Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
A Constituent Institute of Manipal University, Manipal

VI SEMESTER B.TECH (OE II) END SEMESTER EXAMINATION, JUNE 2017

SUBJECT: INTRODUCTION TO OPERATIONS RESEARCH (MME 3288)

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data if any may be suitably assumed.

1A. A contractor has undertaken construction at 5 different locations in a city. The cost of transportation of unit material from location i to location j are given here. At location i = A, D, E stocks of material of 250, 180, and 300 units respectively are available. 350 units are to be sent to location B and the rest to location C. Find the cheapest way of doing this. Use North West Corner method to obtain initial basic feasible solution. **(05)**

		To 'j' location				
		A	**B**	**C**	**D**	**E**
From 'i' location	**A**	-	8	9	15	12
	B	6	-	7	21	11
	C	12	9	-	17	18
	D	13	8	14	-	10
	E	7	6	12	10	-

1B. Sketch the methodology used in operations research. **(05)**

2A. Solve the given LPP using Simplex method **(05)**

Max $Z = 3X_1 + 5X_2 + 5X_3$

Subject to the constraints

$X_1 + 2X_3 \leq 7$

$3X_1 + 2X_2 + X_3 \leq 19$

$X_1, X_2, X_3 \geq 0$

2B. Solve the following game using graphical method. **(05)**

		Player B				
		B_1	B_2	B_3	B_4	B_5
Player A	A_1	1	8	5	-7	9
	A_2	2	-6	6	4	-2

3A. A computer center has 4 key punchers A, B, C & D. The owner receives 5 jobs to be punched. He wishes to reject one of them. The profit of each job depends upon which key-puncher is assigned to it as shown in the table below. Determine the optimal assignment under the added conditions that A cannot do job 1 and that there would be an additional penalty of Rs. 3000/- if the job 2 goes undone. Also find the maximum profit that can be realized.

Key Puncher	Job Profits (Rs. × 1000) Job				
	J_1	J_2	J_3	J_4	J_5
A	1	5	2	0	4
B	4	7	5	6	3
C	5	8	4	3	5
D	3	6	6	2	6

(05)

3B. i) What steps are to be followed in crashing an activity in a project network?

ii) Differentiate between a PERT and CPM network. **(05)**

iii) What is a dummy activity?

4A. Write the dual for given LPP.

Maximise $Z = 5X_1 + 7X_2 + 6X_3$

Subject to

$X_1 + X_2 + X_3 \leq 30$

$4X_1 - X_2 - X_3 \geq 35$

$X_1 + X_2 + X_3 = 12$ $X_1, X_2 \geq 0$, X_3 unrestricted in sign.

(05)

4B. Information on the activities required for a project is as follows:

Activity	A	B	C	D	E	F	G	H	I
Node	1-2	1-3	2-6	3-4	3-5	4-6	5-6	5-7	6-7
Duration (Days)	4	6	8	7	4	6	5	19	10

(05)

Draw the CPM network and calculate earliest start, earliest finish, latest start and latest finish times of each of the activities. Also compute total float & free float for all the activities.

5A. The optimal table obtained using the simplex algorithm for maximization LPP is given below.

C_B	X_B	20	40	25	0	0	0	Q
		X_1	X_2	X_3	S_1	S_2	S_3	
40	X_2	1/3	1	0	1/3	-1/3	0	8
25	X_3	5/6	0	1	-1/6	2/3	0	14
0	S_3	-5/3	0	0	-2/3	-1/3	1	10

(03)

Carry out sensitivity analysis for the changes in objective function coefficients and RHS values of constraints.

5B. What are the restrictions in a travelling salesman matrix when compared to an assignment matrix on the choice of elements? **(02)**

5C. Customers arriving at a counter in the post office are randomly distributed. They are served by the clerk as per their requirements and hence service time is also random. A study of 100 arrivals gave the following inter-arrival time frequency distribution and service distribution.

Inter arrival time (min)	Frequency	Service time (min)	Frequency
2	50	1	10
4	30	2	30
6	10	3	30
8	10	4	20
-	-	5	10

(05)

Simulate the queue for first 10 arrivals and compute the following

(i) Proportion of time the clerk is idle.

(ii) The average waiting time of the customer.

Use the following set of random numbers taken from the pool of 00-99, taking first 10 numbers for arrival time and the remaining for service time.

06 96 64 49 49 24 55 60 73 33 56 76 42 22 06 12 99 57 79 81