

MATHEMATICS PAPER IIA.- MAY 2011.

ALGEBRA AND PROBABILITY.

TIME : 3hrs

Max. Marks.75

Note: This question paper consists of three sections A,B and C.

SECTION A

VERY SHORT ANSWER TYPE QUESTIONS.

10X2 =20

Noe : Attempt all questions. Each question carries 2 marks.

1. For what values of x the expression x^2-5x+6 is positive.
2. If 1,1,α are roots of $x^3-6x^2+9x-4=0$ then find α
3. If $A = \begin{bmatrix} 2 & 4 \\ -1 & k \end{bmatrix}$ and $A^2 = 0$ then find the value of 'k'
4. If $A = \begin{bmatrix} 0 & 2 & 1 \\ -2 & 0 & -2 \\ -1 & x & 0 \end{bmatrix}$ is a skew symmetric matrix, then find x.
5. If ${}^n P_7 = 42. {}^n P_5$, find n.
6. Find number of ways of selecting 3 vowels and 2 consonants from the letters of word "EQUATION"
7. If ${}^{22}C_r$ is the largest Binomial coefficient in the expansion $(1+x)^{22}$ find the value of ${}^{13}C_r$
8. Find coefficient of x^3 in the expansion e^{2x+3}
9. If A,B are two events with $P(A \cup B) = 0.65$ $P(A \cap B) = 0.15$ then find $P(A^c) + P(B^c)$
10. The mean and variance of a binomial distribution are 4 and 3 respectively find n

SECTION B

SHORT ANSWER TYPE QUESTIONS.

5X4 =20

Note : Answer any FIVE questions. Each question carries 4 marks.

11. If 'x' real prove that $\frac{x}{x^2 - 5x + 9}$ lies between 1 and $\frac{-1}{11}$
12. If $\theta - \phi = \frac{\pi}{2}$, then show that $\begin{bmatrix} \cos^2 \theta & \cos \theta \sin \theta \\ \cos \theta \sin \theta & \sin^2 \theta \end{bmatrix} \begin{bmatrix} \cos^2 \phi & \cos \phi \sin \phi \\ \cos \phi \sin \phi & \sin^2 \phi \end{bmatrix} = 0$
13. If letters of the word "MASTER" are permuted in all possible ways and the words thus formed are arranged in a dictionary order then find the rank of the word "MASTER"
14. Simplify ${}^{34}C_5 + \sum_{r=0}^4 {}^{(38-r)}C_4$

15. Resolve into partial fractions $\frac{2x^2 + 3x + 4}{(x-1)(x^2 + 2)}$
16. Show that $\frac{1}{2x+1} + \frac{1}{3(2x+1)^3} + \frac{1}{5(2x+1)^5} + \dots = \log_e \sqrt{\frac{x+1}{x}}$
17. Let A and B be independent events with $P(A)=0.2$ $P(B)=0.5$ find i) $P(A/B)$ ii) $P(B/A)$ iii) $P(A \cap B)$ iv) $P(A \cup B)$

SECTION C

LONG ANSWER TYPE QUESTIONS.

5X7 =35

Note: Answer any Five of the following. Each question carries 7 marks.

18. Solve $18x^3 + 81x^2 + 121x + 60 = 0$, given that a root is equal to half the sum of the remaining roots.

19. Show that
$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

20. solve the equations $x+y+z=9$ $2x+5y+9z=52$ $2x+y-z=0$ by "matrix inversion"

21. If $x = \frac{1}{5} + \frac{1.3}{5.10} + \frac{1.3.5}{5.10.15} + \dots \infty$ then find the value of $3x^2 + 6x$?

22. If the coefficient of 4 consecutive terms in the expansion of $(1+x)^n$ are a_1, a_2, a_3, a_4 respectively, then show that
$$\frac{a_1}{a_1 + a_2} + \frac{a_3}{a_3 + a_4} = \frac{2a_2}{a_2 + a_3}$$

23. a) define conditional event and conditional probability
b) A bag B_1 contains 4 white and 2 black balls, bag B_2 contains 3 white and 4 black balls. A bag is drawn at random and a ball is chosen at random from it. Then what is the probability that the ball is white

24. The range of a random variable X is $\{0, 1, 2\}$. Given that $P(X=0) = 3c^3$, $P(X=1) = 4c - 10c^2$, $P(X=2) = 5c - 1$
Find (i) The value of c (ii) $P(X < 1)$, $P(1 < X \leq 2)$ and $P(0 < X \leq 3)$