: 15A03601 **R15**

B.Tech III Year II Semester (R15) Supplementary Examinations December/January 2018/19

OPERATIONS RESEARCH

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) What are the limitations of an OR model?
(b) What is graphical optimization?
(c) What is meant by dual problem?
(d) Explain unbounded solution.
(e) What is a payoff matrix in game theory?
(f) Write the classification of queues.
(g) What is a critical path in PERT/CRM?
(h) Write the principle of n-job and m-machine.
(i) State the usefulness of dynamic programming.
(j) What is group replacement?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Solve the following LPP graphically:

Maximize $Z = 2x_1 + 3x_2$

Subject to: $x_1 + x_2 \geq 1$

$5x_1 - x_2 \geq 0$

$x_1 + x_2 \leq 6$

$x_1 - 5x_2 \leq 0$

$x_2 - x_1 \geq -1$

$x_2 \leq 3$

$x_1, x_2 \geq 0$

OR

3 Solve the following LP problem:

Max. $Z = 2x_1 + x_2 + x_3$

Subject to: $4x_1 + 6x_2 + 3x_3 \leq 8$

$3x_1 - 6x_2 - 4x_3 \leq 1$

$2x_1 + 3x_2 - 5x_3 \leq 4$

$x_1, x_2, x_3 \geq 0$

UNIT – II

4 The following table shown all the necessary information on the available supply to each warehouse, the requirement of each market and the unit transportation cost form each warehouse to each market.

Warehouse \ Market	I	II	III	IV	Supply
A	5	2	4	3	22
B	4	8	1	6	15
C	4	6	7	5	8
Requirement	7	12	17	9	

The shipping clerk has worked out the following schedule form experience. 12 units from A to II, I unit from A to III, 9 units from A to IV, 15 units from B to III, 7 units from C to I and I unit from C to III.

(i) Check and see if the clerk has the optimal schedule.

(ii) Find the optimal schedule and minimum total shipping cost.

(iii) If the clerk is approached by a carrier of route C to II, who offers to reduce his rate in the hope of getting some business, by how much the rate be reduced before the clerk should consider giving him an order.

Contd. in page 2

OR

5 Solve the following assignment problem. Given time matrix (hrs) as shown in the table:

Persons	Machines I	II	III	IV
A	8	26	17	11
B	13	28	4	26
C	38	19	18	15
D	19	26	24	10

UNIT – III

6 Solve the game graphically:

	Player B			
Player A	2	2	3	-1
	4	3	2	6

OR

7 A bank has two tellers working on savings accounts. The first teller handles withdrawals only. The second teller handles deposits only. It has been found that the service time distribution for the deposits and withdrawals both are exponential with mean service time 3 minutes per customer. Depositors are found to arrive in a Poisson fashion throughout the day with mean arrival 16 per hour. With drawers also arrive in a Poisson fashion with mean arrival rate 14 per hour. What would be the effect on the average waiting time for depositors and withdrawers if each teller could handle both withdrawals and deposits? What would be the effect if this could only be accomplished by increasing the service time to 3.5 minutes?

UNIT – IV

8 The matrix of setup costs are given below. Show how to sequence production so as to minimize setup cost per cycle.

	A	B	C	D	E
A	∞	3	6	2	3
B	3	∞	5	2	3
C	6	5	∞	6	4
D	2	2	6	∞	6
E	3	3	4	6	∞

OR

9 A project consists of the following activities whose time estimates in weeks are given below:

Activity	Most optimistic time	Most pessimistic time	Most likely time
1-2	1	7	1
2-3	1	7	4
1-4	2	8	2
2-5	1	1	1
3-5	2	14	5
4-6	2	8	5
5-6	3	15	6

(i) Draw the net work and find the critical path.
(ii) Find the expected duration and variance from each activity.
(iii) Determine total float and free float for each activity.

UNIT – V

10 What is Bellman's principle of optimally? Apply this principle to divide a given quantity 'c' into 'n' parts so as to maximize their product.

OR

11 The data collected in running a machine, the cost of which is Rs.60,000 are given below.

Year	1	2	3	4	5
Resale value (Rs.)	42,000	30,000	20,400	14,400	9,650
Cost of spares (Rs.)	4,000	4,270	4,880	5,700	6,800
Cost of labour (Rs.)	14,000	16,000	18,000	21,000	25,000

Determine the optimum period for replacement of the machine.

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