M.Sc. MATHEMATICS
FOURTH SEMESTER
GENERAL MATHEMATICS II
MSM – 406 MDC
[USE OMR FOR OBJECTIVE PART]

SET A

Duration: 3 hrs.   Full Marks: 70

(**Objective**)

Time: 30 min.   Marks: 20

Choose the correct answer from the following: *1X20=20*

1. what is the value of θ if $\sin\theta = 1$
   a. $(4n + 1)\frac{\pi}{2}$ b. $(4n - 1)\frac{\pi}{2}$
   c. $(2n + 1)\frac{\pi}{2}$ d. $(2n - 1)\frac{\pi}{2}$

2. what is the value of θ if $\cos\theta = -1$
   a. $(2n - 1)\pi$ b. $(2n + 1)\pi$
   c. $(2n\pi + 1)\pi$ d. None of this

3. Find the domain of $\sin^{-1}x$
   a. $[-1, \frac{1}{2}]$ b. $[0, 1]$
   c. $[-1, 0]$ d. $[-1, 1]$

4. Find the range of $\cot^{-1}x$
   a. $]0, -\pi[$ b. $]-\pi, \pi[$
   c. $]0, \pi[$ d. None of this

5. Calculate the general values of the $\cot^{-1}x$
   a. $n\pi + x, 0 < x < \pi$ b. $n\pi - x, 0 < x < \pi$
   c. $n\pi \mp x, 0 < x < \pi$ d. None of this

6. If $\sin^2\theta = \sin^2\alpha$ then the value of θ is
   a. $n\pi + \alpha$ b. $n\pi - \alpha$
   c. $n\pi \pm n\alpha$ d. $n\pi \pm \alpha$

7. What is the value of θ if $\tan\theta = 1$
   a. $-n\pi$ b. π
   c. $n\pi$ d. None of this

8. What is the value of θ if $\tan\theta = -1$
   a. $(4n - 1)\frac{\pi}{2}$ b. $(4n - 1)\frac{\pi}{4}$
   c. $(4n + 1)\frac{\pi}{2}$ d. $(4n + 1)\frac{\pi}{4}$

9. If $f(x) = \sqrt{x}$, $f'(x) = ?$

    a. $\dfrac{1}{\sqrt{x}}$

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

    c. $\dfrac{1}{2\sqrt{x}}$

    d. $\dfrac{1}{2x}$

10. If $f(x) = x + |x|$, $f(-3) = ?$

    a. 1

    b. 6

    c. 0

    d. None of the above

11. What is the distance of the point (a,b) from the line x=0.

    a. a

    b. b

    c. ab

    d. None of the above

12. The product of two matrices A and B, AB exists

    a. If the number of columns in A is equal to the number of rows in B.

    b. If the number of columns in B is equal to the number of rows in A.

    c. If the number of columns in A is not equal to the number of rows in B.

    d. If the number of columns in B is not equal to the number of rows in A.

13. Equation of X-axis is

    a. $x = 0$

    b. $y = 0$

    c. $y = c$ (constant)

    d. $x = c$ (constant)

14. Domain of $\dfrac{1}{x}$ is

    a. $R - \{-1\}$

    b. R

    c. $R - \{1\}$

    d. $R - \{0\}$

15. In what ratio does the X-axis devide the line segment joining the point (2,-4) and (-3,4) is

    a. $1 : 1$

    b. $1 : -1$

    c. $-1 : -1$

    d. $1 : 3$

16. At what point the X-axis cuts the line $x - y = 4$?

    a. (0,4)

    b. (-4,0)

    c. (0,-4)

    d. (4,0)

17. What is value of $\int Sinx\, dx = ?$

   a. $Sinx$ b. $cosx$

   c. $- Sinx$ d. $- cosx$

18.

Value of the Determinant $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ -1 & -2 & -3 \end{vmatrix}$ is

   a. -6   b. 6

   c. 5   d. 0

19. $\dfrac{d}{dx}(x) = ?$

   a. 1   b. 0

   c. -1   d. 2

20. The value of $\lim_{x \to 0} \dfrac{x+5}{x-2}$ is

   a. $\dfrac{5}{2}$ b. $\dfrac{-5}{2}$

   c. 0   d. None of these

-- --- --

$$\boxed{\textbf{Descriptive}}$$

Time : 2 hrs. 30 mins.   Marks : 50

[Answer question no.1 & any four (4) from the rest]

1.   a.   If A, B, and C are sets, then prove that analytically   5+5=10
     $A - (B \cap C) = (A - B) \cup (A - C)$

     b.   Prove that i. $(A \cup B)^c = A^c \cap B^c$
     ii. $(A \cap B)^c = A^c \cup B^c$

2.   If R and S be relation on a set A represented by the matrices $M_g =$ 2+2+2+
     $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$ and $M_s = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ then find matrices that   2+2=10
     a. $R \cup S$
     b. $R \cap S$
     c. $R \circ S$
     d. $S \circ R$
     e. $R \oplus S$

3.   a.   solve $2 sin^2 x + \sqrt{3} \cos x + 1 = 0$ 5+5=10
     b.   solve $sin^2 x - \cos x = \frac{1}{4}$

4.   a.   write the general value and principal values of $cos^{-1}(-\frac{1}{2})$ 5+5=10
     b.   Evaluate $3 sin^{-1} x = sin^{-1}(3x - 4x^3)$

5.   Find the Domain of following function   5+5=10

     (i). $f(x) = \sqrt{(x-3)(x-5)}$

     (ii) $f(x) = \dfrac{x}{\sqrt{4 - x^2}}$

6. Evaluate $\quad$ 5+5=10

(a) $\displaystyle\lim_{x \to 0} \frac{1-\cos x}{x^2} e^x$

(b) $\displaystyle\lim_{x \to 1} \frac{1}{\sqrt{x+1}-\sqrt{x-1}}$

7.

a. Given $P(\theta) = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, Show $\qquad$ That

$P(\theta)P(\phi) = P(\theta + \phi)$. Hence Deduce that $\{P(\theta)\}^n = P(n\theta)$

b. What do you mean by Adjoint of the Matrix.

8. If the points $(1,0),(0,1)$ and (α, β) are collinear show that $\quad$ 7+3=10
$\alpha + \beta = 1$. Also find the distance between the points $(a,-b)$ and $(-a,b)$

$$= = ^{***} = =$$