MODEL QUESTION PAPER

MATHEMATICS – Paper II A

(Algebra, Probability)

Time : 3 Hours | Max Marks : 75

Section – A

I. Very Short Answer Questions
Attempt all Questions. Each Question carries 2 marks.
10 x 2 = 20 Marks

1. If α and β are the roots of the equation $2x^2 + 3y^2 + 6 = 0$ find the quadratic equation whose roots are α^3 and β^3.

2. If the roots of the equation $x^3 - 3x^2 - 6x + 8 = 0$ are in A.P. find them.

3. If $A = \begin{pmatrix} 2 & 4 \\ -1 & k \end{pmatrix}$ and $A^2 = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$ find the value of k.

4. Find the value of the determinant of $\begin{pmatrix} 1 & w & w^2 \\ w & w^2 & 1 \\ w^2 & 1 & w \end{pmatrix}$ where $w^3 = 1$.

5. If ${}^nP_4 = 1680$ find 'n'.

6. If ${}^{21}C_{2r+1} = {}^{21}C_{r-4}$ find 'r'.

7. Find the term independent of 'x' in $\left(x^5 - \frac{1}{x^3}\right)^8$

8. If a card is drawn at random from a pack of cards, what is the probability that it is an ace or a diamond.

9. Find the sum of the infinite series

$$1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \ldots\ldots\ldots$$

10. In a Binominal distribution if the sum of the mean and the variance is 1.8 find the distribution when $n = 5$.

Section – B

II. Short Answer Questions

Attempt any five questions. Each question carries 4 marks

5 x 4 = 20 Marks

11. If x is real show that the values of the expression $\frac{x^2 - 34x - 71}{x^2 + 2x - 7}$ do not lie between 5 and 9.

12. For $1 < r \leq n$ prove, with usual notation, that

$^nC_{r-1} + {}^nC_r = {}^{(n+1)}C_{r-1}$ find 'r'.

13. Prove that $C_0C_r + C_1C_{r+1} + C_2C_{r+2} + \ldots\ldots\ldots + C_{n-r}C_n = \frac{(2n)!}{(n-r)!\,(n+r)!}$

14. Find the partial fractions of $\dfrac{x^3}{(2x-1)(x+2)(x-3)}$

15. Sum the series $log_3 e - log_9 e + log_{27} e - log_{81} e + \ldots\ldots\ldots$

16. If $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$ then show that $A2 - 4A - 5I = O$.

17. If two numbers are selected randomly from 20 consecutive natural numbers find the probability that the sum of the two numbers is
(i) an even number (ii) an odd number.

Section – C

II. Long Answer Questions 5 x 7 = 35 Marks

Attempt any five questions. Each question carries 7 marks

18. Solve $x^3 - 18x - 35 = 0$ by using Cardan's method.

19. Find the number of ways of selecting 11 members for a cricket team from 7 batsmen, 5 bowlers and 3 wicket keepers having atleast 3 bowlers and 2 wicket keepers.

20. Find the sum of the series $+\dfrac{1.3}{3.6} + \dfrac{1.3.5}{3.6.9} + \dfrac{1.3.5.7}{3.6.9.12} + \ldots\ldots\ldots$

21. Solve by Gauss-Jordan method, the system of equations :

$x + y + z = 6$

$2x + 3y - z = 3$

$3x + 5y + 2z = 19$

22. Show that

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

23. State and prove Bayes' Theorem.

24. If X is a random variable with the probability distribution

$P(X = k) = \dfrac{(k+1)C}{2^k}$ $(k = 0,1,2,\ldots..)$ then find C and also the mean of X.

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