P-459

MRD-XI-19 (A)

Total Time: 3:00 Hours

Mathematics (Part-I)

(Fresh/New Course)

Total Marks: 100

Note: There are three sections in this paper i.e. Section A, B & C.

VERSION : B

Time Allowed: 20 Minutes

"Section-A"

Marks: 20

INSTRUCTIONS:

- Attempt this section on the MCQs Answer Sheet only.
- Use black ball point or marker for shading only one circle for correct option of a question.
- No mark will be awarded for cutting, erasing, over writing and multiple circles shading.

Q. 1. Choose the correct option i.e. A,B,C, or D.

1. If $u = 2i - j + 3k$ then $|u| =$ ....
   (A) $\sqrt{6}$ ● $\sqrt{14}$ (C) $\sqrt{13}$ (D) 4
2. Solution set of $z^2 + 4 = 0$ is ....
   ● $\{\pm 2i\}$ (B) $\{\pm 2\}$ (C) $\{\pm 4i\}$ (D) None of these
3. If A is a square matrix of order 3, then $A - A^t$ is ....
   (A) Symmetric matrix (B) Null matrix ● Skew symmetric (D) None of these
4. If $a \cdot b \times c = 0$ then the vectors a, b, c are ....
   (A) Perpendicular ● Coplanar (C) Unit vectors (D) None of these
5. The arithmetic mean between $\sqrt{2} + 3$ and $\sqrt{2} - 3$ is ....
   (A) 0 (B) -5 (C) 6 ● $\sqrt{2}$
6. The sum of an infinite geometric sequence whose first term$(a_1)$is 1 and common ratio (r)is $\frac{1}{3}$ is given by $S_\infty =$ ... ...
   ● $\frac{3}{2}$ (B) $\frac{2}{3}$ (C) 1 (D) Does not exist
7. The sum of first 'n' terms of an arithmetic series is given by $S_n =$ ... ...
   (A) $2a + (n-1)d$ ● $\frac{n}{2}[2a_1 + (n-1)d]$ (C) $\frac{a(1-r^n)}{1-r}$ (D) $\frac{a}{1-r}$
8. $^nP_r =$ ... ...
   (A) $(n-r)!$ (B) $\frac{n!}{(n-r)!\,r!}$ ● $\frac{n!}{(n-r)!}$ (D) $\frac{r!}{(n-r)!}$
9. If A and B are two mutually exclusive events then $P(A \cup B) =$ ....
   (A) $P(A) - P(B)$ (B) $\frac{P(A)}{P(B)}$ (C) 0 ● $P(A) + P(B)$
10. The general term in the bi-nomial expansion of $(a+b)^n$ is $T_{r+1} =$..................
    (A) $a^{n-r}b^r$ ● $\binom{n}{r}a^{n-r}b^r$ (C) $\binom{n}{r}a^r b^{n-r}$ (D) $a^r b^{n-r}$
11. In the expansion of $(a+b)^9$, the sum of exponents of a and b in each term is equal to ....
    ● 9 (B) 10 (C) 0 (D) None of these
12. $f(x) = x^3$ is .... function.
    (A) Even ● Odd (C) Constant (D) None of these
13. $\sin(\pi + \theta) =$ ....
    (A) $\cos\theta$ (B) $-\cos\theta$ (C) $\sin\theta$ ● $-\sin\theta$
14. $\cos(\alpha + \beta) + \cos(\alpha - \beta) =$ ....
    (A) $2\cos\alpha\sin\beta$ ● $2\cos\alpha\cos\beta$ (C) $2\sin\alpha\sin\beta$ (D) $2\sin\alpha\cos\beta$
15. Radius of circumcircle is given by $R =$ ....
    ● $\frac{abc}{4\Delta}$ (B) $\frac{\Delta}{s}$ (C) $\frac{\Delta}{s-a}$ (D) None of these
16. The maximum value of $y = 1 + 2\sin\theta$ is ....
    (A) 5 (B) 1 ● 3 (D) 2
17. Domain of $\sin 2x$ is ....
    ● R (B) $R - \{2\}$ (C) 2π (D) None of these
18. The matrix $\begin{bmatrix} 0 & 2 & 3 \\ 0 & 0 & -5 \\ 0 & 0 & 0 \end{bmatrix}$ is in ... ... form.
    (A) Reduced echelon (B) Echelon (C) Triangular (D) All of these
19. The additive inverse of $5 - 3i$ is ....
    (A) $5 + 3i$ (B) $-5 - 3i$ ● $-5 + 3i$ (D) 0
20. $\begin{bmatrix} 2 & 3 & 1 \\ 0 & 4 & -2 \\ 0 & 0 & 1 \end{bmatrix}$ is ... ... matrix.
    ● Upper Triangular (B) Lower Triangular (C) Diagonal (D) Scalar

