Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI• EXAMINATION–SUMMER 2015

Subject Code: 161601 **Date:14/05/2015**

Subject Name: Modelling Simulation and Operations Research

Time:10:30 am to 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 Operations Research? Write its applications and also explain various phases of Operations Research study. **07**

(b) A firm manufactures two products P1 and P2, both of which have to be processed on two machines M1 and M2. Product P2 requires 4 hours on both machines, while product P1 requires 6 hours on machine M1 and 2 hours on machine M2. The available hours on machine M1 and machine M2 are 24 and 16 respectively. The profit per unit is estimated at Rs 50 for product P1 and Rs 100 for product P2. Formulate the problem and solve graphically. **07**

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

Maximize $Z = 40x + 35y$

subject to

$2x + 3y \leq 60$

$4x + 3y \leq 96$

$x, y \geq 0$

(b) Solve the following LPP using two-phase method. **07**

Minimize $Z = 40x1 + 24x2$

subject to:

$20x1 + 50x2 \geq 4800$

$80x1 + 50x2 \geq 7200$

$x1, x2 \geq 0$

OR

(b) Obtain initial solution using Vogel's approximation method for the following transportation problem. **07**

From/To	P	Q	R	S	Supply
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	1	4	2	19
Demand	21	25	17	17	

Q.3 **(a)** Briefly discuss duality in Linear Programming Problem. Write the steps to convert a given primal problem into a dual problem. Also find dual for the following LPP. **07**

Maximize $Z = x + 3y + 6z$

subject to

$3x + z \leq 10$

$2x + 5y + 4z \leq 8$

$x, y, z \geq 0$

(b) Solve the following assignment problem using Hungarian assignment method. **07**

Worker	Job			
	A	B	C	D
1	35	41	53	43
2	43	43	45	34
3	36	34	44	53
4	44	41	48	42

OR

Q.3 **(a)** Briefly discuss bounded feasible region and unbounded feasible region in graphical method of LPP. Using graphical method, state the whether the region is bounded or not for the following LPP. **07**

Maximize $Z = 10x1 + 20x2$

Subject to

$2x1 + 4x2 \geq 16$

$x1 + 5x2 \geq 15$

$x1$ and $x2 \geq 0$

(b) The ABC station has a central store where service mechanics arrive to take spare parts for the jobs 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 16 mechanics in an hour on an average. The arrival rate of the mechanics averages 12 per hour. Assuming that the pattern of mechanics' arrivals in Poisson distributed and the servicing time is exponentially distributed. Determine the following: **07**

(i) Utilization parameter

(ii) The probability that the given system is idle.

(iii) Expected number of mechanics in the store.

(iv) Expected number of mechanics waiting for their service.

Q.4 **(a)** Draw the network diagram for the following information for ten activities: **07**

Activity	A	B	C	D	E	F	G	H	I	J
Immediate	----	----	B	A,B	A,B	B	E,D,F	D,E	E,F	H,G,I,C

(b) (1) Define Slack variable and artificial variable of Linear Programming Problem with example. **03**

(2) Discuss the following special cases with respect to transportation problem: **04**

- unbalanced problem
- prohibited routes

OR

Q.4 **(a)** (1) Justify the following statement: **02**

"PERT is probabilistic in nature while CPM is deterministic.

(2) In the following transportation table, initial solution is given by NWC method. Find and trace closed loop for unoccupied cells (PF, QD, RD, and RE) and also find opportunity cost for the same cells. **05**

From/To	D	E	F	Supply
P	80 5	20 1	3	100
Q	3	10 3	15 5	25
R	6	4	75 4	75
Demand	80	30	90	

(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)** Discuss the importance of queuing systems. Explain the types of queuing system with the help of six-character code. **07**

(b) (1) Write a brief note on : Random Number Generation **03**

(2) Briefly discuss maximal flow problem. **04**

OR

Q.5 **(a)** Discuss the term modelling and simulation in brief. Write the advantages and disadvantages of simulation. **07**

(b) What is a replacement problem? Describe some important replacement situation. Also discuss group replacement problem **07**

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