COMMON QUARTERLY EXAMINATION - SEPTEMBER 2019

Reg No 1 1 1 4

Standard - 11

PART - III - MATHEMATICS

Time Allowed: 2.30 Hours Maximum Marks: 90

Instructions: 1. **Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.**
2. **Use Blue or Black ink to write and underline and pencil to draw diagrams.**

PART - I

Note: i) Answer all the questions. **20×1=20**
ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.

1) The range of the function $\frac{1}{1-2\sin x}$ is

a) $(-\infty, -1) \cup \left(\frac{1}{3}, \infty\right)$ b) $\left(-1, \frac{1}{3}\right)$

c) $\left[-1, \frac{1}{3}\right]$ d) $(-\infty, -1] \cup \left[\frac{1}{3}, \infty\right)$

2) The function $f : [0, 2\pi] \to [-1, 1]$ defined by $f(x) = \sin x$ is
a) one-to-one b) onto c) bijection d) cannot be defined

3) The solution set of the following inequality $|x-1| \geq |x-3|$ is
a) [0, 2] b) [2, ∞) c) (0, 2) d) (−∞, 2)

4) If 3 is the logarithm of 343, then the base is
a) 5 b) 7 c) 6 d) 9

5) In a ΔABC, $\tan\left(\frac{A}{2}\right) =$

a) $\sqrt{\frac{(s-b)(s-c)}{bc}}$ b) $\sqrt{\frac{s(s-a)}{bc}}$

c) $\sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$ d) $\sqrt{s(s-a)(s-b)(s-c)}$

6) There are 10 points in a plane and 4 of them are collinear. The number of straight lines joining any two points is
a) 45 b) 40 c) 39 d) 38

7) The n^{th} term of the sequence 1, 2, 4, 7, 11, ... is

a) n^3+3n^2+2n b) n^3-3n^2+3n c) $\frac{n(n+1)(n+2)}{3}$ d) $\frac{n^2-n+2}{2}$

8) The slopes 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) $2, \frac{-1}{2}$

9) If the pair of straight lines $6x^2+41xy-7y^2 = 0$ makes angle α and β with x-axis, then $\tan\alpha \tan\beta$ =

a) $\frac{-6}{7}$ b) $\frac{6}{7}$ c) $\frac{-7}{6}$ d) $\frac{7}{6}$

10) If n(A) = 5 and n(B) = 7 then the number of subsets of A×B is

a) 2^{35} b) 2^{49} c) 2^{25} d) 2^{70}

11) The relation "less than" in the set of natural numbers is

a) only symmetric b) only transitive
c) only reflexive d) equivalence

12) If $\left(\frac{2}{3}\right)^{x+2} = \left(\frac{3}{2}\right)^{2-2x}$ then x =

a) 1 b) 3 c) 4 d) 0

13) The value of $\frac{2(3^{n+1})+7(3^{n-1})}{3^{n+2}-2\left(\frac{1}{3}\right)^{1-n}}$ is

a) 1 b) 3 c) −1 d) 0

14) If $\frac{\cos 3\theta}{2\cos 2\theta - 1} = \frac{1}{2}$, then the value of θ is

a) $\theta = n\pi + \frac{\pi}{3}$ b) $\theta = 2n\pi \pm \frac{\pi}{3}$ c) $\theta = 2n\pi \pm \frac{\pi}{6}$ d) $\theta = n\pi \pm \frac{\pi}{6}$

15) If $1+\cos(x-y) = 0$ then

a) $\cos x-\cos y = 0$ b) $\cos x+\cos y = 0$
c) $\cos x+\sin y = 1$ d) $\sin x+\cos y = 1$

16) The number of diagonals of octogen will be

a) 28 b) 20 c) 10 d) 16

17) The number of words which can be formed from the letters of the word "MAXIMUM", if two consonents cannot occur together is

a) 4! b) 3!×4! c) 7! d) 5!

18) If the 19^{th} term of A.P is zero then its 49^{th} term : 29^{th} term is

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

19) The distance between the lines $3x-4y+5 = 0$ and $6x-8y+5 = 0$ is

a) 2 b) $\frac{1}{2}$ c) $\frac{3}{2}$ d) $\frac{5}{2}$

20) Angle between the pair of straight lines $x^2-xy-6y^2-7x+31y-18 = 0$ is

a) 45° b) 60° c) 90° d) 30°

PART - II

Answer any seven questions. **7×2=14**
Question no. 30 is compulsory.

21) If $\wp(A)$ denotes the power set of A, then find $n(\wp(\wp(\wp(\phi))))$.

