Common First Revision Test - January 2024

Standard - 11

MATHEMATICS

Time Allowed: 3.00 Hours Maximum Marks: 90

PART - I

20×1=20

Note: 1. **Answer all the questions.**
2. **Choose the correct or the most suitable answer.**

1) The number of constant functions from a set containing m elements to a set containing n elements is

a) mn b) m c) n d) m+n

2) The number of roots of $(x+3)^4 + (x+5)^4 = 16$ is

a) 4 b) 2 c) 3 d) 0

3) The value of $\left(3^{-6}\right)^{1/3}$ is .... =

a) 9 b) $1/9$ c) 3 d) $1/6$

4) $\dfrac{\cos 6x + 6\cos 4x + 15\cos 2x + 10}{\cos 5x + 5\cos 3x + 10\cos x} =$

a) cos x b) cos 2x c) cos 3x d) 2 cos x

5) Convert 18° to radians ....

a) −10 b) 30 c) 10 d) $\pi/10$

6) If P_r stands for rp_r then the sum of the series $1+P_1+2P_2+3P_2+....+nP_n$ is ...

a) P_{n+1} b) $P_{n+1}-1$ c) $P_{n+1}+1$ d) $n+1P_{n-1}$

7) The remainder when 38^{15} is divided by 13 is ....

a) 12 b) 1 c) 11 d) 5

8) The length of ⊥ from the origin to the line $\frac{x}{3} - \frac{y}{4} = 1$ is ......

a) $11/5$ b) $5/12$ c) $12/5$ d) $5/7$

9) If $A = \begin{bmatrix} a & x \\ y & a \end{bmatrix}$ and if xy = 1 then $\det(AA^T) =$

a) $(a-1)^2$ b) $(a^2+1)^2$ c) (a^2-1) d) $(a^2-1)^2$

10) If $\lambda\vec{i} + \lambda 2\vec{j} + \lambda 2\vec{k}$ is a unit vector then the value of λ is

a) $1/3$ b) $1/4$ c) $1/9$ d) $1/2$

11) The sum of the squares direction cosines of $\vec{r}$ is

a) 1 b) 2 c) $\sqrt{x^2+y^2+z^2}$ d) π

12) $\underset{x \to 0}{\text{Limit}} \dfrac{\sin x}{\sqrt{x^2}} =$....

a) −1 b) 1 c) 0 d) ∞

13) If Pv = 81 then $\frac{dp}{dv}$ at υ = 9 is .....

a) 1 b) −1 c) 2 d) −2

14) The slope of the tangent lines to the graph $x^2+y^2 = 4$ at the points corresponding to $x = 1$ is

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

15) $\int \frac{\sec x}{\sqrt{\cos 2x}} dx =$ ....

a) $\tan^{-1}(\sin x)+c$ b) $2\sin^{-1}(\tan x)+c$ c) $\tan^{-1}(\cos x)+c$ d) $\sin^{-1}(\tan x)+c$

16) $\int e^{3x} dx =$ ......

a) $\frac{e^{3x}}{3}+c$ b) $\frac{e^{3x}}{-3}+c$ c) $e^{3x}+c$ d) $\frac{1}{e^{3x}}+c$

17) Ten coins are tossed. The probability of getting at least 8 heads is ....

a) $\frac{7}{64}$ b) $\frac{7}{32}$ c) $\frac{7}{16}$ d) $\frac{7}{12}$

18) 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) $\frac{2}{\sqrt{3}}a^2$

19) The number of relations on a set containing 3 elements is

a) 9 b) 81 c) 512 d) 1024

20) In 3 fingers, the number of ways four rings can be worn is .....

a) 4^3-1 b) 3^4 c) 68 d) 64

PART - II

Answer any seven questions. Question No. 40 is compulsory. 7×2=14

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

22) Rationalize the denominator of $\frac{\sqrt{5}}{\sqrt{6}+\sqrt{2}}$

23) Write $\cos 5\theta \cos 2\theta$ of product as a sum or difference.

24) A trust has 25 members (i) How many ways 3 officers can be selected? (ii) In howmany ways can a President, Vice President and a Secretary be selected?

25) Find the distance between the parallel lines are $12x+5y = 7$ and $12x+5y+7 = 0$

26) Find the area of the triangle whose vertices are (−2, −3) (3, 2) and (−1, −8)

27) Write the direction ratios and direction cosines of the vectors $3\vec{i}-4\vec{j}+8\vec{k}$

28) Differentiate: $y = \frac{\sin x}{1+\cos x}$

29) If $f'(x) = 4x-5$ and $f(2) = 1$ find $f(x)$

30) If two coins are simultaneously, then find the probability of getting (i) one head and one tail (ii) at most two tails.

