CantonmentPublic School& College, Saidpur
Special Test-2020
Class:XI (EV)
Subject:Higher Mathematics 1st & 2nd Part
Time: 2 hours 35 minutesFull Marks: 50
[Answer five questions taking at least 1 from 2nd paper]
<u>1st Paper</u>

1. An important chapter of MATHEMATICS is PERMUTATION .

a. If $^nP_2 = 3 \times {}^np_3$, find the value of n.   2

b. In how many ways can the letters of the book "MATHEMATICS" be arranged where vowels will not appear together ?   4

c. Find the number of ways in which the letters of the word "PERMUTATION" may be rearranged without changing the position of any vowel.   4

2. The equationofthe threestraight lines

(i)$6x - y - 1 = 0$, (ii) $2x - 5y - 5 = 0$ **and** (iii). **$6x - y = 1$**

a. If$x + y - 1 = 0$and $px - y + 13 = 0$ represent the same straight line, find the value of P .   2

b. If A(h,k) is a point on (i) and B(k,h) is a point on (ii) ,find the equation of AB.   4

c. Find the coordinates of the middle point of the intercept ofthe straight line (iii) between the axes. If this intercept be the side of a square , find its area .   4

3. $A = \begin{bmatrix} 3 & 2 \\ 5 & -1 \end{bmatrix}$ and $D = \begin{vmatrix} a & b & ax+by \\ b & c & bx+cy \\ ax+by & bx+cy & 0 \end{vmatrix}$

a. For what value of x, $\begin{bmatrix} x^2 & 2x \\ 5 & 3 \end{bmatrix}$ will be singular matrix.   2

b. Using stem, find the value of $A^2-5A+6I$,where I is identity matrix.   4

c. Using stem prove that,$|D| = (ax^2 + 2bxy + cy^2)(b^2 - ac)$.   4

4. $h(x) = b\frac{x-a}{b-a} + a\frac{x-b}{a-b}$,

    $f: \mathbb{R} - \left\{-\frac{1}{2}\right\} \longrightarrow \mathbb{R} - \left\{\frac{1}{2}\right\}$ Where$f(x) = \frac{x-3}{2x+1}$

a. If $g(x) = x^2$then find $g^{-1}(-16)$ 2

b. Show that, $h(a) + h(b) = h(a + b)$.   4

c. Justify $f(x)$is an one-one and on to function and determine $f^{-1}(x)$.   4

5. Scenerio-1: $f(x) = \dfrac{1}{3}x^3 + \dfrac{1}{2}x^2 - 6x + 8$

Scenerio-2: $f(x) = ax(1 - x)$

a. Find the coordinates of the points on the curve $y = x^3 - 3x^2 + 2$ where the
tangents are parallel to the $-axis$.   2

b. Find the maximum and minimum values of the scenerio-1.   4

c.   Using scenerio-2, for what value of 'a' will the tangent of the curve $f(x)$ at
the origin make an angle of 60^0 with the x-axis?   4

6. Scenario-i: $y(x + 1)(x + 2) - x + 4 = 0$

   Scenario-ii: $f(x) = 2x^3 - 3x^2 - 12x + 1$

a. What is the slope of the equation of curve $y^2 = 4ax$ at the point $(at^2, 2at)$.   2

b. Using scenario-i, find the equation of the tangent and normal drawn at the point
where the curve intersect at the x-axis.   4

c. Using scenario-ii, find the maximum and minimum values.   4

2nd Paper

7. Scenerio-1: $\cos A = \dfrac{x}{a}, \cos B = \dfrac{y}{b}$

Scenerio-2: $\sin A = x, \sin B = y \quad A + B = \dfrac{\pi}{2}$.

