

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V • EXAMINATION – SUMMER • 2014****Subject Code: 152005****Date: 24-06-2014****Subject Name: Quantitative Techniques in Management****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 Solve the following LPP by Big-M method: **14**

$$\begin{aligned} \text{Maximize } Z &= 6x_1 + 4x_2 \\ \text{Subject to } 2x_1 + x_2 &\leq 30 \\ 3x_1 + 2x_2 &\leq 24 \\ x_1 + x_2 &\geq 3 \\ x_1, x_2 &\geq 0 \end{aligned}$$

Q.2 (a) A manufacturer, finds from his past records that the costs per year associated with a machine with a purchase price of Rs. 50,000 are as given below : **07**

Year	1	2	3	4	5	6	7	8
Running Cost (maintenance) Rs.	15000	16000	18000	21000	25000	29000	34000	40000
Scrap Value Rs.	35000	25000	17000	12000	10000	5000	4000	4000

Determine the optimum replacement policy.

(b) Explain infeasibility, unboundedness and feasible region in graphical method. **07****OR****(b)** Use graphical method to solve the following LPP: **07**

$$\begin{aligned} \text{Minimize } Z &= 30x_1 + 10x_2 \\ x_1 + 2x_2 &\leq 40 \\ 3x_1 + x_2 &\geq 30 \\ 4x_1 + 3x_2 &\geq 60 \\ x_1, x_2 &\geq 0 \end{aligned}$$

Q.3 (a) The machines in production shop breakdown at an average of 2 per hour. The non-productive time of any machine costs Rs.30 per hour. If the cost of repairman is Rs.50 per hour and the repair rate is 3 per hour. Calculate: **07**

- (a) Number of machines not working at any point of time.
- (b) Average time that a machine is waiting for a repairman.
- (c) Cost of non-productive time of the machine operator.
- (d) Expected cost of system per hour.

- (b) Construct a network diagram from the following information and determine the critical path. **07**

Activity	Immediate Predecessor	Duration (Months)
A	-	2
B	A	4
C	A	6
D	B	8
E	C	6
F	C	10
G	E	10
H	F	14
I	G,H	8
J	G,H	12
K	I	4
L	J	10

OR

- Q.3** There are four jobs each of which has to be processed on machines A, B, C, D, E, F in the order ABCDEF. Processing time in hours is given below. Find out the optimal sequencing of jobs, minimum time required to process these jobs and the idle time for each of these machines. **14**

JOBS	MACHINES					
	A	B	C	D	E	F
1	15	8	6	14	6	26
2	17	7	9	10	15	22
3	21	7	12	9	11	19
4	18	6	11	12	14	17

- Q.4** Find the initial feasible solution with the help of Vogel's Approximation Method. Also find out the optimal solution. Compute the total minimum transportation cost based on the optimal solution. **14**

	Warehouse 1	Warehouse 2	Warehouse 3	Warehouse 4	Supply
Factory 1	48	60	56	58	140
Factory 2	45	55	53	60	260
Factory 3	50	65	60	62	360
Factory 4	52	64	55	61	220
Demand	200	320	250	210	

OR

- Q.4 (a)** Draw a network diagram corresponding to the following information. Obtain the early and late start and finish times of each activity. Also determine all the critical activities. **07**

Activity	1-2	1-3	2-6	3-4	3-5	4-6	5-6	5-7	6-7
Duration	4	6	8	7	4	6	5	19	10

- (b) Following is the past data available for four players who have played at different batting order against Australia. Indian Captain wants to decide the batting order for the first four batsmen in such a way that the total score is maximum in early overs. **07**

	I	II	III	IV
Rohit Sharma	52	45	38	31
Shikhar Dhavan	40	35	30	25
Virat Kohli	40	35	30	25
Ajinkya Rahane	34	30	26	22

Is there any alternative solution? If yes mention it. Also compute the maximum score.

- Q.5** The Oil India Corporation is considering whether to go for an offshore drilling contract to be awarded to Bombay High. If they bid, value would be Rs. 600 million with 65% chance of getting the contract. The corporation may set up a new drilling operation or move the already existing operation, which has proved successful to new site. The probability of success and expected returns are as follows: **14**

Outcome	New Drilling operation		Existing operation	
	Probability	Expected Revenue in Millions Rs.	Probability	Expected Revenue in Millions Rs.
Success	0.75	800	0.85	700
Failure	0.25	200	0.15	350

If the Corporation does not bid or lose the contract, they can use Rs. 600 million to modernize their operations. This would result in a return of either 5% or 8% of the money invested with probabilities of 0.45 and 0.55 respectively.

- Construct a decision tree for showing clearly courses of actions.
- Suggest the actions to be taken with priorities.

OR

- Q.5** (a) Explain the general structure of a queuing system with its important elements. **07**
 (b) A company has to assign four workers A, B, C & D to four jobs W, X, Y & Z. The cost matrix is as under: **07**

	W	X	Y	Z
A	1000	1200	400	900
B	600	500	300	800
C	200	300	400	500
D	600	700	300	1000

Suggest the optimal assignment if for certain reasons, worker D cannot be assigned to job Y.
