Common Quarterly Examination - 2024

Standard 11
MATHEMATICS
PART - I

Time: 3.00 Hours Marks: 90

I. Choose the correct answer **20x1=20**

1) If $n[(A\times B)\cap(A\times C)] = 8$ and $n[B\cap C]=2$, then $n(A)$ is
   a) 6 b) 4 c) 8 d) 16

2) The rule $f(x) = x^2$ is a bijection if the domain and the co-domain are given by
   a) R, R b) R, $(0,\infty)$ c) $(0,\infty)$, R d) $[0,\infty)$, $[0,\infty)$

3) Let R be universal relation on a set x with more than one element. Then R is
   a) not reflexive b) not symmetric
   c) transitive d) none of the above

4) If $|x+2| \le 9$, then x belongs to
   a) $(-\infty,-7)$ b) $[-11, 7]$ c) $[-\infty,-7]\cup[11,\infty)$ d) $(-11, 7)$

5) The number of solutions of $x^2+|x-1|=1$ is
   a) 1 b) 0 c) 2 d) 3

6) If $\log_{\sqrt{x}} 0.25=4$, then the value of x is
   a) 0.5 b) 2.5 c) 1.5 d) 1.25

7) If $\cos 28^\circ + \sin 28^\circ = k^3$, then $\cos 17^\circ$ is equal to
   a) $\frac{K^3}{\sqrt{2}}$ b) $\frac{-K^3}{\sqrt{2}}$ c) $\pm\frac{K^3}{\sqrt{2}}$ d) $\frac{-K^3}{\sqrt{3}}$

8) $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \ldots\ldots\ldots + \cos 179^\circ =$
   a) 0 b) 1 c) −1 d) 89

9) In 3 fingers, the number of ways four rings can be worn is ..... ways
   a) $4^3 - 1$ b) 3^4 c) 68 d) 64

10) If ${}^nC_4$, ${}^nC_5$, ${}^nC_6$ are in A.P, the value of n can be
   a) 14 b) 11 c) 9 d) 5

11) In a plane there are 10 points are there out of which 4 points are collinear, then the number of triangles formed is
   a) 110 b) $10C_3$ c) 120 d) 116

12) The number of five digit telephone numbers having atleast one of their digits repeated is
   a) 90000 b) 10000 c) 30240 d) 69760

13) If a, 8, b are in A.P, a, 4, b are in G.P and a, x, b are in HP then x is
   a) 2 b) 1 c) 4 d) 16

14) The sum upto n-terms of the series $\sqrt{2}+\sqrt{8}+\sqrt{18}+\sqrt{32}+\ldots.$ is
   a) $\frac{n(n+1)}{2}$ b) $2n(n+1)$ c) $\frac{n(n+1)}{\sqrt{2}}$ d) 1

15) The value of the series $\frac{1}{2}+\frac{7}{4}+\frac{13}{8}+\frac{19}{16}+\ldots\ldots$ is
   a) 14 b) 7 c) 4 d) 6

16) The co-efficient of x^8y^{12} in the expansion of $(2x+3y)^{20}$ is

a) 0 b) $2^8 3^{12}$ c) $2^8 3^{12} + 2^{12} 3^8$ d) $20C_8\ 2^8 3^{12}$

17) The slope of the line which makes an angle 45° with the line $3x-y=-5$ are

a) 1, −1 b) $\frac{1}{2}$, −2 c) 1, $\frac{1}{2}$ d) 2, $\frac{-1}{2}$

18) The equation of the line with slope 2 and the length of the prependicular from the origin equal to $\sqrt{5}$ is

a) $x+2y=\sqrt{5}$ b) $2x+y=\sqrt{5}$ c) $2x+y=5$ d) $x+2y=5$

19) The area of the triangle formed by the lines $x^2-4y^2=0$ and $x = a$ is

a) $2a^2$ b) $\frac{\sqrt{3}}{2}a^2$ c) $\frac{1}{2}a^2$ d) $\frac{2}{\sqrt{3}}a^2$

20) If one of the lines given by $6x^2-xy+4cy^2=0$ is $3x+4y=0$, then c equals to

a) −3 b) −1 c) 3 d) 1

PART - II

II. Answer any 7 questions. Q.No: 30 is compulsory. **7x2=14**

21) $f : N \to N$ defined by $f(n)=n+2$, check whether f is one-to-one and onto

22) Solve: $|2x-3| = |x-5|$

23) Find the values of p for which the difference between the roots of the equation $x^2+px+8=0$ is 2.

