

GUJARAT TECHNOLOGICAL UNIVERSITY**MBA - SEMESTER-II • EXAMINATION – WINTER 2013****Subject Code: 820007****Date: 30-12-2013****Subject Name: Research Methodology and Operation Research (RM&OR)****Time: 2.30 pm – 5.30 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)** The production volume of units assembled by three different operators (1,2 and 3) during 9 shifts are summarized below in the tabular form. Check whether there is significant difference between the production volumes of units assembled by the three operators using Kruskal-Wallis test at a significance level of 0.05 **07**

Shift No.	Operator-1	Operator-2	Operator-3
1	29	30	26
2	34	21	36
3	34	23	41
4	20	25	48
5	32	44	27
6	45	37	39
7	42	34	28
8	24	19	46
9	35	38	15

- (b)** Find the minimum spanning tree using Kruskal's algorithm to the following network. **07**

Arc	Distance	Arc	Distance
1-2	4	4-7	10
1-4	2	5-7	5
1-5	3	5-8	7
2-3	6	6-7	3
2-4	6	6-10	6
3-4	5	7-8	1
3-6	9	7-9	3
4-5	4	8-9	2
4-6	8	9-10	5

- Q.2 (a)** A production manager is faced with the problem of job allocation to his two production teams. The production rate of Team-1 is 8 units per hour, while the production rate of Team-2 is 5 units per hour. The normal working hours for each of the teams is 40 hours per week. The production manager has prioritized the following goals for the coming week: **07**

P1: Avoid underachievement of the desired production level of 550 units.

P2: Overtime operation of Team-1 is limited to 5 hours.

P3: The total overtime for both teams should be minimized.

P4: Any underutilization of regular working hours of the teams should be avoided, assign differential weights according to the relative productivity of the two teams.

Formulate this problem as a goal programming model.

- (b)** Write the importance of integer programming and different methods of solving Integer Programming. **07**

OR

- (b) The data on seven persons referring to years of service and their monthly income are as follows 07

Years of service	11	7	9	5	8	6	10
Income('000)	10	8	6	5	9	7	11

Obtain the followings :

1. Both the regression equations.
2. Correlation between both the variables.
3. What initial start would you recommend for a person applying for the job after having served in a similar capacity in another company for 13 years ?

- Q.3** (a) Write different construction methods of scaling techniques and describe any two of them. 07

- (b) Describe the drawbacks of Qualitative and Quantitative Research Design. 07

OR

- Q.3** (a) "Processing of data implies editing, coding, classification and tabulation". Describe the four operations limited to four points each, pointing out the significance of each in context of research study. 07

- (b) In a computer company, the performance indices of a randomly selected sample of programmers of each of its two branches located in different cities are summarized below in the tabular form. Apply Mann-Whitney U test to check whether the two samples are drawn from identical populations against the alternate hypothesis that the first population is significantly larger than the second population at a significance level of 0.05. 07

Performance Indices of Employees			
Branch-1	Branch-2	Branch-1	Branch-2
94	78	62	97
77	95	68	84
64	54	83	53
88	71	73	61
65	91	90	98
55	56	60	87
75	82	63	-
93	92	-	-

- Q.4** (a) What difficulties a research student can face if he collects insufficient sample size for his research? 07

- (b) The simplex tableau for a maximization problem of linear programming is given as follows : 07

		C _j	4	5	0	0	
C _B	Y _B	X _B	X ₁	X ₂	S ₁	S ₂	Ratio
5	X ₂	10	1	1	1	0	
0	S ₂	3	1	0	-1	1	
		Z _j	5	5	5	0	
		C _j -Z _j	-1	0	-5	0	

Answer the following questions, giving reasons in brief:

1. Is this solution feasible ?
2. How many units of the two products X₁ and X₂ are being produced and what is the total profit.
3. Machine A (associated with slack S₁, in hours/week) has to be shut down for repairs for 2 hours next week. What will be the effect on profits ?

OR

- Q.4 (a)** What is a hypothesis ? What characteristics it must possess in order to be a good research hypothesis ? **07**
- Q.4 (b)** Consider a transportation problem where the origins are plants and destinations are warehouses. The unit transportation costs capacity at the plants and the requirements at the depots are indicated below : **07**

Plant	Warehouse			Supply
	W ₁	W ₂	W ₃	
P ₁	1	3	15	150
P ₂	3	5	25	300
Demand	150	150	150	450

Unit transportation cost from Plant to Plant

From Plant	To	
	Plant P ₁	Plant P ₂
P ₁	0	65
P ₂	1	0

Unit transportation cost from Warehouse to Warehouse

From Warehouse	To		
	Warehouse W ₁	Warehouse W ₂	Warehouse W ₃
W ₁	0	23	1
W ₂	1	0	3
W ₃	65	3	0

Unit transportation from Warehouse to Plant

Warehouse	Plant	
	P ₁	P ₂
W ₁	3	15
W ₂	25	3
W ₃	45	55

Calculate the transportation cost by using Vogel's Approximation Method.

- Q.5 (a)** You have received a business research report done by a consultant for your firm, a life insurance company. The study is a survey of customer satisfaction based on a sample of 600. Comment on its quality. What will you look for ? **07**
- (b)** A salesman has to visit five cities A,B,C,D and E. The intercity distances are tabulated below : **07**

From/To	A	B	C	D	E
A	-	12	24	25	15
B	6	-	16	18	7
C	10	11	-	18	12
D	14	17	22	-	16
E	12	13	23	25	-

If the salesman starts from city A and has to come back to city A, which route would you advice him to take so that total distance travelled by him is minimized ?

OR

- Q.5 (a)** Solve the L.P.P graphically. **07**
 Max $Z = 10X_1 + 20X_2$
 s.t.c.
 $2X_1 + 5X_2 \geq 50$, $4X_1 + X_2 \leq 28$; $X_1, X_2 \geq 0$
- (b)** Explain the significance of a research report and the various steps involved in writing such a report. **07**
