Reg. No.



VI SEMESTER B.TECH (OPEN ELECTIVE -II) END SEMESTER EXAMINATION, APRIL/MAY 2017 SUBJECT: INTRODUCTION TO OPERATIONS RESEARCH (MME 3288)

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

(05)

(05)

(05)

Instructions to Candidates:

- Answer ALL the questions.
- Missing data if any may be suitably assumed.
- **1A.** A store requires following monthly quantities of 3 different sizes of refrigerators.

Size	А	В	С
No. required	16	24	15

The store has received quotations from 4 manufacturers who are able to supply not more than the quantities below(of all sizes combined)

Manufacturer	1	2	3	4	
Max. supply	24	8	23	5	

The store estimates that its profit per refrigerator will vary with the size and manufacturer as shown in the following table.

Size		А	В	С
Manufacturer	1	20	15	13
	2	19	12	21
	3	17	13	18
	4	22	12	18

i) How should the orders be optimally placed? What is the maximum monthly profit for the store?

- ii) Suppose that the store has already entered in to contact with manufacturer 1 to buy 7 units monthly of size C, what is the maximum sum the store would be willing to pay (per month) to be released from obligation.
- iii) Total supplies from manufacturer 2 and 3 are fixed but the amounts obtained from 1 and 4 can be varied (for the same overall total). How this flexibility could be best employed.
- **1B.** Explain the significant features of operations research.
- **2A.** Solve the given LPP using Simplex method

Max $Z = 3X_1 + 5X_2 + 5X_3$ Subject to the constraints

$$X_{1} + 2X_{3} \le 7$$

$$3X_{1} + 2X_{2} + X_{3} \le 19$$

$$X_{1}, X_{2}, X_{3} \ge 0$$

- 2B. Players A and B play a game of coins. Each player has three coins: one each of Re. 1, Rs. 2 and Rs. 5. One trail of the game is said to be played when each player simultaneously tosses one of his coins. If the sum of the coins tossed is even, A wins the worth of B's coin and if the sum is odd, A loses the worth of his coin to B. Formulate the pay-off matrix for A and solve the game.
- **3A.** A machine operator processes 5 types of items on his machine each week and must choose a sequence for them. The main costs involved are setup costs & priority. The setup cost per change depends on the time presently on the machine and the setup made according to the following table.

		To Item					
		А	В	С	D	E	
	Α		4	7	3	4	
Erom	В	4		6	3	4	
itom	С	7	6		7	5	
nem	D	3	3	7		7	
	Е	4	4	5	7		

(05)

In addition, there is a priority rating among the items, A and B having higher priority than C, D and E. This may be interpreted as adding an additional cost of 5 when any high priority item immediately follows a low priority item. If he processes each type of item once and once each week, how should he sequence the items on machine?

- **3B.** Write any five rules of constructing a project network using critical path **(05)** method.
- **4A.** A company is manufacturing two products, A and B. The manufacturing time required to make them, the profit, and capacity available at each work centre are as follows:

Droduct		Work centre	Profit per unit		
FIDUUCI	Machining	Fabrication	Assembly	(Rs.)	(05)
А	1 hour	5 hours	3 hours	85	
В	2 hours	4 hours	1 hour	105	
Total capacity	720 hours	1800 hours	900 hours		
لمباهدها الم	مائية فلتسدد أمعاه (10	a dual (Da nat			

Formulate the LPP and write the dual. (Do not solve).

4B. Following are the various activities involved in a project. The cost and time for these activities is given below.

	Proceeding	No	rmal	Crash		
Activity	Activity	Time (days)	Cost (Rs.)	Time (days)	Cost (Rs.)	
А		3	140	2	210	
В		6	215	5	275	
С		2	160	1	240	
D	A,B	4	130	3	180	
Е	A,B	2	170	1	250	
F	C,D,E	7	165	4	285	
G	C,D,E	4	210	3	290	

a) Draw the CPM network

- b) Find out the critical path and project completion time.
- c) What is the minimum possible project completion time after crashing the activities involved in the project and the associated cost of completing the project?

(05)

5A. Optimal table obtained by the simplex algorithm for maximization LPP is given below.

Basi	S	X ₁	X ₂	S ₁	S ₂	S ₃	b _i
Х2	100	0	1	5/6	-1/6	0	300
X ₁	80	1	0	-2/3	1/3	0	120
S ₃	0	0	0	7/6	-5/6	1	240
Ci		80	100	0	0	0	
Soluti	on	120	300	0	0	240	
Δ_{i}		0	0	-30	-10	0	

Conduct the sensitivity analysis for changes in the objective function coefficients and right hand side values of constraints.

- **5B.** What are the unique characteristics of an assignment matrix? (02)
- 5C. Customers for local bakery arrive randomly following a Poisson process. The single salesman can attend customers at an average rate of 12 customers per hour, the service time being distributed exponentially. The mean arrival rate of 12 customers per hour, the service time being distributed exponentially. The mean arrival rate of the customers is 20 per hour. Is the above queuing system workable? If not, why? If yes, determine the following. (05)
 - a) The mean number of customers in the bakery
 - b) The mean time spent by a customer in the bakery
 - c) The expected number of customers waiting to be served.
 - d) The mean waiting time of a typical customer in the queue.

(03)