Final Term Examination – 2019-2020

Class – XI

Subject – MATHEMATICS

Time : 3 Hours **Max. Marks : 80**

General Instructions:

1. **All questions are compulsory.**
2. **The question paper consists of 36 questions divided into four sections A, B, C and D. Section A comprises of 20 questions of one mark each, section B comprises of 6 questions of 2 marks each, section C comprises of 6 questions of 4 marks each and section D comprises of 4 questions of 6 marks each.**
3. **There is no overall choice. However, internal choice has been provided in 3 questions of 1 mark, 2 questions of 2 marks, 2 questions of 4 marks and 2 questions of 6 marks each. You have to attempt only one of the alternatives in all questions.**
4. **Use of calculators is not permitted. You may ask for logarithmic tables, if required.**

Section: A (1×20=20)

Q1 - Q10 are multiple choice type questions. Select the correct option

1) If set A = {1}, number of elements contained in P[P{P(A)}] are

(a) 2 (b) 16 (c) 4 (d) none of these

2) If $|z| = 2$ *and* $\arg(z) = \frac{3\pi}{4}$, then one of the value of z is

(a) $\sqrt{2} + i\sqrt{2}$ (b) $-\sqrt{2} + i\sqrt{2}$ (c) $\sqrt{2} - i\sqrt{2}$ (d) $-\sqrt{2} - i\sqrt{2}$

3) The sum of n terms of the sequence given by $a_n = 5 - 6n, n \epsilon N$ is

(a) $5 - 6n$ (b) $2 - 3n$ (c) $n\,(2 - 3n)$ (d) none of these

OR

The minimum value of $4^x + 4^{1-x}, x \in R$ *is*

(a) 2 (b) 4 (c) 1 (d) none of these

4) The value of $\sin 50^0 - \sin 70^0 + \sin 10^0$ is

(a) 1 (b) 0 (c) $\frac{1}{2}$ (d) 2

5) If $\cos\theta = -\frac{1}{2}$ *and* $\pi < \theta < 2\pi$, then the solution is

(a) $\theta = \frac{4\pi}{3}$ (b) $\theta = \frac{2\pi}{3}$ (c) $\theta = \frac{7\pi}{6}$ (d) $\theta = \frac{5\pi}{6}$

6) Range of the function $f(x) = \frac{x}{x+2}$ is

(a) R (b) $R - \{0, 2\}$ (c) R – {1} (d) R - {-2}

7) If P (n): $2^n < n!$, then the smallest positive integer for which P(n) is true is

(a) 4 (b) 3 (c) 2 (d) 1

8) Let R be a relation from a set A to a set B, then

(a) R = $A \cup B$ (b) R = $A \cap B$ (c) R ⊆A x B (d) R ⊂ A x B

9) The length of the foot of the perpendicular from the point P (3, 4, 5) on y - axis is :

(a) 10 (b) $\sqrt{34}$ (c)$\sqrt{113}$ (d) $5\sqrt{2}$

10) Distance between the lines $5x + 3y - 7 = 0$ *and* $15x + 9y + 14 = 0$ is

(a) $\frac{35}{\sqrt{34}}$ (b) $\frac{35}{2\sqrt{34}}$ (c) $\frac{35}{3\sqrt{34}}$ (d) none of these

(Q11 - Q15) Fill in the blanks

11) If P is the point on the ellipse $25\,x^2 + 16y^2 = 400$ whose foci are S and S', then the value of PS + PS' is _____.

OR

The equation of circle whose centre is (1, 2) and touching y axis is _____.

12) If $\sin x + cosec\ x = 2$, then value of $\sin^{12} x + cosec^{12} x$ is _____.

13) The slope of the lines which make equal intercept with the axes is _____.

14) Point (4, -3, -5) lies in _____Octant.

15) If A and B are two sets such that $A \subset B$, then B' – A' in terms of A and B is _____.

(Q16 - Q20) Answer the following questions

16) Write the coordinates of the foci of the hyperbola $y^2 - 16\,x^2 = 16$.

OR

Write the value of eccentricity of the ellipse with foci on x- axis and its latus rectum is equal to half of length of the major axis.

17) Write the contrapositive of the statement "**If two lines are parallel, then they do not intersect in the same plane.**"

18) Write the negation of the given statement: **Every rectangle is a square.**

19) If $A = \{1\ , 2\}\ and\ B =\ 3\}$, write AxAxB.

