HIGHER SECONDARY IST YEAR

MATHEMATICS

MODEL QUESTION PAPER

TIME:2 ½ HOURS **Max.Marks:90**

PART-I

All questions are compulsory.
Choose the correct answer.

1. Number of elements in a matrix of order 2x3 is
(a) 5 (b) 2 (c) 3 (d) 6

2. If A is a square matrix of order 4 then $|KA|$is
(a) $K|A|$ (b)$K^2|A|$ (c)$K^3|A|$ (d)$K^4|A|$

3. If "G" is centroid of the triagle ABC and 'O' is any other point then $\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC}$ = is equal to
(a) $\vec{O}$ (b) $\overrightarrow{OG}$ (c) 3 $\overrightarrow{OG}$ (d)4 $\overrightarrow{OG}$

4. If $\vec{a}=2\vec{\imath} - \vec{\jmath}$ and $\vec{b}=\vec{\jmath}-\vec{k}$ then the magnitude of $\vec{a}-\vec{b}$ is
(a) 1 (b)9 (c)3 (d)$\sqrt{3}$

5. A polygon has 44 diagonals, then the number of its sides is
(a) 11 (b)7 (c)8 (d)12

6. $If \ \frac{3x+7}{(x-1)(x-2)} = \frac{A}{x-2} - \frac{10}{x-1}$ then A is
(a)13 (b)–13 (c)–10 (d) 10

7. The A.M., G.M., H.M., between two positive numbers a and b are equal then
(a) a=b (b)ab=1 (c)a > b (d) a < b

8. If $a_n = n^2\ 3^{-n}$ then the third term is
(a)$\frac{1}{9}$ (b) 1 (c)$\frac{1}{3}$ (d) 3

9. If the pair of straight lines given by $ax^2+2hxy+by^2=0$ are perpendicular, then
(a) ab=0 (b) a+b=0 (c) a-b=0 (d) a=0

10. The radius of the circle $x^2+y^2-2x+4y-4=0$ is
(a) 1 (b) 2 (c) 3 (d) 4

11. If $\cos\theta$=0 then θ is

(a)n π (b) (2n+1) $\frac{\pi}{2}$ (c)$-\pi$ (d) –n π

12. If the terminal side is collinear with the initial side in the opposite direction, then the angle included is

(a) 0 ° (b) 90° (c)180° (d)270°

13. The range of the function $\log_e x$ is

(a) $(0, \infty)$ (b) $(-\infty, \infty)$ (c) $(-\infty, 0)$ (d) $[0, \infty)$

14. The value of $\lceil 3.5 \rceil$ is

(a) 2 (b) 3 (c) 4 (d) 5

15. $\frac{d}{dx}(log\sqrt{x})$ is

(a) $\frac{1}{2\sqrt{x}}$ (b) $\frac{1}{2x}$ (c) $\frac{1}{x\sqrt{x}}$ (d) $\frac{1}{2x\sqrt{x}}$

16. $\lim_{x \to \infty} \left(1+\frac{3}{x}\right)^x$ is

(a) e (b) e^x (c) e^3 (d) ∞

17. $\int \log x \ dx =$ is

(a) $\frac{1}{x}$ +c (b) $\frac{(\log x)^2}{2}$ +C (c) $x \log x + x + c$ (d) $x \log x - x + c$

18. $\int e^{2x} \sin 3x \ d(x)$ is

(a) $\frac{e^{2x}}{13}$(2sin 3x - 3 cos 3x)+c (b) $\frac{e^{2x}}{13}$(3sin 2x - 2 cos 2x)+c

(c) $\frac{e^{2x}}{13}$(2sin 3x + 3 cos 3x)+c (d) $\frac{e^{2x}}{13}$(3cos 3x + 2 sin 3x)+c

19. If two events A and B are independent then P(A/B)= ----------

(a) P(A) (b) P(A∩B) (c) P(A)=P(B) (d) $\frac{P(A)}{P(B)}$

20. X speaks truth in 95 percent of cases and Y in 80 percent of cases. The percentage of cases they likely to contradict each other in stating same fact is

(a) 14% (b) 86% (c) 23% (d) 85.5%

PART - II

Answer any SEVEN questions. 7 x 2 = 14
Question 30 is compulsory.

