MATHEMATICS PAPER IIA - MARCH 2010

ALGEBRA AND PROBABILITY

TIME : 3hrs **Max. Marks.75**

SECTION A

VERY SHORT ANSWER TYPE QUESTIONS. **10X2 =20**

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

1. If α and β are the roots of the equation $ax^2 + bx + c = 0$ then find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$

2. If -1, 2 and α are the roots of $2x^3+x^2-7x-6 = 0$ then find 'α'.

3. If $A = \begin{bmatrix} -2 & 1 \\ 5 & 0 \\ -1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 3 & 1 \\ 4 & 0 & 2 \end{bmatrix}$ find $2A + B^T$

4. Find the determinant of $\begin{bmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{bmatrix}$

5. If ${}^{(n+1)}P_5 : {}^{n}P_6 = 2:7$ find n

6. Find ${}^{10}C_5 + 2.{}^{10}C_4 + {}^{10}C_3$

7. Find the coefficient of x^{-7} in the expansion of $\left(\frac{2x^2}{3} - \frac{5}{4x^5}\right)^{11}$

8. Find $1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + ...$

9. If A, B are two events with $P(A) = 0.5, P(B) = 0.4$ and $P(A \cap B) = 0.3$, then find probability of neither A nor B occurs.

10. A Poisson variable satisfies P(X = 1) = P(X = 2). Find P(X = 5)

SECTION B

SHORT ANSWER TYPE QUESTIONS. **5X4 =20**

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

11. Determine the range of the expression $\frac{x^2+x+1}{x^2-x+1}$, x€R

12. If $I\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$ and $E=\begin{bmatrix}0 & 1\\0 & 0\end{bmatrix}$ then show that $(aI+bE)^3=a^3I+3a^2bE.$

13. Find the sum of all four digited numbers that can be formed using the digits 1,2,4,5,6 with out repetition.

14. Find the number of ways of forming a committee of 5 persons from a groupof 5 Indians and 4 Russians such that there are atleast 3 Indians in the committee.

15. Resolve $\frac{x}{(x-1)(x-2)}$ in to partial fractions.

16. Show that $\frac{1}{2.3}+\frac{1}{4.5}+\frac{1}{6.7}+.......=1-\log_e 2$

17. If A, B, C are three independent events of an experiment such that

$$P\left(A\cap B^c\cap C^c\right)=\frac{1}{4},P\left(A^c\cap B\cap C^c\right)=\frac{1}{8},P\left(A^c\cap B^c\cap C^c\right)=\frac{1}{4}$$, then find P(A), P(B) and P(C).

SECTION C

LONG ANSWER TYPE QUESTIONS. **5X7 =35**

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

18. Solve that equation $x^4-10x^3+26x^2-10x+1=0$.

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

20. Solve the equations x + y + z = 6, x – y + z = 2, 2x – y + 3z = 9 by Gauss Jordan method.

21. If P and Q are the sum of odd terms and the sum of even terms respectively in the expansion of $(x+a)^n$ then prove that i) $P^2 - Q^2 = (x^2 - a^2)^n$ ii) $4PQ = (x+a)^{2n} - (x-a)^{2n}$

22. Find the sum of the infinite series $\frac{1}{4} + \frac{5}{4\cdot 8} + \frac{5\cdot 7}{4\cdot 8\cdot 12} + \ldots\infty$

23. A,B,C are 3 news papers from a city , 20% of the population read A, 16% read B, 14% read c, 8% read both A and B , 5% both A and C, 4% read both B and C and 2% read all the three. Find the percentage of the population who read atleast one news paper and find the percentage of population who read the newspaper A only.

24. A random variable X has the following probability distribution

$X = x_i$	0	1	2	3	4	5
$P(X = x_i)$	0	k	2k	3k	4k	5k

Find k, mean and varience of X.

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