

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**MBA Second Semester ( Regular / Evening ) Examination May 2010**

**Subject code: 820007**

**Subject Name: Research Methodology and Operations Research**

**Date: 28 / 05 / 2010**

**Time: 11.00 am – 01.30 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)** Prepare a research plan for marketing manager of tata Nano car who wants to know about customer satisfaction level across India who recently purchased newly Introduced car. **07**

**(b)** A farm is engaged in breeding pigs. The pigs are fed on various products grown on the farm. With a view to ensuring certain minimum nutrition for the growth of the pigs, two types of feeds A and B are purchased from the market. The contents of these feeds per unit, in nutrient constituents are as given in the following table. Formulate and solve graphically. **07**

Nutrient	Nutrient content in feeds		Minimum requirement of feed nutrient for a pig
	A	B	
M <sub>1</sub>	12	6	108
M <sub>2</sub>	3	9	81
M <sub>3</sub>	15	10	150

If feed A costs Rs. 20 and B Rs. 40 per unit, how much of each of these two should be bought, so that the total cost is minimized?

**Q.2 (a)** Test the given data using Kolmogorov –Smirnov test. **07**

	Freshman	Sophomore	Junior	Senior	Graduate
Number in each class	5	9	11	16	19

Given that critical value for D is  $1.36 / \sqrt{N}$  at  $\alpha = 0.05$

Take the KS test , with an analysis of the results of the dining club study, in terms of various class levels.

**(b)** Describe the Qualitative vs. Quantitative Research **07**

**OR**

**(b)** What is Sample Size? What features would you consider in designing a Sample Size? **07**

**Q.3 (a)** Obtain the dual of the following primal linear programming problem. **04**

Maximize  $Z_x = X_1 - 2X_2 + 3X_3$   
 Subject to the constraints,

$$-2X_1 + X_2 + 3X_3 = 2$$

$$2X_1 + 3X_2 + 4X_3 = 1$$

And  $X_1, X_2, X_3 \geq 0$

**(b)** Define Type I and Type II errors with illustration. **03**

(ii) Calculate the Average Expected time and draw network for a project with the following activity times.

Activity	Optimistic time (hrs)	Pessimistic time (hrs)	Most likely time (hrs)
2-4	1.0	5.0	3.0
2-6	1.0	7.0	4.0
4-8	4.0	16.0	7.0
6-8	1.0	5.0	1.5
8-10	1.5	14.5	3.5

OR

- Q.3 (a)** What do you mean by hypothesis? Should every research problem have hypothesis? Discuss. **07**
- (b)** Discuss the parameters to be kept in mind while structuring an instrument for primary data collection? **07**

- Q.4 (a)** A traveling salesman has to visit 5 cities. He wishes to start from a particular city, visit each city once and then return to his starting point. The traveling cost (in Rs. '000) of each city from a particular city is given below. **07**

		TO CITY				
		A	B	C	D	E
FROM CITY	A	∞	2	5	7	1
	B	6	∞	3	8	2
	C	8	7	∞	4	7
	D	12	4	6	∞	5
	E	1	3	2	8	∞

What is the sequence of visit of the sales man so that the cost is minimum?

- (b)** Explain coding, editing, and tabulation of a data. **07**

OR

- Q.4 (a)** Maruti Machines company has plants at Delhi, Calcutta and Bombay. Its major distribution centers are located at Bangalore and Jaipur. The capacity of the three Plants during next Quarter are 1000, 1500 and 1200 machines. The quarterly demand at the two distribution centers are 2300 and 1400 machines. The transportation cost per Kilometer is Rs.0.08. The Distance (kms) between the plants and the distribution centers is as given below. **07**

	Jaipur	Bangalore	Calcutta	Bombay	Delhi
Delhi	500	3000	3000	2000	-
Calcutta	2500	2000	-	2500	3000
Bombay	1500	1000	2500	-	2000
Jaipur	-	2500	2500	1500	500
Bangalore	2500	-	2000	1000	3000

Give the minimum transportation cost distribution in case the entire supply from all sources could pass through any source or destination before it is redistributed.

- (b)** What is a Research Problem? State the main issue which should receive the attention of the researcher. Give examples to illustrate your answer. **07**

- (i) The range of the profit contribution of product C (i.e. co-efficient  $C_3$  of variable  $X_3$ ) in the objective function such that current optimal product mix remains unchanged.
- (ii) What shall be the new optimal product mix when profit per unit from product C increased from Rs. 2 to Rs. 10.

$C_j$		4	6	2	0	0	
Basis		$X_1$	$X_2$	$X_3$	$S_1$	$S_2$	$b_i$
$X_1$	4	1	0	-1	4/3	-1/3	1
$X_2$	6	0	1	2	-1/3	1/3	2
$Z_j$		4	6	8	10/3	2/3	
$C_j - Z_j$		0	0	-6	-10/3	-2/3	

- (b) Solve the following linear programming problem using simplex method. 07

Maximize  $Z = 2X_1 + 4X_2$

Subject to the constraints

$$2X_1 + X_2 \leq 18$$

$$3X_1 + 2X_2 \geq 30$$

$$X_1 + 2X_2 = 26 \text{ and}$$

$$X_1, X_2 \geq 0$$

**OR**

- Q.5 (a) Distinguish between null hypothesis and alternative hypothesis 04
- (b) Obtain optimal solution of the following problem using modified distribution method 05

FROM	TO				Supply
	P	Q	R	S	
A	12 <sup>(180)</sup>	10 <sup>(150)</sup>	12 <sup>(170)</sup>	13	500
B	7	11	8 <sup>(180)</sup>	14 <sup>(120)</sup>	300
C	6	16	11	7 <sup>(200)</sup>	200
Demand	180	150	350	320	1000

- (c) Explain Internal and External source of Secondary data. 05

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