21. Prove that $\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}^2 = \begin{vmatrix} a_1^2+a_2^2 & a_1 b_1+ a_2 b_2 \\ a_1 b_1+ a_2 b_2 & b_1^2 + b_2^2 \end{vmatrix}$

22. If ABC and A′B′C′ are two triangles and G, G′ be their corresponding centroids, prove that $\overrightarrow{AA'}+\overrightarrow{BB'}+\overrightarrow{CC'}=3\ \overrightarrow{GG'}$

23. If $10P_r = 5040$, find the value of r.

24. A point moves so that it is always at a distance of 6 units from the point (1, -4). Find its locus.

25. Simplify : Cos (-870°)

26. If f,g : R→R, defined by f(x)=x+1 and $g(x)=x^2$ then find (fog) (3)

27. Find $\frac{d^2y}{dx^2}$ if $y=x^3-6x^2+7x+6$

28. Evaluate : $\int cos^2x\ dx$

29. Three coins are tossed once. Find the probability of getting atleast two heads.

30. show that $\frac{e^2-1}{e^2+1} = \frac{\frac{1}{11}+\frac{1}{31}+\frac{1}{51}.....}{1+\frac{1}{21}+\frac{1}{41}.....}$

PART III

Answer any SEVEN questions. 7x3=21
Question 40 is compulsory.

31. Prove that the sum of the vectors directed from the vertices to the mid-point opposite sides of a triangle is zero.

32. Find the co – efficient of x^5 in the expansion of $\left(x+\frac{1}{x^3}\right)^2$

33. Find 5 geometric means between 576 and 9.

34. The slope of one of the straight lines $ax^2+2hxy+by^2=0$ is twice that of the other, show that $8h^2=9ab$.

35. Show that : $Sin20^o\ Sin40°\ Sin\ 80° = \frac{\sqrt{3}}{8}$

36. Let f: R→R be defined by f (x) = 3x+2 find f^{-1} and show that $fof^{-1} = f^{-1}of = I$.

37. Evaluate : Lim $\frac{\sqrt{1+x}-\sqrt{1-x}}{\text{Sin}^{-1}x}$ $x \to 0$

38. Integrate : $\int (3x+4)\ \sqrt{3x+7}\ dx$

39. Two cards are drawn from a pack of 52 cards in succession. Find the probability that both are kings when,
(i) The first drawn card is replaced
(ii) The card is not replaced.

40. Find k so that $A^2 = KA - 2I$ where $A = \begin{pmatrix} 3 & -2 \\ 4 & -2 \end{pmatrix}$

PART -IV

Answer all the question : **7x5=35**

41. Using factor theorem prove that

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

(Or)

Examine whether the vectors $\vec{i}+3\vec{j}+\vec{k}$, $2\vec{i}-\vec{j}-\vec{k}$ and $7\vec{j}+5\vec{k}$ are coplanar.

42. If A + B = 45°, show that (1 + tanA) (1 + tanB) = 2 and hence deduce the value of tan $22\frac{1}{2}°$

(Or)

State and prove Napier's formulae.

43. Prove by Mathematical Induction

$1^2+2^2+3^2+\ldots\ldots\ldots\ldots+n^2 = \frac{n(n+1)(2n+1)}{6}$,for all $n \in N$

(Or)

If a,b,c are in H.P. Prove that $\frac{b+a}{b-a}+\frac{b+c}{b-c} = 2$

44. Find the equation of the circle passing through the points (1,1), (2,-1) and (3,2).

(Or)

Find the co-ordinates of orthocentre of the triangle formed by the straight lines x – y – 5 = 0, 2x – y – 8 = 0 and 3x – y – 9 = 0

45. If y = cos (sinx), Prove that $\frac{d^2y}{dx^2} + tanx\frac{dy}{dx} + y\,cos^2x = 0$

(OR)

For $\left|\frac{\Delta x}{a}\right| < 1$ and for any rational index n, prove that

$\lim_{x \to a} \frac{x^n - a^n}{x-a} = na^{n-1}$ $(a \neq 0)$

46. Evaluate the definite integral as limit of sum $\int_1^2 (2x+5)dx$

(OR)

Evaluate

$$\int \frac{3x+1}{\sqrt{2x^2+x+3}}dx$$

47. If x is real, prove that the range of f(x) = $\frac{x^2-2x+4}{x^2+2x+4}$ is between $[\frac{1}{3}, 3]$

(OR)

In a bolt factory machines A_1, A_2, A_3 manufacture respectively **25**%, 35% and **40**% of the total output of these **5**, 4, 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it was manufactured by machine A_2?