a. What is the value of $4\left(\sin^{-1}\dfrac{1}{\sqrt{5}} + \cot^{-1}3\right)$.   2

b. If A+B=θ, using scenerio-1 prove that $\dfrac{x^2}{a^2} - \dfrac{2xy\cos\theta}{ab} + \dfrac{y^2}{b^2} = \sin^2\theta.$ 4

c. Using scenerio-2, prove that , $x^2 + y^2 = 1$.   4

8. Scenerio-1: $f(x) = \sin(\pi\cos x) - \cos(\pi\sin x)$

   Scenerio-2:   A=$\sqrt{2}\sin\theta$ and B=$\sqrt{\cos 2\theta}$

a. What is the value of $\sec^2(\tan^{-1}6) + \tan^2(\sec^{-1}8)$ 2

b. According to scenerio-1, prove that , $x = \dfrac{1}{2}\sin^{-1}\dfrac{3}{4}$.   4

c. Using scenerio-2, prove that $\sin^{-1}A + \sin^{-1}B = \dfrac{\pi}{2}$.   4

Cantonment Public School & College, Saidpur
Special Test -2020
Class: XI (EV)
Subject: Higher Mathematics 1ˢᵗ Paper & 2ⁿᵈ paper

Time: 25 minutes   Full Marks: 25
[N.B. – Answer all the questions. Each question carries 1 Mark.]

1. The function $f : \mathbf{R} \to \mathbf{R}$ is defined as
$f(x) = x^2 + 1$ then what is the value of $f^{-1}(17)$?
     a. {4}   b. {−4, 4}
     c. {ϕ}   d. ϕ

2. Which one is the equation of straight line is parallel to x- axis ?
     a. $x - 3 = 0$ b. $y = 0$
     c. $x = 0$ d. $y + 5 = 0$

3. What is the slope of normal at the point $(2, 3)$ of the curve $y = x^2 - x + 1$?
     a. $\frac{4}{7}$ b. $\frac{3}{2}$
     c. $-\frac{1}{3}$ d. $\frac{1}{3}$

4. Which one of the following is the equation of tangent at the point $(0, 2)$ of the circle
$x^2 + y^2 - 2x - 4y + 4 = 0$?
     a. $x = 0$ b. $x = 2$
     c. $y = 0$ d. $y = 2$

Answer the question no. 5 and 6 according to the following information:
$x + 3y - 12 = 0$ is a equation of straight line

5. In which point the straight line intersect with y-axis?
     a. (0, 4)   b. (0, 12)
     c. (4, 0)   d. (0, 3)

6. Which one is the length of the line intercepted between the axes of coordinates?
     a. $4\sqrt{5}$ b. 5
     c. $4\sqrt{10}$ d. 12

7. Which one is the derivative of $cot^{-1} \frac{1-x}{1+x}$ with respect to x ?
     a. $\frac{1}{1+x^2}$ b. $-\frac{1}{1+x^2}$
     c. $\frac{2x}{1+x^2}$ d. $\frac{2x}{1-x^2}$

8. $\frac{d}{dx}\left(\frac{1}{x}\right) = $ What ?
     a. lnx b. 0
     c. $\frac{1}{x^2}$ d. $-\frac{1}{x^2}$

9. In how many ways the word MILLENNIUM arrange where M remain in first and last position?
     a. 5040   b. 2040
     c. 226800   d. 4050

10. In how many ways can any three letters be selected from the word "Dhaka"?
     a. 3   b. 7
     c. 11   d. 6

11. What is the number of arrangements of the letters of the words "Courage" all of which begin with a vowel ?
     a. 2870   b. 2880
     c. 2890   d. 2810

12. $\begin{bmatrix} 0 & 2 & 3 \\ -2 & 0 & 6 \\ -3 & -6 & 0 \end{bmatrix}$ is a-
i. symmetric
     ii. Skew symmetric
     iii. square
     Which one is correct
     a. i & ii   b. ii & iii   c. i & iii   d. i, ii & iii

13. If $\begin{vmatrix} 1 & 1 & 1 \\ x & a & b \\ x^2 & a^2 & b^2 \end{vmatrix} = 0$ then what is the value of x ?
     a. –a or b   b. a or -b
     c. –a or - b   d. a or b

