Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – SUMMER • 2014

Subject Code: 161601 **Date: 28-05-2014**

Subject Name: Modeling Simulation and 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)** Give any two definitions of Operation Research and formulate the Linear Programming Problem for the following: **07**

A factory makes two types of products A and B and sells them at a profit of Rs. 5 per unit on type A and Rs. 2 per unit on type B. Each product is processed on two machines M1 and M2. Type A requires 1 minute of processing time on M1 and 2 minutes on M2. Type B requires 1.5 minutes on M1 and 2.5 minutes on M2. The machines M1 and M2 are available for 6 hours 30 minutes and 9 hours respectively.

(b) (1) Explain Operation Research methodology in brief. **03**

(2) Find the dual for the following LPP. **04**

(i) Maximize $Z = 3x + 4y + 5z$

subject to $x + 2y + z \leq 10$,

$7x + 3y + 9z \leq 12$,

x, y and z are non-negative

(ii) Minimize $Z = y1 + 2y2$

subject to $3y1 + 4y2 \geq 5$

$2y1 + 6y2 \geq 6$

$y1 + y2 \geq 2$

y1 and y2 are non-negative

Q.2 **(a)** Solve the following LPP using graphical method. **07**

Minimize $Z = 4x + 5y$

Subject to

$x + y \geq 1$

$x + 2y \leq 4$

$y \leq 4$

$x \leq 4$

$x \geq 0, y \geq 0$

(b) Solve the following LPP using Simplex method **07**

Maximize $Z = 45x1 + 80x2$

subject to,

$5x1 + 20x2 \leq 400$

$10x1 + 15x2 \leq 450$

$x1 \geq 0, x2 \geq 0$

OR

(b) Solve the following using Two phase method. **07**

Minimize $Z = 40x1 + 24x2$

Subject to,

$20x1 + 50x2 \geq 4800$

$80x1 + 50x2 \geq 7200$

$x1 \geq 0$ and $x2 \geq 0$

Q.3 **(a)** A company has three plants at location A, B and C which produce the same product. It has to supply this to buyers located at P, Q and R. The weekly plant capacities for A, B and C are 250, 800 and 350 units respectively, while the buyer requirements are 700, 200 and 500 for P, Q and R respectively. The unit shipping costs (in Rs) are given as: **07**

	Buyers		
Plant	P	Q	R
A	8	4	10
B	9	7	9
C	6	5	8

Determine the distribution for the company so as to minimize the cost of transportation using Least Cost Method.

(b) (1) Explain the following cases with respect to transportation problem: **04**

(i) Balanced/unbalanced problem

(ii) Prohibited Routes

(2) Write the full form of PERT and CPM and give the differences between PERT and CPM. **03**

OR

Q.3 **(a)** Discuss an assignment model. Support your discussion with proper example and also state the difference(s) between a transportation problem and an assignment problem. **07**

(b) Obtain the optimal solution using Stepping Stone method with the following given initial feasible solution of transportation problem with three sources (S1, S2 and S3) and four destinations (D1, D2, D3 and D4). **07**

	Destination(s)				
Source(s)	D1	D2	D3	D4	Supply
S1	12 [180]	10 [150]	12 [170]	13	500
S2	7	11	8 [180]	14 [120]	300
S3	6	16	11	7 [200]	200
Demand	180	150	350	320	

Q.4 **(a)** (1) What is critical path? State the necessary and sufficient conditions of critical path. **03**

(2) Draw the network diagram for the following information for eight activities **04**

Activity Name	A	B	C	D	E	F	G	H
Immediate Predecessor(s)	--	A	A	C	C	B, C	B, C	D, F

(b) What do you mean by random number? Explain the same with its applications and also describe the method to generate such numbers. **07**

OR

Q.4 **(a)** Information on the activities required for a project is as follows: **07**

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

Draw the network and calculate the earliest start (ES), earliest finish (EF), latest start (LS) and latest finish (LF) times of each of the activities. Tabulate your results.

(b) What do you mean by Minimum Spanning Tree? Discuss any algorithm for finding minimum spanning tree. Support your answer with an appropriate example. **07**

Q.5 **(a)** (1) "Simulation is typically the process of carrying out sampling experiments on the models of the system rather than the system itself." Elucidate this statement by taking an example. **03**

(2) The XYZ service station has a central store where service mechanics arrive to take spare parts for the job they work upon. The mechanics wait in queue if necessary and are served on a first-come-first-served basis. The store is manned by one attendant who can attend 8 mechanics in an hour on an average. The arrival rate of the mechanics averages 6 per hour. Assuming that the pattern of mechanics' arrivals is Poisson distributed and the servicing time is exponentially distributed. Find the utilization parameter and the probability that this system is idle. **04**

(b) Discuss the following queuing structures and give example(s) from real life applications for the same queuing structures: **07**

(i) First-come-first-served
(ii) Last-come-first-served
(iii) Service-in-random-order

OR

Q.5 **(a)** What is replacement problem? Describe some important replacement situations and policies. **07**

(b) What is a queuing problem? Discuss the types of Queuing Systems using six character code. **07**

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