20) How many diagonals can be drawn by joining the vertices of an octagon?

Section: B (2×6=12)

21) Let P (n): $\mathbf{3^{2n+2} - 8n - 9}$ **is divisible by 8**, then prove P (k+1) is true if P (k) is true.

22) The minute hand of a clock is 42 cm long. How many centimeters does its tip move in 20 minutes ($use\ \pi = \frac{22}{7}$)?

OR

Find the general solution of the equation: $\sin 2x + \cos x = 0$.

23) A and B are the two sets such that

$n(A - B) = 14 + x, n(B - A) = 3x\ and\ n(A \cap B) = x,$

draw a Venn diagram to illustrate information and if $n(A) = n(B)$ then find the value of x.

24) Solve: $|z| + z = 2 + i$, where z is a complex number.

25) If $(1 + 2i)(2 + 3i)(3 + 4i) = a + ib$, find $a^2 + b^2$.

26) A die is loaded in such a way that each odd number is twice as likely to occur as even number. Find P (G), where G is the event that a number greater than 3 occurs on a single roll of the die.

OR

If A, B, C are three mutually exclusive and exhaustive events of an experiment such that

$3P(A) = 2P(B) = P(C)$, then find $P(A)$.

Section C (4×6=24)

27) Let R be a relation on the set $A = \{1, 2, 3, 4 \ldots \ldots 13, 14\}$ defined as

$R = \{(a, b): 3a - b = 0, \text{a, b} \in A\}$. Write R in roster form.

Are the following true?

i) (a , a) $\in R$, for all a $\in A$

ii) (a , b) $\in R$, implies (b , a) $\in R$, for all a, b $\in A$

iii) $(a, b) \in R$ and $(b, c) \in R$, implies $(a, c) \in R$ for all $a, b, c \in A$

Justify your answer in each case.

28) Calculate the mean and variance for the given data:

Class	0-10	10-20	20-30	30-40	40-50
Frequency	5	8	15	16	6

29) How many 5- digit numbers greater than 50000 and divisible by 5 can be formed by using the digits 0, 1, 3, 5 and 7 when

(a) the digits may be repeated?

(b) the repetition of digits not allowed?

30) Two students Arun and Arvind appeared in an examination. The probability that Arun will qualify the examination is 0.05 and that Arvind will qualify the examination is 0.10. The probability that both will qualify the examination is 0.02 . Find the probability that

a) both Arun and Arvind will not qualify the examination.

b) only one of them will qualify the examination.

31) Find the distance of the point $(2, 3)$ from the line $2x - 3y + 9 = 0$ measured along a line $x - y + 1 = 0$.

OR

Find the equation of line passing through the intersection of the lines $3x + y - 9 = 0$ and $4x + 3y - 7 = 0$ and perpendicular to the line $5x - 4y + 1 = 0$.

32) Show that : $\frac{1\times2^2+2\times3^2+\cdots+n\times(n+1)^2}{1^2\times2+2^2\times3+\cdots\ldots+n^2\times(n+1)} = \frac{3n+5}{3n+1}$

OR

If p, q, r are in G.P. and the equations, $px^2 + 2qx + r = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\frac{d}{p}, \frac{e}{q}, \frac{f}{r}$ are in A.P.

Section D (6×4=24)

33) If $2\tan\alpha = 3\tan\beta$, prove that $\tan(\alpha - \beta) = \frac{\sin 2\beta}{5 - \cos 2\beta}$

OR

If $\cos A = -\frac{12}{13}$ and $\cot B = \frac{24}{7}$, where A lies in second quadrant and B lies in third quadrant, find the values of the values of the following:

(a) $\cos(A + B)$ (b) $\tan(A - B)$ (c) $\tan\left(\frac{B}{2}\right)$

34) The third, fourth and fifth terms in the expansion of $(x + a)^n$ are respectively 84, 280 and 560. Find the value of x, a and n.

OR

If the coefficient of a^{r-1}, a^r and a^{r+1} in the expansion of $(1 + a)^n$ are in arithmetic progression, prove that $n^2 - (4r + 1)n + 4r^2 - 2 = 0$.

35) Solve the following system of inequalities graphically:

$$x + 2y \leq 8, 2x + y \geq 2, x - y < 1, x \leq 0, y \leq 0.$$

36) (a) Find the derivative of $\tan 3x$, with respect to x from first principle.

(b) Evaluate: $\lim_{x \to 0} \frac{\tan x - \sin x}{x^3}$.