14. The equation of curve $y = x^2 - x + 1$-
i. slope of tangent at (1,1) is 1
     ii. $y_2 = 2$
     iii. there will be maximum and minimum at x = $\frac{1}{2}$
     Which one is correct?
     a. i & ii   b. ii & iii   c. i & iii   d. i, ii & iii

15. For what value of x, the slope of the curve y= $x + \frac{1}{x}$ will be zero?
     a. ±2   b. ±3

c. 0   d. ±1

16. For what value x, $f(x) = x + \dfrac{1}{x}$ is maximum or minimum?

    a. 1   b. ± 1

    c. −1   d. 0

17. What is the domain of the function

$$f(x) = \frac{2x}{x+1}?$$

    a. R   b. R − {1}

    c. R − {−1}   d. R − { $\dfrac{1}{2}$ }

18. If $f(x) = 2x - 5$ and $g(x) = x^2 + 6$ then what is the value of $g(f(2))$?

    a. 7   b. 15

    c. 5   d. 57

$$A = \begin{bmatrix} 3 & -1 \\ 4 & 2 \end{bmatrix}$$ is a 2×2 order matrix

Answer 19 and 20 in the above information

19. Which one is the cofactor of A?

    a. $\begin{bmatrix} 2 & 1 \\ -4 & 3 \end{bmatrix}$ b. $\begin{bmatrix} -4 & 1 \\ 3 & 2 \end{bmatrix}$

    c. $\begin{bmatrix} 2 & -4 \\ 1 & 3 \end{bmatrix}$ d. $\begin{bmatrix} 1 & 3 \\ -4 & 2 \end{bmatrix}$

20. Which one is the inverse matrix of A ?

    a. $\dfrac{1}{2}\begin{bmatrix} 2 & 1 \\ -4 & 3 \end{bmatrix}$ b. $\dfrac{1}{2}\begin{bmatrix} 3 & -1 \\ 4 & 2 \end{bmatrix}$

    c. $\dfrac{1}{10}\begin{bmatrix} 4 & 2 \\ 3 & -1 \end{bmatrix}$ d. $\dfrac{1}{10}\begin{bmatrix} 2 & 1 \\ -4 & 3 \end{bmatrix}$

21. Which one is the value of $tan^{-1}x + cot^{-1}x$?

    a. 1   b. 0

    c. $\dfrac{\pi}{4}$ d. $\dfrac{\pi}{2}$

22. Which one of the following is the value of

$$sin^2\left(cos^{-1}\tfrac{1}{3}\right) - cos^2\left(sin^{-1}\tfrac{1}{\sqrt{3}}\right)?$$

    a. $\dfrac{1}{9}$ b. $\dfrac{1}{6}$

    c. $\dfrac{1}{2}$ d. $\dfrac{2}{9}$

23. If $sin^{-1}x = \theta$ then $cos\theta =$?

    a. $\dfrac{x}{\sqrt{1-x^2}}$ b. $\dfrac{1}{\sqrt{1-x^2}}$

    c. $\sqrt{1-x^2}$ d. $1 - x^2$

24. If $f(x) = tan^{-1}x$-

    i. $f(1) = \dfrac{\pi}{4}$

    ii. $f(0) = \dfrac{\pi}{2}$

    iii. $2f(x) = sin^{-1}\dfrac{2x}{1-x^2}$

    Which one is correct?

a. i & ii   b. ii & iii   c. i & iii   d. i, ii & iii

25. $\dfrac{d}{dx}\left(tan^{-1}\dfrac{1+x}{1-x}\right) =$ What?

    a. $\dfrac{1}{1+x^2}$ b. $-\dfrac{1}{1+x^2}$

    c. $\dfrac{1}{\sqrt{1-x^2}}$ d. $\dfrac{-x}{1+x^2}$