

Quarterly Examination - 2018-19

MATHEMATICS

Class : XI

Time : 3 Hours + 15 Min.

Full Marks : 100

(Candidates are allowed additional 15 minutes for only reading the paper. They must NOT start writing during this time).

Candidate are required to attempt all questions

(All working, including rough work, should be done on the same sheet as, and adjacent to the rest of the answer.

The intended marks for questions or parts of questions are given in brackets []

Section A (80 Marks)

1. i. A survey was conducted of the TV programme watched by 120 students of a school hostel. It was learnt that 70 students watched Discovery channel and 56 watched ESPN channel, 24 watched both programmes. Find the no of students who watched at least one TV programme. (2)
- ii Solve $\sqrt{\frac{x}{1-x}} + \sqrt{\frac{1-x}{x}} = \frac{16}{3}$
- iii Form a quadratic equation with rational coefficients one of whose roots is -1-3i (2)
- iv Find the values of k so that the equations $2x^2 + kx - 5 = 0$ and $x^2 - 3x - 4 = 0$ may have a common root. Find the common root. (2)
- v Prove that $\tan x \cdot \tan\left(\frac{2\pi}{3} + x\right) \cdot \tan\left(\frac{\pi}{3} + x\right) = 3 \tan 3x$ (2)
- vi If A, B, C, D are the angles of cyclic quadrilateral, prove that $\sin(A+D) + \sin(B+C) = 0$ (2)
- vii If two sides of a square are: $10x-4y-7=0$ and $4x+10y-7=0$ and one vertex is origin find its area (2)
- viii Find the angle between the lines $2x+2y-4=0$ and $3x+2y-5=0$ (2)
- ix Prove that $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2 \sin x$ (2)
- x Find the equation of the line perpendicular the line $2x-3y+5=0$, and passing through the point of intersection of the lines $5x - 2y = 4$ and $x - 5y = -1$ (2)
- xi If $\sin A$ and $\cos A$ are the roots of the equation $px^2 + qx + r = 0$ then prove that $p^2 - q^2 + 2pr = 0$ (2)
- 2 If $2\cos A = x + \frac{1}{x}$ prove that $\cos 3A = \frac{1}{2}\left(x^3 + \frac{1}{x^3}\right)$ (4)
- 3 Prove that $4 \sin A \sin\left(A + \frac{\pi}{3}\right) \sin\left(A + \frac{2\pi}{3}\right) = \sin 3A$ (4)

- 4 Prove that $\cos 4x = 1 - 8\cos^2 \theta + 8\cos^4 \theta$? (4)
- 5 If $\tan \frac{x}{2} = \frac{m}{n}$, Prove that $m \sin x + n \cos x = n$ (4)
- 6 In a town of 10000 families, it was found that 38% families buy news paper A, 22% buy news paper B and 10% buy newspaper C, 5% families buy A and B, 3% buy B and C 4% buy A and C. If 2% buy all the three news paper, find the number of families which buy (i) B only (ii) none of A B and C (4)
- 7 Show that $\frac{\sin 3x \cos 4x - \sin x \cos 2x}{\sin 4x \sin x + \cos x \cos 6x} = \tan 2x$ (4)
- 8 A vertex of an equilateral triangle is (2,3), and the equation of the opposite side is $x+y+2=0$. Find the equations of the other two sides (4)
- 9 Find the locus of a point such that the difference of distances from the two points (-2,0) and (2,0) is always 1 (4)

The line through the points (h,3) and (4,1) intersects the line $7x-9y-19=0$ at right angles, find the value of h

OR
- 10 If α and β are the roots of the equation $x^2 - 2x + 1 = 0$ find an equation whose roots are $\frac{\alpha}{2\beta+3}, \frac{\beta}{2\alpha+3}$. (4)
- 11 Determine the range values of x for which $\frac{x^2 - 2x + 5}{3x^2 - 2x - 5} > \frac{1}{2}$ (4)
- 12 Solve graphically $-7x + 4y \leq 14$, $3x + 4y \leq 18$, $x - 6y \leq 3$, $x > 0$, $y > 0$ (4)
- 13 If $\cos \theta = \frac{\cos \phi - e}{1 - e \cos \phi}$, prove that $\tan^2 \frac{\theta}{2} = \frac{1+e}{1-e} \tan^2 \frac{\phi}{2}$ (6)
- 14 If $\sin x = \frac{4}{5}$, $\cos y = \frac{12}{13}$, $0 < x < \frac{\pi}{2}$, $\frac{3\pi}{2} < y < 2\pi$ find the values of $\sin(x-y)$ and $\cot(x+y)$ and $\tan 3x$ (6)
- 15 Find the bisector of the acute angle between the lines $5x=12y+24$ and $12x=5y+10$ (6)
- 16 If the roots of the equation $a(b-c)x^2 + b(c-a)x + c(a-b) = 0$ are equal, show that $\frac{2}{b} = \frac{1}{a} + \frac{1}{c}$ (6)
- 17 Prove that $\sin^3 x + \sin^3\left(x + \frac{2\pi}{3}\right) + \sin^3\left(x + \frac{4\pi}{3}\right) = -\frac{3 \sin 3x}{4}$ (6)