MRD-XI-18 (A) P-387

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 : A

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 $Z = -(2+3i)$ then $\bar{Z} =$ .....
   Ⓐ $2+3i$ ● $-2+3i$ Ⓒ $-2-3i$ Ⓓ $2-3i$

2. If $Z = a + bi$ then $Z\bar{Z} =$ .....
   ● $|Z|^2$ Ⓑ Z Ⓒ $\bar{Z}$ Ⓓ $|-Z|$

3. The matrix $\begin{bmatrix} 0 & 2 & 3 \\ 0 & 0 & -5 \\ 0 & 0 & 0 \end{bmatrix}$ is ..... form.
   ● Echelon Ⓑ Not Echelon Ⓒ Reduced Echelon Ⓓ Not Reduced Echelon

4. A system $AX = 0$ of three homogeneous linear equations in three variables has a trivial solution if A is .....
   ● Non Singular Ⓑ Singular Ⓒ Non Negative Ⓓ Homogeneous

5. $k \times j =$ .....
   Ⓐ $+i$ ● $-i$ Ⓒ 0 Ⓓ 1

6. The nth term of Geometric sequence is .....
   Ⓐ r^{n-1} Ⓑ ar^{n+1} Ⓒ ar^n ● a_1r^{n-1}

7. Harmonic Mean between 2 and 3 is .....
   ● $\frac{12}{5}$ Ⓑ $\frac{5}{12}$ Ⓒ $\frac{1}{6}$ Ⓓ $\frac{5}{6}$

8. $\frac{7!}{4!3!} =$ .....
   Ⓐ 70 ● 35 Ⓒ 42 Ⓓ 120

9. If E and E′ are complementry events then $P(E') =$ .....
   Ⓐ $P(E)-1$ Ⓑ $P(E)$ Ⓒ $1+P(E)$ ● $1-P(E)$

10. In the expansion $(a+b)^n$ if n is odd then it has ..... middle term.
    Ⓐ One ● Two Ⓒ Three Ⓓ None of these

11. $\binom{n}{n-r} =$ .....
    Ⓐ ${}^{n}P_{r}$ ● $\binom{n}{r}$ Ⓒ $\binom{n-1}{r}$ Ⓓ $\binom{n}{r-1}$

12. The function $f(x) = x^3 + x^2 + 1$ is .....
    Ⓐ Even Ⓑ Odd ● Neither even nor odd Ⓓ None of these

13. The linear inequalities that are involved in the problem are called .....
    ● Problem constraints Ⓑ Feasible region Ⓒ Feasible solution Ⓓ Feasible problem

14. $\cos\beta =$.....
    Ⓐ $\cos(\pi-\beta)$ ● $-\cos(\pi-\beta)$ Ⓒ $\cos(\pi+\beta)$ Ⓓ $\sin(\pi-\beta)$

15. $\sin(x+y)+\sin(x-y) =$.....
    ● $2\sin x\cos y$ Ⓑ $2\sin y\cos x$ Ⓒ $2\cos x\cos y$ Ⓓ $2\sin x\sin y$

16. $\cot\left(\frac{\alpha-\beta}{2}\right)\tan\left(\frac{\alpha+\beta}{2}\right) =$.....
    ● $\frac{a+b}{a-b}$ Ⓑ $\frac{a-b}{a+b}$ Ⓒ $\frac{\alpha^2-\beta^2}{4}$ Ⓓ $\frac{b-c}{b+c}$

17. Area of triangle when two sides and their included angle is given. Area = ...
    Ⓐ $\frac{1}{2}ab\sin\beta$ Ⓑ $\frac{1}{2}bc\sin\gamma$ Ⓒ $\frac{1}{2}ac\sin\alpha$ ● $\frac{1}{2}ab\sin\gamma$

18. All the real numbers except $(2n+1)\frac{\pi}{2}$, $n \in Z$ is the domain of .....
    Ⓐ $\tan x$ Ⓑ $\sin x$ Ⓒ $\sec x$ ● Both A and C

19. The angle of $\cos^{-1}\left(-\frac{1}{2}\right) =$ .....
    Ⓐ $\frac{\pi}{3}$ Ⓑ $\frac{-\pi}{3}$ ● $\frac{2\pi}{3}$ Ⓓ $\frac{-2\pi}{3}$

20. A function $f(x) = \sqrt{x^2+1}$ is ..... function.
    Ⓐ Rational Ⓑ Identity Ⓒ Odd ● Even

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Total Time: 2:40 Hours

MATHEMATICS (Part-I)

(Fresh/New Course)

Total Marks: 80

"Section-B"

Marks: 50

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

(i) If $Z_1 = 2 + 3i$, $Z_2 = -5 + 6i$ then verify that $\overline{Z_1 + Z_2} = \overline{Z_1} + \overline{Z_2}$

(ii) If A is a square matrix of order 3, then show that $A - A^t$ is skew symmetric.

(iii) If $p = 2i - j$ and $q = xi + 3j$ then find the value x such that $|p + q| = 5$

(iv) The 2nd term of an H. P is $\frac{1}{2}$ and the fifth term is $-\frac{1}{4}$. Find the 12th term.

(v) Sum the series $2^2 + 4^2 + 6^2 + \ldots\ldots\ldots$ up to n terms.

(vi) Prove that ${}^{n-1}C_r + {}^{n-r}C_{r-1} = {}^nC_r$

(vii) Show by mathematical induction that $\frac{5^{2n}-1}{24}$ is an integer.

(viii) Find the inverse function of $f(x) = \frac{4x-3}{2x+2}$

(ix) Find the minimum value of the function $f(x, y) = 5x + 2y$ subject to the constraints $2x + y \geq 2$, $x + 2y \leq 10$, $x \geq 0, y \geq 0$

(x) Prove that $\sin^2\frac{\theta}{2} = \frac{\sin\theta \operatorname{Tan}\frac{\theta}{2}}{2}$

(xi) Find the area of triangle ABC in which $a = 30, \beta = 50^\circ$ and $\gamma = 100^\circ$

(xii) Show that Sec (Arc Tan x) $= \sqrt{1 + x^2}$

(xiii) Find the angle between the pairs of vectors $r_1 = i + 2j - k$, $r_2 = i + j - 2k$

"Section-C"

Marks: 30

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

Q. 3. (a) If $y = \frac{1}{2^2} + \frac{1.3}{2!}\cdot\frac{1}{2^4} + \frac{1.3.5}{3!}\cdot\frac{1}{2^6} + \ldots\ldots\ldots\ldots\ldots$ then show that $y^2 + 2y - 1 = 0$

(b) If $A = \begin{bmatrix} 3 & 2 & 1 \\ -1 & 5 & 7 \\ 0 & 9 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 3 & 1 \\ 2 & -5 & 3 \\ 7 & 1 & 9 \end{bmatrix}$ then show that $(A + B)^t = A^t + B^t$

Q. 4. (a) if $a_6 + a_4 = 6$ and $a_6 - a_4 = \frac{2}{3}$, find the arithmatic sequence.

(b) An isosceles triangle has a vertical angle of 108° and a base 20 cm long. Calculate its altitude.

Q. 5. (a) Find maximum and minimum of the function $y = \frac{1}{4\cos 2\pi\theta}$

(b) If $P(A) = \frac{1}{3}$, $P(A \cup B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{4}$ Find P(B)

Q. 6. (a) Find the term independent of x in the expansion of $\left(2x^2 + \frac{3}{5x}\right)^9$

(b) Use the law of cosines to prove that $1 + \cos\propto = \frac{(b+c+a)(b+c-a)}{2bc}$