MRD-XI-19 (A)

Total Time: 2:40 Hours

Mathematics (Part-I)

(Fresh/New Course)

Total Marks: 80

"Section-B"

Marks: 50

Q. 2. Attempt any Ten (10) of the following parts. Each part carries equal marks.

(i) Verify $\overline{\left(\frac{Z_1}{Z_2}\right)} = \frac{\overline{Z_1}}{\overline{Z_2}}$, when $Z_1 = 2 - 3i$, $Z_2 = 4 - i$.

(ii) Maximize $f(x, y) = 3x + 4y$ subject to the constraints $2x + 3y \geq 6$, $x + y \leq 8$, $x \geq 0$, $y \geq 0$.

(iii) Reduce to Echelon form $A = \begin{bmatrix} 2 & -5 & 1 \\ 3 & 0 & -4 \\ 1 & 10 & 5 \end{bmatrix}$

(iv) Let $\overrightarrow{OB} = i - j + 2k$, $\overrightarrow{OA} = i + j + k$. Find direction cosines of $\overrightarrow{AB}$.

(v) Find the work done by the force $\vec{F} = 2i + 3j + k$ in displacement of an object from point $A(-2, 1, 2)$ to the point $B(5, 0, 3)$.

(vi) A person went on a diet for 10 weeks. Each week he lost 3 pounds. At the end of the dieting period he weighed 218 pounds. How much did he weigh before he began dieting?

(vii) Suppose that the third term of a geometric sequence is 27 and the fifth term is 243. Find the first term and common ratio of the sequence.

(viii) Solve for 'n' when ${}^{n+1}C_4 = 6 \cdot {}^{n-1}C_2$

(ix) Simplify $\sum_{k=0}^{3} \frac{2^k}{(k+1)}$

(x) Given $\sin\alpha = \frac{12}{13}$ and $\cos\beta = \frac{3}{5}$ where α, β are in the first quadrant. Then find the value of $\cos(\alpha + \beta)$.

(xi) Find the area of the inscribed circle of the triangle with measures of the sides 55m, 25m, 70 m.

(xii) Factorize $P(z) = 3z^2 + 7$

(xiii) If $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$, show that $(A^{-1})^{-1} = A$

"Section-C"

Marks: 30

Note:- Attempt any Three (3) questions. Each question carries equal marks.

Q. 3. (a) Find the sum of the series $\sum_{k=1}^{n} \frac{1}{k^2 + 7k + 12}$.

(b) Find the value of 'n', when $\frac{n!}{(n-4)!} : \frac{(n-1)!}{(n-4)!} = 9 : 1$

Q. 4. (a) Find the term independent of 'x' in $\left(2x^2 + \frac{1}{x}\right)^9$

(b) Find the inverse function of $f(x) = \frac{2x+1}{x-1}$, $x > 1$.

Q. 5. (a) Find the angle of largest measure when $a = 74$, $b = 52$, $c = 47$.

(b) Find the area of triangle ABC, when $a = 92$, $b = 71$, $\gamma = 56^\circ 44'$.

Q. 6. (a) Let $\overrightarrow{OA} = i + j + k$, $\overrightarrow{OC} = j + k$, $\overrightarrow{OD} = 2i + j$. If H and K are the mid points of AC and CD, Show that $2\overrightarrow{HK} = \overrightarrow{AD}$

(b) Prove the identity $\frac{\cos\beta + \cos 3\beta + \cos 5\beta}{\sin\beta + \sin 3\beta + \sin 5\beta} = \cot 3\beta$