Seat No.: Enrolment No.

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 or 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

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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 07 network.

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:
 - 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 **07** solving Integer Programming.

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

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

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 07 sample size for his research?
 - (b) The simplex tableau for a maximization problem of linear programming is **07** given as follows:

0	1 011 005 1	0110 110 1						
			Cj	4	5	0	0	
	Св	ΥB	Хв	X1	X2	S1	S2	Ratio
	5	X 2	10	1	1	1	0	
	0	S ₂	3	1	0	-1	1	
			Zj	5	5	5	0	
			Cj-Zj	-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 X_1 and X_2 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?

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

Plant		Cumply		
Piant	W 1	W2	W3	Supply
P1	1	3	15	150
P2	3	5	25	300
Demand	150	150	150	450

Unit transportation cost from Plant to Plant

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From	То				
Plant	Plant P1	Plant P2			
P1	0	65			
P2	1	0			

Unit transportation cost from Warehouse to Warehouse

Chit transportation cost from warehouse to warehouse					
From	To				
Warehouse	Warehouse W1	Warehouse W2	Warehouse W3		
W 1	0	23	1		
W2	1	0	3		
W3	65	3	0		

Unit transportation from Warehouse to Plant

Warahayaa	Pla	ant
Warehouse	P1	P ₂
W1	3	15
W2	25	3
W3	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?
 - (b) A salesman has to visit five cities A,B,C,D and E. The intercity distances are 07 tabulated below:

From/To	A	В	С	D	Е
A	-	12	24	25	15
В	6	-	16	18	7
С	10	11	-	18	12
D	14	17	22	-	16
Е	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.

Max $Z = 10X_1 + 20X_2$

s.t.c

$$2X_1+5X_2 \ge 50$$
, $4X_1+X_2 \le 28$; $X_1, X_2 \ge 0$

(b) Explain the significance of a research report and the various steps involved 07 in writing such a report.

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