(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 140851   Roll No.

B.Tech.

(SEM. VIII) THEORY EXAMINATION 2013-14

OPERATIONS RESEARCH

Time : 3 Hours   *Total Marks : 100*

Note :– Answer the following **five** questions, choices are within. Marks are indicating therein.

1.   Attempt any **two** parts of the following :   (10×2=20)

   (a)   The manager of an oil refinery has to decide upon the optimal mix of two possible blending processes of which the inputs and outputs per production run are as follows :

Process	Input		Output	
	Crude A	Crude B	Gasoline X	Gasoline Y
1	5	3	5	8
2	4	5	4	4

   The maximum amount available of Crude A and B is 200 units and units 150 units respectively. Market requirements show that at least 100 units of gasoline X and 80 units of gasoline Y must be produced. The profit per production run from process 1and process 2 are Rs. 3 and Rs. 4 respectively. Formulate the problem as an LPP nad solve the problem by graphical methods.

(b) Use the two-phase simplex method to :

Maximize $Z = 5x_1 - 4x_2 + 3x_3$

Subject to $\quad 2x_1 + x_2 - 6x_3 = 20$

$\quad 6x_1 + 5x_2 + 10x_3 \leq 76$

$\quad 8x_1 - 3x_2 + 6x_3 \leq 50,$

$\quad x_1, x_2, x_3 \geq 0$

(c) Discuss the significance and scope of OR in modern management. What are the limitations of graphical method for solving LPP ?

2. Attempt any **two** parts of the following : $\quad$ (10×2=20)

(a) Find the optimum solution to the following Transportation problem in which the cells contain the transportation cost in rupees.

Warehouses	1	2	3	4	5	Supply
1	7	6	4	5	9	40
2	8	5	6	7	8	30
3	6	8	9	6	5	20
4	5	7	7	8	6	10
Demand	30	30	15	20	5	

(b) Write brief notes on :

(i) Degenerate Transportation Problem

(ii) Hungarians method for assignment problems.

(c) Five wagons are available at stations 1,2,3,4,and 5. These are required at five stations I, II, III, IV, and V. The mileages between various stations are given by the table below. How should the wagons be assigned so as to minimize the total mileage covered ?

	I	II	III	IV	V
1	10	5	9	18	11
2	13	9	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10

3. Attempt any **two** parts of the following : $\quad$ (10×2=20)

(a) Solve the following game by using the principle of dominance :

Player A	Player B					
	B1	B2	B3	B4	B5	B6
A1	4	2	0	2	1	1
A2	4	3	1	3	2	2
A3	4	3	7	-5	1	2
A4	4	3	4	-1	2	2
A5	4	3	3	-2	2	2

Find the best strategy for each player and the value of the game.

(b) There are seven jobs, each of which has to go through the machines A and B in the order AB. Processing time in hours are given as :

Job	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time T .Also find idle time for machine A and B.

(c) Write brief notes on :

(i) Assumptions for Johnsons rule

(ii) Decision under various conditions

4. Attempt any **two** parts of the following : **(10×2=20)**

(a) (i) How will you control the inventories of a manufacturing organization ? Discuss the various inventory costs associated with this organization.

(ii) A company uses Rs. 10,000 worth of an item during the year. The ordering costs are Rs. 25 per order and carrying charges are 12.5% of the average inventory value. Find the economic order quantity, number of orders per year, time period per order and the total cost.

(b) A company manufactures around 200 mopeds. Depending upon the availability of raw materials and other conditions the daily production has been varying frtom 196 mopeds to 204 mopeds, whose probability distribution is as given below:

Production/day	196	197	198	199	200	201	202	203	204
Probability	0.05	0.09	0.12	0.14	0.20	0.15	0.11	0.08	0.06

The finished mopeds are transported in a specially designed three storied lorry that can accommodate only 200 mopeds. Using the following 15 random numbers 82, 89,78,24, 53, 61, 18, 45, 04, 23, 50, 77, 27, 54 and 10 , simulate the process to find out

(i) What will be the average number of mopeds waiting in the factory ?

(ii) What will be the number of empty spaces in the lorry ?

(c) (i) Describe the simulation process. What are the advantages and limitations of simulation ?

(ii) Represent in the form of a table the various types of inventory control models.

5. Attempt any **two** parts of the following : **(10×2=20)**

(a) Explain the characteristics of Queuing Model. A person repairing radios finds that time spent on the radio sets has exponential distribution with mean 20 minutes. If the radios are repaired in the order in which they come in and their

arrival is approximately Poisson with an average rate of 15 for 8-hours day, what is the repairman's expected idle time each day ? How many jobs are ahead of the average set just brought in ?

(b) A small project is composed of 7 activities whose time estimates are listed below. Activities are being identified by their beginning (i) and ending (j) node numbers.

Activity		Time		
i	j	T_o	T_m	T_p
1	2	1	1	7
1	3	1	4	7
1	4	2	2	8
2	5	1	1	1
3	5	2	5	14
4	6	2	5	8
5	6	3	6	15

1. Draw the network

2. Calculate the expected variances for each

3. Find the expected project completed time

4. Calculate the probability that the project will be completed at least 3 weeks before than expected.

5. If the project due date is 18 weeks , what is the probability of not meeting the due date ?

(c) (i) Differentiate between CPM and PERT.

(ii) Discuss the cost associated with queueing system.