Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 714603 **Date: 30-12-2013**

Subject Name: Advance Operation Research

Time: 10.30 am – 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** What is operation research? Discuss limitations, significance and scope of OR in modern management. **07**

(b) The manager of an oil refinery has to decide upon the optimal mix of two possible blending processes, of which the inputs and the outputs per production runs are as follows: **07**

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 150 units respectively. Market requirements show that at least 100 units of gasoline X and 80 units of gasoline Y must be produced. The profits per production run from process 1 and 2 are Rs. 3 and Rs. 4 respectively. Formulate the problem as a LP problem.

Q.2 **(a)** Solve the following LP problem graphically. Minimize $Z = 3X_1 + 5X_2$ **07**
$-3X_1 + 4X_2 \leq 12$; $-2X_1 - X_2 \geq -2$; $2X_1 + 3X_2 \geq 12$; $X_1 \leq 4$; $X_2 \geq 2$; $X_1, X_2 \geq 0$;

(b) Define the following and indicate their significance to simplex method. **07**
i)Degeneracy, ii)Multiple optima, iii)Infeasibility

OR

(b) Solve the following problem by simplex method. Maximize $Z = 10X_1 + 20X_2$ **07**
$2X_1 + 4X_2 \geq 16$; $X_1 + 5X_2 \geq 15$; $X_1, X_2 \geq 0$;

Q.3 **(a)** What is the significance of duality in linear programming problem? Write general rules for writing the dual of a LP problem. **05**

(b) i) What is degeneracy in transportation problem? How it is resolved? **09**
ii) Analyze the following cases write your findings:
Case-1) IBFS does not degenerate but at later stage it degenerates. Why?
Case-2) IBFS degenerate and during optimization it happens that degeneracy disappears. Why?

OR

Q.3 **(a)** Consider the following unbalanced transportation problem. **07**

From\To	1	2	3	Supply
1	5	1	7	10
2	6	4	6	80
3	3	2	5	
Demand	75	20	50	

Since there is not enough supply, some of the demands at these destinations may not be satisfied. The penalty costs for every unsatisfied demand unit for destination 1, 2 and 3 are 5, 3 and 2 respectively. Find the optimum solution. Apply VAM for initial solution.

(b) Solve the following assignment problem and obtain the minimum cost at which all the jobs can be performed. **07**

Worker	Job cost in thousands of rupees				
	1	2	3	4	5
A	25	18	32	20	21
B	34	25	21	12	17
C	20	17	20	32	16
D	20	28	20	16	27

Q.4 **(a)** Discuss similarities and limitations of CPM and PERT. Explain the applications of CPM/PERT in project planning. **07**

(b) Draw the network diagram for the given data and identify the critical path. Also find out total float for all the non critical activities. **07**

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Time(day)	2	8	10	6	3	3	7	5	2	8

OR

Q.4 **(a)** The time estimates in weeks for the activities of a PERT network are: **07**

Activity	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

i. Draw the network and identify critical path and project duration
ii. Find out the expected time and variance for each activity
iii. What is the probability that the project will be completed at least 4 weeks earlier than expected time? (For z = -1.33, Area = 0.9082)

(b) Write a short note on: **07**
(1) Resource leveling (2) Resource smoothening

Q.5 **(a)** i. Write a short note on integer linear programming? **07**
ii. What is the concept of Gomory's cutting plane method?

(b) Discuss the basic elements of waiting line problem. Give some application of queuing theory. Also explain the terms: balking and queue discipline. **07**

OR

Q.5 **(a)** Solve the following problem by using the principle of dominance. **07**

Player A	Player B				
	I	II	III	IV	V
I	1	3	2	7	4
II	3	4	1	5	6
III	6	5	7	6	5
IV	2	0	6	3	1

(b) Define the following network techniques with suitable example. **07**
1. Maximal Flow Problem
2. Shortest Path Problem

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