



ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER - 2008

QUANTITATIVE METHODS - I

SEMESTER - 1

Time : 3 Hours]

[Full Marks : 70

Graph sheet is provided on Page 31.

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any ten of the following : 10 × 1 = 10

i) Variance is dependent on

- a) origin only
 b) scale only
 c) both origin and scale.

ii) The chart in which different categories of data are represented as percentage of 360° is called

- a) Pie chart b) Histogram.
 c) Ogive d) Bar Diagram.

iii) The number of permutations of n different things taken r at a time in which p particular things will never occur is

- a) $(n-p)P_r$ b) nP_r
 c) $(n-p)P_{(r-p)}$ d) $nP_{(r-p)}$

iv) If BCA (A and B are two arbitrary sets), then

- a) $P(A \cap \bar{B}) = P(A) - P(B)$
 b) $P(A \cap \bar{B}) = P(A) - P(\bar{B})$
 c) $P(A \cap \bar{B}) = P(A) + P(B)$
 d) $P(A \cap \bar{B}) = P(B) - P(A)$.

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- v) If A and B are two sets, then $A - B$ is
- a) $A \cup B^c$
 - b) $A^c \cup B$
 - c) $A \cap B^c$
 - d) $A^c \cap B$
- vi) The number of ways 10 persons can occupy 10 chairs arranged at a round table is
- a) $10! - 1$
 - b) $9! - 1$
 - c) $10!$
 - d) $9!$
- vii) If $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$, $P(A \cap B) = \frac{1}{4}$, then $P(A \cup B)$ is
- a) $\frac{7}{12}$
 - b) $\frac{1}{6}$
 - c) $\frac{5}{12}$
 - d) none of these.
- viii) S. D. of two values is
- a) half of their difference
 - b) half of their summation
 - c) square root of their product
 - d) none of these.
- ix) If the correlation between x and y is 0.5, the correlation between $5x$ and $-3y$ will be
- a) 0.5
 - b) -0.5
 - c) 2
 - d) -2.
- x) The value of $\int e^{\log(2x)} dx$ is
- a) $\log(2x) + c$
 - b) $\log(x^2) + c$
 - c) $2x + c$
 - d) $x^2 + c$.
- xi) The function $f(x) = e^x + e^{-x}$ is
- a) even
 - b) odd
 - c) neither even nor odd.



xii) For a square matrix A

a) $|A| = -|A^t|$

b) $|-A| = |A^t|$

c) $|A| = |A^t|$

d) none of these.

xiii) For two matrices $A_{(m \times n)}$ and $B_{(n \times p)}$

a) $(AB)^{-1} = A^{-1}B^{-1}$

b) $(AB)^{-1} = AB^{-1}$

c) $(AB)^{-1} = B^{-1}A^{-1}$

d) none of these.

xiv) If $u = x^2 + xy + y^2$ then $x \frac{\delta u}{\delta x} - y \frac{\delta u}{\delta y}$ is

a) $x^2 - y^2$

b) $2x^2 + 2y^2$

c) $x^2 + y^2$

d) $2x^2 - 2y^2$

GROUP - B

(Short Answer Type Questions)

Answer any three of the following.

3 × 5 = 15

2. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ show that $A^2 - 4A + 3I_2 = 0$.

Hence find A^{-1} .

3. Differentiate $\log [x + \sqrt{1 + x^2}]$ with respect to x .

4. What is the probability of getting 3 white balls in a draw of 3 balls from a box containing 5 white and 4 black balls?

5. a) What is a scatter diagram?

b) If Pearson's coefficient of correlation between x and y is 0.52, then their covariance is +7.8 and the variance of x is 16, find the S.D. of y .

6. If $A = \{ \text{all positive integers less than 5} \}$, $B = \{ \text{the roots of the equation } x^2 - 5x + 6 \}$ find $A - B$ and $A \times B$.

7. Write short notes on :

a) Quartile Deviation

b) Kurtosis.

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**GROUP - C****(Long Answer Type Questions)**Answer any *three* questions. $3 \times 15 = 45$

8. a) In a statistical investigation of 1003 families of Kolkata, it was found that 63 families had neither a Radio nor a T.V., 794 families had a radio and 187 a T.V. each. How many families in that group had both a radio and a TV ?
- b) Solve the system of equation by Matrix Inversion Method :
- $$2x + y + z = 5,$$
- $$x - y = 0,$$
- $$2x + y - z = 1.$$
- c) In how many ways can 5 books on economics, 7 books on management and 4 books on mathematics be arranged in a shelf, if all the books on economics are kept together ? $5 + 5 + 5$
9. a) Define "Covariance" and "Correlation".
- b) Prove that Co-efficient of Correlation of the two variates will lie in between + 1 and - 1.
- c) Marks of 10 students in Mathematics and Statistics are given below :
- | | | | | | | | | | | |
|---------------|----|----|----|----|----|----|----|----|----|----|
| Mathematics : | 32 | 38 | 48 | 43 | 40 | 22 | 41 | 69 | 35 | 64 |
| Statistics : | 30 | 31 | 38 | 43 | 33 | 11 | 27 | 76 | 40 | 59 |
- Calculate Product-moment Correlation Co-efficient. $5 + 5 + 5$
10. The following table gives the distribution of monthly income of 600 families in a certain city.

Monthly income	No. of families
Below 75	60
75 - 150	170
150 - 225	200
225 - 300	60
300 - 375	50
375 - 450	40
450 and over	20

Draw a 'less than' and a 'greater than' ogive curve for the above data on the same graph and from there read the median income.

15



11. a) The mean income per month of a friendly society of 25 members is Rs. 350 and the standard deviation is Rs. 50. Five more members are admitted to the society and their incomes in rupees per month are 260, 300, 320, 490, and 590. Find the mean and standard deviation of income for the new group of 30 members.
- b) Prove that $nC_r + nC_{r-2} + 2 \times nC_{r-1} + (n+2)C_r$. 10 + 5

12. a) Calculate the mean and median of the following :

Income (Rs.) :	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
No. of workers :	5	15	20	20	10	5

- b) Find the maximum and minimum values of $x^3 - 3x^2 - 9x + 27$.
- c) Evaluate $\int_1^4 \left(\sqrt{x} + \frac{1}{\sqrt{x}} \right) dx$. 6 + 5 + 4
13. a) With the help of 'Lagrange's Multiplier' find the minimum value of $x^2 + y^2 + z^2$, subject to the condition $2x + 3y + 5z = 30$.
- b) State and prove Bayes' theorem. 7 + 8

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