

HIGHER SECONDARY 1ST 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 triangle ABC and 'O' is any other point then  $\vec{OA} + \vec{OB} + \vec{OC}$  is equal to  
(a)  $\vec{O}$  (b)  $\vec{OG}$  (c)  $3\vec{OG}$  (d)  $4\vec{OG}$
4. If  $\vec{a}=2\vec{i} - \vec{j}$  and  $\vec{b}=\vec{j}-\vec{k}$  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  $\theta$  is  
 (a)  $n\pi$  (b)  $(2n+1)\frac{\pi}{2}$  (c)  $-\pi$  (d)  $-n\pi$
12. If the terminal side is collinear with the initial side in the opposite direction, then the angle included is  
 (a)  $0^\circ$  (b)  $90^\circ$  (c)  $180^\circ$  (d)  $270^\circ$
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.  $\lim_{x \rightarrow \infty} \left(1 + \frac{3}{x}\right)^x$  is  
 (a) e (b)  $e^x$  (c)  $e^3$  (d)  $\infty$
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)  $\frac{e^{2x}}{13} (2\sin 3x - 3 \cos 3x) + c$  (b)  $\frac{e^{2x}}{13} (3\sin 2x - 2 \cos 2x) + c$   
 (c)  $\frac{e^{2x}}{13} (2\sin 3x + 3 \cos 3x) + c$  (d)  $\frac{e^{2x}}{13} (3\cos 3x + 2 \sin 3x) + c$
19. If two events A and B are independent then  $P(A/B) =$  -----  
 (a)  $P(A)$  (b)  $P(A \cap B)$  (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 
$$\left| \begin{array}{cc} a_1 & b_1 \\ a_2 & b_2 \end{array} \right|^2 = \left| \begin{array}{cc} a_1^2 + a_2^2 & a_1 b_1 + a_2 b_2 \\ a_1 b_1 + a_2 b_2 & b_1^2 + b_2^2 \end{array} \right|$$

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<sup>2</sup> then find (fog) (3)
27. Find  $\frac{d^2y}{dx^2}$  if y=x<sup>3</sup>-6x<sup>2</sup>+7x+6
28. Evaluate :  $\int \cos^2 x \, dx$
29. Three coins are tossed once. Find the probability of getting atleast two heads.
30. show that 
$$\frac{e^2-1}{e^2+1} = \frac{\frac{1}{11} + \frac{1}{31} + \frac{1}{51} \dots \dots \dots}{1 + \frac{1}{21} + \frac{1}{41} \dots \dots \dots}$$

**PART III**

**Answer any SEVEN questions.**  
**Question 40 is compulsory.**

**7x3=21**

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<sup>5</sup> 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<sup>2</sup>+2hxy+by<sup>2</sup>=0 is twice that of the other, show that 8h<sup>2</sup>=9ab.
35. Show that : Sin20° Sin40° Sin 80° =  $\frac{\sqrt{3}}{8}$
36. Let f: R→R be defined by f (x) = 3x+2 find f<sup>-1</sup> and show that fo f<sup>-1</sup> = f<sup>-1</sup> of = I.

37. Evaluate :  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{\sin^{-1} x}$
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  $A + B = 45^\circ$ , show that  $(1 + \tan A)(1 + \tan B) = 2$  and hence deduce the value of  $\tan 22\frac{1}{2}^\circ$

(Or)

State and prove Napier's formulae.

43. Prove by Mathematical Induction

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

(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  $y = \cos(\sin x)$ , Prove that  $\frac{d^2y}{dx^2} + \tan x \frac{dy}{dx} + y \cos^2 x = 0$   
(OR)

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

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

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  $A_2$ ?

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