Code: 15A03601

R15

B.Tech III Year II Semester (R15) Regular Examinations May/June 2018

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 is the purpose of a mathematical model?
(b) What is an artificial variable?
(c) What are the differences between transportation and assignment problems?
(d) What is the principle of optimality?
(e) Define Pure and mixed strategies.
(f) Explain (M | M | 1) : (∞| FCFS) model.
(g) What are the rules to be followed in the construction of a net work?
(h) What is dummy arrow in net work?
(i) State the applications of dynamic programming.
(j) What is replacement?

PART – B

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

UNIT – I

2 Solve the following LPP by using Big M method:

Maximize $z = -2x_1 - x_2$

Subjected to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 4$

$x_1, x_2 \geq 0$

OR

3 A Toy company manufactures two types of dolls, a basic version doll `A' and a deluxe version doll `B'. Each doll of type B takes twice as long to produce as one of type A and the company would have time to make a maximum of 2,000 per day if it produced only the basic version. The supply of plastic is sufficient to produce 1,500 dolls per day (both A and B combined). The deluxe version requires a fancy dress of which there are 600 per day available. If the company makes profit of Rs. 3/- and Rs.5/- per doll respectively on doll A and B, graphically determine, how many of each should be produced per day in order to maximize profit.

UNIT – II

4 Using dual simplex method, solve the following L.P.P.

Minimize $Z = 2x_1 + 2x_2 + 4x_3$

subject to: $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 \leq 3$

$x_1 + 4x_2 + 6x_3 \leq 5$

$x_1, x_2, x_3 \geq 0$

OR

5 Following is the unit cost matrix of a transportation problem. Use MODI method to obtain the optimum basic feasible solution.

	D_1	D_2	D_3	Available
S_1	50	30	220	1
S_2	90	45	170	3
S_3	250	200	50	4
Requirement	4	2	2	

Contd. in page 2

UNIT – III

6 The following matrix represents the pay-off to P_1 in a rectangular game between two persons P_1 and P_2.

	P_2			
P_1	8	15	-4	-2
	19	15	17	16
	0	20	15	5

By the notation of dominance, reduce the game to a (2 × 4) game and solve it.

OR

7 The mean arrival rate to a service center is 3 per hour. The mean service time is 10 minutes. Assuming Poisson arrival rate and exponential servicing time, determine the following.
(i) Utilization factor. (ii) Probability of two units in the system. (iii) Expected number of units in the system. (iv) Expected number of units in the queue. (v) Expected time in minute's customer has to wait in the system.

UNIT – IV

8 There are four jobs 1, 2, 3 & 4 are to be processed on each of the five machines A, B, C, D and E in the order ABCDE. The processing times in minutes are given in the table. Find the minimum elapsed time if no passing of jobs is permitted.

M/C → Job ↓	A	B	C	D	E
1	7	5	2	3	9
2	6	6	4	5	10
3	5	4	5	6	8
4	8	3	3	2	6

OR

9 A project consists of eight activities. The precedence relationships and the activity durations are given below:

Activity	A	B	C	D	E	F	G	H
Immediate predecessor	-	A	A	B	C	C	D, E	F, G
Duration	8	5	6	10	9	7	3	6

(i) Construct the activity network of the project. (ii) Find the critical path. (iii) Calculate the total float and free float for each activity.

UNIT – V

10 Solve the L.P.P. using dynamic programming:

Maximize $z = 4x_1 + 14x_2$

Subject to constraints: $2x_1 + 7x_2 \leq 21$

$7x_1 + 2x_2 \leq 21$

$x_1, x_2 \geq 0$

OR

11 Fleet of cars have increased their costs as they continue in service due to increased direct operating cost (gas and oil) and increased maintenance (repairs, tyres, batteries, etc..).The initial cost is Rs.3500 and the trade in value drop as time passes until it reaches a constant value of Rs.500. Given the cost of operating, maintaining and the trade in value, determine the proper length of service before cars should be replaced.

Year of service	1	2	3	4	5
Year end trade in value (Rs.)	1900	1050	600	500	500
Annual operating cost (Rs.)	1500	1800	2100	24,000	2700
Annual maintaining (Rs)	300	400	600	800	1000

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