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**SVKM's Narsee Monjee Institute of Management Studies (NMIMS)
SCHOOL OF DISTANCE LEARNING**

Programme: PGDSCM/ADSCM **Year:** I
Semester: I (2009-2010) **Time:** 3 hours **Max Marks:** 100
Subject: QUANTITATIVE METHODS / ~~TECHNIQUES~~
Date: January 02, 2010 **Time:** 11 am to 2 pm

- Instructions:**
- 1) Choice for the various questions is indicated in italics, in bold
 - 2) Use of cell phones for any purpose strictly prohibited
 - 3) Marks for each of the questions is indicated at the beginning of the questions
 - 4) Graphs/diagrams to be drawn in the answer book itself

Attempt any two out of question nos. (1) , (2) , (3) and (4). Each of these questions carries five (5) marks. {TOTAL = 10 marks}

Q1) Determine the coordinates and nature of any turning points on the curve

$$y = x^3 - 7.5x^2 + 18x + 6$$

Q2) The table below gives the marks of 9 students. Calculate the standard deviation.

Roll No.	1	2	3	4	5	6	7	8	9
Marks	43	48	65	57	31	60	37	48	78

Q3) Use a scatter diagram to establish the correlation for the following values of x and y

x	2	3	5	6	8	9	7	5	4	9
y	6	5	7	8	12	11	10	6	7	13

Draw the diagram in your answer book itself

Q4) Use Gauss-Elimination method to find the inverse of the matrix: $A = \begin{bmatrix} 4 & 5 \\ 2 & 3 \end{bmatrix}$

Write short notes on any three (3) out of five (5). Each short note carries 5 marks {TOTAL = 15 marks}

Q5 a) Enumerate the limitations of graphs and diagrams in statistics

Q5 b) What are the merits and limitations of the Rank Correlation Method?

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- Q5 c) State and briefly explain the concept of Baye's theorem
- Q5 d) State any five properties of the normal distribution
- Q5 e) Briefly explain the OR techniques of 'queuing' theory and 'simulation'.

Attempt any three (3) questions out of five (5) questions from question nos. (6), (7), (8), (9) and (10). Each of these questions carries 15 marks {TOTAL = 45 marks }

- Q6) A finance company has offices located in every division, every district and every taluka in a certain State in India. Assume that there are 5 divisions. Each office has one head clerk (HC), one cashier (Ca), one clerk (Cl), and one peon (P). A divisional office has, in **addition**, one office superintendent (OS), two clerks, one typist (Ty), one peon.. A district office has, in **addition**, one clerk and one peon. The basic monthly salaries are as follows: OS = Rs 5,000 ; HC = Rs 2,000 ; Ca = Rs 1,750 ; Cl = Rs 1,500 ; Ty = Rs 1,500 ; P = Rs 1,000.

Represent the above data in **matrix** form. Then, using **matrices only**, find the total

- i) number of posts of each kind in all the offices taken together
- ii) basic monthly salary bill for each kind of office
- iii) basic monthly salary bill for all the offices taken together
- Q7) The variable cost associated with a certain process is Rs 0.65 per item. The fixed cost per day has been calculated as Rs 250, with a special cost being estimated as Rs $0.02x^2$, where 'x' is the size of production run (i.e., number of items produced).
- i) Derive a function to describe cost per item for a day's production
- ii) Calculate the size of the daily run that will minimize cost per item
- iii) Find the cost for a day's production for a run that minimizes cost per item

- Q8) Find the Karl Pearson's Coefficient of Skewness for the following data

C.I.	0-5	5-10	10-15	15-20	20-25	25-30	30-35
Freq	8	18	23	39	27	15	11

- Q9) In an organization, the distribution of the wages of the workers, who number 5,000, was 'normal'. The mean wages of the workers were calculated as Rs 800 per month, and the standard deviation was worked out to be Rs 200. On the basis of this information, estimate:
- The number of workers getting salary between Rs 700 and Rs 900
 - The percentage of workers getting salary above Rs 1,000
 - Proportion of workers getting salary below Rs 600
 - The minimum wage for the highest paid 10% of the workers
 - The maximum wage for the lowest paid 15% of the workers

$$[\text{Given: } P(-0.5 < z < +0.5) = 0.3830 ; P(0 < z < 1.00) = 0.3413 ; \\ P(0 < z < 1.28) = 0.4 ; P(0 < z < 1.035) = 0.35]$$

- 10) A company manufactures two products, namely A and B. Product A yields a contribution of Rs 30 per unit, and for product B, it is Rs 40 per unit. It is estimated that the sales for product A for the coming month will not exceed 20. The sales for product B have not been estimated, but the company does have a contract to supply at least 10 units of product B to a regular customer.

The total available machine hours for the coming month are 100 hours. Product A and product B require 4 hours and 2 hours per unit respectively. Total labour hours available are 180 and product A requires 4 hours of labour per unit and product B requires 6 hours of labour per unit. Total materials available are restricted to 40 units and the two products, namely, A and B, each require one unit of material for each of their units produced.

Solve the above linear programming problem *graphically* to maximize the contribution.

Question nos. (11) and (12) are both compulsory. Each question carries 15 marks.
{TOTAL = 30 marks}

- 11) A private firm employs typists on an hourly piece-rate basis for their daily work. Five typists are working in that firm and their charges and speeds are different. On the basis of some earlier understanding, only one job is given to one typist and the typist is paid for full hours even though when he or she works for a fraction of an hour. Using Assignment technique, find the least cost allocation for the following data:

Typist	Rate per hour	No. of pages typed per hour	Job	No. of pages
A	5	12	P	199
B	6	14	Q	175
C	3	8	R	145
D	4	10	S	298
E	4	11	T	178

12) A department store wishes to purchase the following types of sarees:

Types of sarees	A	B	C	D	E
Quantity	150	100	75	250	200

Tenders are submitted by four different manufacturers who undertake to supply not more than the quantities mentioned below (all types of sarees combined):

Manufacturer	W	X	Y	Z
Total Quantity	300	250	150	200

The store estimates that the profit per saree will vary with the manufacturer as shown below:

Manufacturer ↓	S A R E E →				
	A	B	C	D	E
W	275	350	425	225	150
X	300	325	450	175	100
Y	250	350	475	200	125
Z	325	275	400	250	175

Use the transportation technique to determine how the orders should be placed. What is the maximum profit? Test your solution for optimality.