

67p = I

PART - A

MATH 2019

$20 \times 1 = 20$

Q.1(a). Choose the correct answer.

- (i) Absolute value of $-1 - 3i$ is ... ($\sqrt{10}, \sqrt{8}, \sqrt{7}, \sqrt{11}$)
- (ii) Conjugate of 11 is ... ($-11, 11, 0, 1$)
- (iii) Adjoint of $\begin{bmatrix} 1 & 4 \\ 5 & 6 \end{bmatrix}$ is ... ($\begin{bmatrix} 6 & 5 \\ 4 & 1 \end{bmatrix}, \begin{bmatrix} 6 & -4 \\ -5 & 1 \end{bmatrix}, -14, \text{none of these}$)
- (iv) If any two column of a determinant are identical the value of the determinant is ... ($1, -1, 0, 4$)
- (v) If $-\frac{x}{2}i - 7j - 8k = 4i - 7j - 8k$ value of x is ... ($-8, 4, \frac{1}{2}, 8$)
- (vi) Which of the following represents volume of tetrahedron ...?
 $(\vec{a} \cdot (\vec{b} \times \vec{c}), \frac{1}{3}\vec{a} \cdot (\vec{b} \times \vec{c}), \frac{1}{6}\vec{a} \cdot (\vec{b} \times \vec{c}), |\vec{a} \times \vec{b}|)$
- (vii) If $a_n = \frac{n}{2}a_{n-1}$ and $a_1 = 1$ then $a_2 = \dots$ ($2, 1, \frac{1}{2}, -2$)
- (viii) If $\frac{1}{2}, -\frac{1}{2}, -\frac{3}{2}$ are in A.P, then common difference d is ... ($-1, 1, 2, 3$)
- (ix) $\sum_{x=1}^4 x^2 = \dots$ ($25, 30, 35, 40$)
- (x) If $n_{C_5} = n_{C_4}$ then $n = \dots$ ($9, 5, 4, 10$)
- (xi) $8.9 = \dots$ ($9!, 8!, \frac{9!}{7!}, \text{none of these}$)
- (xii) A function f is defined by $f(x) = 4x - 1$ and $f(x) = x$ then $x = \dots$ ($2, 3, \frac{1}{3}, 0$)
- (xiii) The graph of a quadratic function is a ... ($\text{parabola, line, circle, hyperbola}$)
- (xiv) The point of intersection of two boundaries of a feasible region is called
 $(\text{Corner point, Intercept, Solution region, None of these})$
- (xv) Number of terms in the expansion of $(x + y)^{10}$ is ... ($10, 11, 9, 8$)
- (xvi) $\cos\left(\frac{\pi}{2} - \theta\right) = \dots$ ($\cos\theta, -\sin\theta, \sin\theta, -\cos\theta$)
- (xvii) Period of $\sin x$ is ... ($\pi, 2\pi, 3\pi, 5\pi$)
- (xviii) Range of $y = \cot^{-1}x$ is ... ($]0, \pi[,]-\frac{\pi}{2}, \frac{\pi}{2}[,]-\frac{\pi}{2}, \frac{\pi}{2}[- \{0\},]-\frac{\pi}{2}, \frac{\pi}{2}[)$)
- (xix) $\tan^2 \theta \cot^2 \theta = \dots$ ($\tan^4 \theta, \cot^4 \theta, \sec^4 \theta, 1$)
- (xx) The radius R of a circumcircle is ... ($\frac{\Delta}{s-a}, \frac{\Delta}{s-b}, \frac{s}{r}, \frac{abc}{4\Delta}$)

PART - B

Q.2. Attempt any ten (10) parts.

$10 \times 4 = 40$

- (i) Separate into real and imaginary parts $(7 - 3i)^{-1}$
- (ii) Show that the matrix $\begin{bmatrix} 0 & -4 & 3 \\ 4 & 0 & -5 \\ -3 & 5 & 0 \end{bmatrix}$ is skew symmetric.
- (iii) Find a vector in the direction of vector $\vec{a} = -i - 7j$ that has magnitude 8 units.
- (iv) Find volume of parallelepiped whose three adjacent edges are represented by $2i + 8j - 5k, 3i - j - k$ and $6i + 7j - 4k$
- (v) Find the vulgar fraction equivalent to recurring decimal $1.\dot{5}$
- (vi) How many diagonals can be drawn in a plane figure of 14 sides?
- (vii) Find value of n if $n_{P_2} = 56$
- (viii) Using binomial series, find the first four terms of the expansion of $\frac{4}{4+x}$
- (ix) If $f(x) = 7x + 9$, find value of $\frac{f(a+h) - f(a)}{h}$
- (x) Find the inverse of the function $f(x) = \frac{3x-1}{5x+3}$
- (xi) Solve and draw the number line $(x - 1) \geq 4(2x + 1)$
- (xii) Show that $\sin 2\theta = \frac{2 \tan \theta}{1 + \tan^2 \theta}$
- (xiii) Express the product as sum or difference $-2 \sin(p + q) \sin(p - q)$
- (xiv) Find area of the triangle ABC if $a = 14.5, b = 11.5, c = 10$
- (xv) Without using calculator, show that $\tan^{-1}\left(\frac{12}{5}\right) = \cot^{-1}\left(\frac{5}{12}\right)$

PART - C

$5 \times 8 = 40$

Attempt any five (5) question.

- Q.3. Factorize the polynomial $p(z) = z^3 - 7z^2 + 19z - 13$
- Q.4. Using properties of determinants, show that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)$
- Q.5. If the sum of first and 6th term of H.P is $\frac{31}{116}$. Find the sequence if the first term is $\frac{1}{4}$.
- Q.6. Sum the series of upto n terms $3^2 + 6^2 + 9^2 + \dots$
- Q.7. If x is so small that its square and higher powers may be neglected, show that $\sqrt{\frac{1+2x}{1-x}} \approx 1 + 3x$
- Q.8. Find the radii R and r of the circumcircle and inscribed circle of triangle ABC if $a = 18, b = 24, c = 30$
- Q.9. Find the general solution of the equation $4 \sin^2 \theta - 1 = 0$