22) If a and b are the roots of the equation $x^2-px+q = 0$, find the value of $\frac{1}{a}+\frac{1}{b}$.

23) Evaluate $\left(\left((256)^{-1/2}\right)^{\frac{-1}{4}}\right)^3$.

24) A foot ball player can kick a football from ground level with an initial velocity of 80 ft/second. Find the maximum horizontal distance the football travels and at what angle? (Take g = 32)

25) Find the general solution of $\sin\theta = \frac{-1}{\sqrt{2}}$.

26) In how many ways 5 different balls be distributed among 3 boxes?

27) If $15C_{2r-1} = 15C_{2r+4}$, find r.

28) Find the sum of the first n terms of the series

$$\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \ldots\ldots$$

29) The length of the perpendicular drawn from the origin to a line is 12 and makes an angle 150° with positive direction of the x-axis. Find the equation of the line.

30) If $f(x) = y = \frac{ax-b}{cx-a}$, then prove that f(y) = x.

PART - III

Answer any seven questions. Question No. 40 is compulsory: **7×3=21**

31) Discuss the following relations for reflexivity, symmetricity and transitivity: Let P denote the set of all straight lines in a plane. The relation R defined by "ℓRm if ℓ is perpendicular to m".

32) Find the domain of the function $f(x) = \frac{1}{1-2\cos x}$.

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

34) State and prove Projection formula.

35) Find the rank of the word BLEAT.

36) Find the sum of $1 + \frac{4}{5} + \frac{7}{25} + \frac{10}{125} + \ldots\ldots$

37) If a, b, c are in geometric progression, and if $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$ then prove that x, y, z are in arithmetic progression.

38) Express the equation $\sqrt{3}x - y + 4 = 0$ in the following equivalent form (i) Slope and Intercept form (ii) Intercept form.

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

40) Find the value of $\frac{1}{\log_x(yz)+1} + \frac{1}{\log_y(zx)+1} + \frac{1}{\log_z(xy)+1}$.

Exercise 6.2 → 4th sum.

PART - IV

Answer all the questions: **7×5=35**

41) a) If $f:R\to R$ is defined by $f(x) = 2x-3$ prove that f is a bijection and find its inverse.

(OR)

b) Resolve into partial fraction $\frac{x^2+x+1}{x^2-5x+6}$.

42) a) From the curve $y = x^3$, draw the following in the same plane (i) $y = -x^3$ (ii) $y = x^3+1$ (iii) $y = x^3-1$ (iv) $y = (x+1)^3$ with the same scale.

(OR)

b) If $\cot\theta(1+\sin\theta) = 4m$ and $\cot\theta(1-\sin\theta) = 4n$, then prove that $(m^2-n^2)^2 = mn$.

43) a) Find all values of x that satisfies the inequality $\frac{2x-3}{(x-2)(x-4)} < 0$.

(OR)

b) By the principle of mathematical induction, prove that, for all integers.

$n \geq 1$, $1^2+2^2+\ldots\ldots\ldots+n^2 = \frac{n(n+1)(2n+1)}{6}$.

44) a) If $A+B+C = \pi$, prove that $\cos A+\cos B+\cos C = 1+4\sin\left(\frac{A}{2}\right)\sin\left(\frac{B}{2}\right)\sin\left(\frac{C}{2}\right)$.

(OR)

b) A committee of 7 peoples has to be formed from 8 men and 4 women. In how many ways can this be done when the committee consists of (i) exactly 3 women? (ii) at least 3 women? (iii) at most 3 women?

45) a) Prove that $\sqrt[3]{x^3+7} - \sqrt[3]{x^3+4}$ is approximately equal to $\frac{1}{x^2}$ when x is large.

(OR)

b) A 150m long train is moving with constant velocity of 12.5 m/s. Find
i) the equation of the motion of the train.
ii) time take to cross a pole.
iii) the time taken to cross the bridge of length 850m is?

46) a) If n is a positive integer, show that $9^{n+1}-8n-9$ is always divisible by 64 using binomial theorem. **(OR)**

b) If the equation $\lambda x^2-10xy+12y^2+5x-16y-3 = 0$ represents a pair of straight lines, find (i) the value of λ and the separate equations of the lines (ii) angle between the lines.

47) a) Solve: $\sec x-\tan x = \sqrt{3}$ $(\cos x \neq 0)$.

(OR)

b) How many numbers greater than ten lakh can be formed with digits 2, 3, 0, 3, 4, 2, 3.

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