24) Find the value of tan 165°.

25) Find the area of the triangle whose sides are 13cm, 14cm and 15cm

26) In how many ways 5 persons can be seated in a row?

27) If ${}^nC_{12} = {}^nC_9$, find ${}^{21}C_n$

28) Find the co-efficient of x^{15} in $\left(x^2+\frac{1}{x^3}\right)^{10}$

29) The slope of one of the straight lines $ax^2+2hxy+by^2=0$ is twice that of the other, show that $8h^2=9ab$.

30) If the two straight lines $x+(2k-7)y+3=0$ and $3kx+9y-5=0$ are perpendicular then find the value of k.

PART - III

III. Answer any 7 questions. Q.No: 40 is compulsory. **7x3=21**

31) On the set of natural numbers let R be the relation defined by aRb if $2a+3b=30$. Write the relation by listing all the pairs. Check whether it is equivalence

32) If $\log_2 x + \log_4 x + \log_{16} x = \frac{7}{2}$, find the value of x

33) Prove that $\tan\left(\pi/4+\theta\right) - \tan\left(\pi/4-\theta\right) = 2\tan 2\theta$

34) Solve: $\sin 5x - \sin x = \cos 3x$

35) In how many ways 5 boys and 4 girls can be seated in a row so that no two girls are together

36) Write the first four terms of the logarithmic series $\log(1+4x)$

37) Expand: $\left[2x - \frac{1}{2x}\right]^4$

38) Find the equations of straight lines which are perpendicular to the line $3x+4y-6=0$ and are at a distance of 4 units from (2, 1).

39) Rewrite $\sqrt{3}x + y + 4 = 0$ into normal form

40) How many triangles can be formed by joining 15 points on the plane, in which no line joining any three points?

PART - IV

IV. Answer all the questions. **7x5=35**

41) Write the values of f at −3, 5, 2, −1, 0 if

$$f(x) = \begin{cases} x^2 + x - 5 & \text{if } x \in (-\infty, 0) \\ x^2 + 3x - 2 & \text{if } x \in (3, \infty) \\ x^2 & \text{if } x \in (2, 0) \\ x^2 - 3 & \text{otherwise} \end{cases}$$

(OR)

Show that the equation $9x^2-24xy+16y^2-12x+16y-12=0$ represents a pair of parallel lines. Find the distance between them.

42) If the equation $x^2-ax+b=0$ and $x^2-ex+f=0$ have one root in common and if the second equation has equal roots, then prove that $ae=2[b + f]$

(OR)

Prove that $32\sqrt{3}\sin\frac{\pi}{48}\cos\frac{\pi}{48}\cos\frac{\pi}{24}\cos\frac{\pi}{12}\cos\frac{\pi}{6} = 3$

43) Show that $\tan 75^\circ + \cot 75^\circ = 4$

(OR)

By the principle of mathematical Induction, prove that, for all intergers $n \geq 1$

$$1^2 + 2^2 + 3^2 + \ldots\ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

44) If the letters of the word GARDEN are permuted in all possible ways and the strings thus formed are arranged in the dictionary order, then find the rank of the words (i) GARDEN (ii) DANGER

(OR)

Find $\sqrt[3]{65}$

45) The A.M of two numbers exceeds their GM by 10 and HM by 16. Find the numbers

(OR)

Resolve into partial fraction: $\frac{7+x}{(1+x)(1+x^2)}$

TVL11M

46) Find the equation of the locus of the point P such that the line segment AB, joining the points A(1, –6) and B(4, –2), substends a right angle at P

(OR)

If f: R→R is defined by $f(x)=3x-5$, Prove that f is a bijection and find its inverse

47) Prove that $\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$

(OR)

Find r, if $5 \times^4 P_r = 6 \times^5 P_{r-1}$

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