Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VI SEMESTER B.TECH (OPEN ELECTIVE - II)

END SEMESTER EXAMINATIONS, JUNE/JULY 2016

SUBJECT: BASICS OF OPERATIONS RESEARCH [MME 378]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitably assumed.

1A. What are the managerial implications of the following special cases of L.P. Problems? i) Multiple optimal solution ii) No feasible solution. How these cases are reflected in the simplex tableau? **05**

1B. A Mutual Fund has developed five investment alternatives given in the table below. Its objective is to maximize the return on investment. The ROI (Return on Investment) is expressed as an annual rate of return on invested capital. The risk is subjective estimate on a scale from 0 to 10 made by the portfolio manager. The term of investment is the average length of time required to realize the ROI indicated in the table. The guidelines for selecting the portfolio are (i) the average risk should not exceed 2.5 (ii) the average term of investment should not be more than six years (iii) at least 15% of the funds should be retained in the form of cash. **05**

Investment Alternative	ROI (%)	Risk	Term of investment (years)
1. Blue chip stock	12	2	4
2. Bonds	10	1	8
3. Growth stock	15	3	2
4.. Cash	0	0	0

2A. Write short notes on a) sensitivity analysis in L.P. Problems b) in Transportation problems. In what circumstance is sensitivity analysis likely to prove useful? **05**

2B Solve the following L.P. Problem of producing 4 products using 2 resources. **05**

Maximize $Z = 2X_1 + 8X_2 + 10X_3 + 6X_4$ (Total Profit)

Subject to $2X_1 + 1X_2 + 4X_3 + 2X_4 \leq 200$ (Material available)

$1X_1 + 2X_2 + 2X_3 + 1X_4 \leq 160$ (Machine hours available)

$X_1, X_2, X_3, X_4 \geq 0$

What is the total profit at the optimum and marginal worth of each resource?

3A. Explain with example the following special cases of L.P. Problems and their managerial implications: **05**
i) Degenerate optimal solution (ii) Unbounded problem (iii) Multiple optimal solutions.

3B. A company supplies its product to three customers from its 4 plants .The table below indicates the production capacity, demand from the customers and unit profit . The customer 2 and the company have an agreement to supply 17 units. The customer 3 can absorb any quantity of available units. Solve the problem to maximize the profit to the company. **05**

Plant	Customers			Supply Capacity
	1	2	3	
A	12	9	13	10
B	20	5	9	10
C	13	17	22	10
D	9	13	17	10
Demand	9	17		

4A A print shop has printing machines which must be dismantled and assembled after each job. The jobs arrive according to the Poisson fashion at a mean rate of 12 per day. The down time for the machine (being serviced or awaiting service) costs Rs. 500 per day. Two applicants for the service are being considered. One wants Rs. 1000 per day and will be able to service the machine in a mean time of 20 minutes. The other wants Rs.1400 per day and can service the machines in a mean time of 10 minutes. Assuming **05**

exponential service time, recommend which one should be hired? What daily rate would make the other one equivalent to the person hired? One work day is 8 hours.

4B. A company has received order for five jobs. It can assign three jobs to 3 workers and one of the jobs to a subcontractor. The table below gives the cost (in Rs. 00's) of assigning jobs to its workers and subcontractor **05**

Worker/ Job	1	2	3	4	5
1	50	50	----	40	30
2	70	60	80	50	40
3	55	45	75	50	35
subcontractor	60	70	50	30	-----

The worker 1 cannot do the job 3 and subcontractor cannot do the job 5. If job 2 is undone, the company has to pay a penalty of Rs.60000/-. Solve the problem using Assignment algorithm and find which job should be declined.

5A. Ships arrive at the main east coast unloading facility. There are two unloading docks at the facility, with the second used only when the first is occupied. The probability distribution of inter arrival times (IAT) is given below: **05**

IAT (hours):	1	2	3	4	5
Probability	0.17	0.30.	0.33	0.13	0.07

The service time is constant at 10 hours per ship for both docks. If the ship is waiting for service for 8 hours, it will leave for the secondary unloading facility.

Simulate the system for 10 ships using following Random numbers:
20, 31, 16 , 66 , 59 43, 91, 34, 92, 78.

From the simulated date determine (a) the average waiting time for the ship (b) average system time (c) average number of ships waiting (d) the fraction of the ships that leave to use the secondary facility.

5B. List and describe various phases of Operations Research with examples. **05**

6A. Two companies compete for securing lucrative business contract. Each company has 3 strategies: Low bid, Medium bid and High bid. These strategies and their respective payoffs can be reflected in the form of 2 person zero sum game as shown: **05**

	Company B		
	50	20	70
Company A	20	-10	40
	10	60	90

Identify the optimal strategy for each company and value of the game.

6B. A project involves 10 activities whose sequence and time in days are given below. day. Draw the network diagram and determine critical path and also four activity times and total float for each activity. **05**

Activity	1-2	1-3	2-3	2-4	2-5	3- 4	4-6	5-6	5-7	6- 7
Time (days)	2	3	5	7	4	8	12	0	7	6

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