Code No. 55026 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, March - 2017

OPERATIONS RESEARCH

(Computer Science and Engineering)

Time: 3Hrs **Max. Marks: 75**

Answer any FIVE questions
All questions carry equal marks

1.a) A firm produces two types of toys. Labour time required for first type is twice that of the second type. If the first type alone is produced, the firm can produce 1000 numbers per day. In a day, a maximum of 300 and 500 numbers of first and second type of toys respectively can be sold. The profit per toy is Rs. 10/- for the first type and Rs. 6/- for the second type. Formulate an LPP to maximize profit per day. Solve graphically.

b) Solve the following by Using Big –M method.

Minimize $Z= -5x_1 + 6x_2$

subject to $2x_1 + 5x_2 >= 1500$

$3x_1 + x_2 >= 1200$ where $x_1, x_2 >= 0$ [7+8]

2.a) Use VAM for IBFS then, Find the optimal solution to the following transportation problem with transportation cost, demand and supplies as given below.

Factory		Ware House				
		W1	W2	W3	W4	Demand
	F1	19	30	50	10	7
	F2	70	30	40	60	9
	F3	40	8	70	20	18
Supply		5	8	7	14	

b) Solve the following Transportation problem whose profit matrix availabilities and requirements at each plant and requirements at each warehouse are given in the following table. [8+7]

From	To				
	W	X	Y	Z	Availability
A	5	4	5	7	50
B	4	8	6	5	40
C	6	3	4	5	70
Demand	40	30	50	10	

3.a) A Computer centre has three programmers. The centre needs three application programmes to be developed. The Head of the Computer Centre, after studying carefully the programmes to be developed, estimate the computer time in minutes required by the experts to the application programmes as follows.

Programmers	Program		
	A	B	C
1	120	100	80
2	70	90	110
3	110	140	120

Assign the programmers to the programmes in such a way that the total computer time is least. [7+8]

b) Solve the following travelling salesman problem.

		To				
		A	B	C	D	E
From	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	-

4.a) Discuss about N- jobs and K- machines problems with example. [5+10]

b) Find the sequence that minimizes the total elapsed time (in hours) required to complete all the following jobs on machines A,B,C in the order B,C,A.

Jobs	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	4	9	8	6	5
Machine C	5	6	2	3	4

5.a) Use dynamic programming to find the value of

Max $Z = y_1.y_2.y_3$ Subject to constraints $y_1 + y_2 + y_3 = 6$

where $y_1, y_2, y_3 >= 0$

b) Solve the following Dynamic programming problem Min $Z = X_1^2 + 2X_2^2 + 4X_3$ [7+8]

Subject to constraints $x_1 + 2x_2 + x_3 >= 8$, $x_1, x_2, x_3 >= 0$

6.a) For a 2×2 two person Zero- Sum game without any saddle point having the pay- off matrix for player A as follows. Find optimum mixed strategies S_A and S_B and value of the game.

PLAYER A	Player B	
	B1	B2
A1	a11	a12
A2	a21	a22

b) Using the principle of dominance reduce the following game matrix and solve it graphically. Give the complete solution and value of the game. [8+7]

		Player B			
		I	II	III	IV
Player A	I	20	15	12	35
	II	25	14	8	10
	III	40	2	19	5
	IV	5	4	11	0

7.a) A machine costs Rs.500/-. The operation and maintenance costs are zero for the first year and increased by Rs.100/- every year. If money is worth 5% every year, determine the best age at which the machine should be replaced. The resale value of the machine is negligibly small. What is the weighted average cost of owning and operating the machine?

b) A decorative series lamp set circuit contains 1000 bulbs, all of which must be in working condition. The mortality rates have been observed for a certain type of light bulbs:

End of week	1	2	3	4	5	6
Probability of failure during week	0.10	0.15	0.25	0.35	0.12	0.03

If a bulb fails in service, it costs Rs.3.50 to replace; but if all the bulbs are replaced at a time it costs Rs.1.20 each, find optimum group replacement policy. [7+8]

8.a) Derive the Economic Order Quantity formula for the manufacturing model without shortages.

b) Consider an item on which incremental quantity discounts are available. The first 100 units costs Rs. 100/- each and additional units costs Rs. 95/- each. Determine the optimal order quantity Q if K = 600 units / year, I = 0.20, C = Rs. 50/ set up. [7+8]

---ooOoo---