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PART - III

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

31) Lex X = {a, b, c, d} and R = {(a, a) (b, b) (a, c)} write down the minimum number of ordered pairs to be included to R to make it. (i) reflexive (ii) symmetric (iii) transitive (iv) equivalence

32) If α and β are roots of the quadratic equation $x^2+\sqrt{2}x+3=0$ form a quadratic polynomials with Zeroe's $1/\alpha$ and $1/\beta$

33) Prove that $\sin(45°+\theta)+\sin(45°-\theta)=\sqrt{2}\sin\theta$.

34) Find the coefficient of x^{15} in the expansion $\left(x^2+\frac{1}{x^3}\right)^{10}$

35) Find the equation of the straight line passing through (8, 3) and having intercepts whose sum is 1.

36) If G is the centroid of the triangle ABC, Prove that $\vec{GA}+\vec{GB}+\vec{GC}=0$

37) Evaluate: $\lim_{x\to 3}\frac{x^2-9}{x^2-6x+9}$

38) Integrate: $x^3\sin x$

39) Suppose the chances of hitting a target by a person X is 3 times in 4 shots, by Y is 4 times in 5 shots, and by Z is 2 times in 3 shots. They are simultaneously exactly one time. What is the probability that the target is damaged by exactly 2 hits?

40) Prove that $\begin{vmatrix}1 & x & x\\ x & 1 & x\\ x & x & 1\end{vmatrix}^2=\begin{vmatrix}1-2x^2 & -x^2 & -x^2\\ -x^2 & -1 & x^2-2x\\ -x^2 & x^2-2x & -1\end{vmatrix}$

PART - IV

Answer all the questions: **7×5=35**

41) Write the values of −3, 5, 2, −1, 0 if $f(x)=\begin{cases}x^2+x-5 & ;x\in(-\infty,0)\\ x^2+3x-2 & ;x\in(3,\infty)\\ x^2 & ;x\in(0,2)\\ x^2-3 & \text{otherwise}\end{cases}$

(OR)

Integrate: $\int\frac{2x+3}{\sqrt{x^2+x+1}}$

42) In ΔABC prove that $\frac{a^2+b^2}{a^2+c^2}=\frac{1+\cos(A-B)\cos C}{1+\cos(A-C)\cos B}$

(OR)

(i) Find $\sqrt[3]{65}$. (ii) Find the sum $1+\frac{4}{5}+\frac{7}{25}+\frac{10}{125}+\ldots\ldots$

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43) Prove that for any natural number n, $a^n - b^n$ is divisible by a−b where a > b.

(OR)

Find the value of K, if the following equation represents a pair of straight lines. Further find whether these lines are parallel or intersecting $12x^2-7xy-12y^2-x+7y+K=0$

44) Prove that $\log_{10}2 + 16\log_{10}\frac{16}{15} + 12\log_{10}\frac{25}{24} + 7\log_{10}\frac{81}{80} = 1$

(OR)

If $A+B+C = \pi/2$ prove that $\cos 2A + \cos 2B + \cos 2C = 1+4\sin A \sin B \sin C$

45) Using factor theorem prove that $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$

(OR)

If $y = \frac{\sin^{-1}x}{\sqrt{1-x^2}}$ prove that $(1-x^2)y_2 - 3xy_1 - y = 0$

46) i) For any vector $\vec{a}$ prove that $|\vec{a}\times\vec{i}|^2 + |\vec{a}\times\vec{j}|^2 + |\vec{a}\times\vec{k}|^2 = 2|\vec{a}|^2$

ii) If $|\vec{a}+\vec{b}| = |\vec{a}-\vec{b}|$. Prove that $\vec{a}$ and $\vec{b}$ are perpendicular.

(OR)

A function f is defined as follows: $f(x) = \begin{cases} 0 & \text{for } x < 0 \\ x & \text{for } 0 \le x < 1 \\ -x^2+4x-2 & \text{for } 1 \le x < 3 \\ 4-x & \text{for } x \ge 3 \end{cases}$

Is the function continuous?

47) The chances of x, y and z becaming managers of a centain company are 4:2:3. The prohabilities that bonus scheme will be introduced if X, Y and Z became managers are 0.3, 0.5 and 0.4 respectively. If the bonus scheme hasbeen introduced, what is the probability that Z was appointed as the manager?

(OR)

Prove by Vector method, A quadrilateral is a parallelogram if and only if its diagonals bisect each other.
