

Subject : Maths (050)

Total Marks : 80

Medium : English

Time : 3 Hours

Section – A

1) Answer the following questions (Each carries 1 mark) [24]

- i. If $n(p(p(p(A)))) = 4$, then $A =$ _____.
(a) $\{\phi\}$ (b) $\{1,2\}$ (c) ϕ (d) U
- ii. Write the set $\{x \in \mathbb{R} / -4 < x \leq 6\}$ in interval form.
- iii. If $\left(\frac{x}{3} + 1, y - \frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$, then find the values of x and y .
- iv. The range of function $f : \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = x^2 + 2$ is _____.
- v. Find the radian measure corresponding to the degree measure 25° .
- vi. Find the value of $\sin 75^\circ$.
- vii. The complex number $3(7 + i7) + i(7 + i7) = a + ib$ then $a =$ _____.
- viii. The roots of the equation $x^2 - x + 2 = 0$ are in...
(a) Complex set C (b) Real set R (c) Irrational set $R - Q$ (d) Integer set Z
- ix. If ${}^nC_2 = {}^nC_8$, then $n =$ _____.
- x. What is the number of ways of choosing 4 cards of the same suits from a pack of 52 cards?
- xi. Find n^{th} term of the sequence 7, 9, 11, 13.....
- xii. If A and G are A.P. and G.P. respectively of the numbers 4 and 16, then $A - G =$ _____.
- xiii. Write the equation of the line passing through the point $(-4, 3)$ with a slope $\frac{1}{2}$.
- xiv. Reduce the equation $\sqrt{3}x + y - 8 = 0$ into normal form.
- xv. Find the centre and radius of the circle $x^2 + y^2 - 4x - 8y - 45 = 0$.
- xvi. Find the equation of the parabola with vertex at $(0,0)$ and focus at $(0,2)$.
- xvii. Find $\frac{d}{dx} (ax^2 + b)^2$, where a and b are constants.
- xviii. If $f(x) = \frac{x+1}{x}$, $x \neq 0$, then find $f'(1)$.
- xix. $\lim_{x \rightarrow \frac{\pi}{2}} \left(\frac{\tan 2x}{x - \frac{\pi}{2}}\right) =$ _____
(a) 2 (b) -1 (c) 1 (d) -2
- xx. If $p(A) = 0.99$, then $p(A') =$ _____.
- xxi. What is the probability of the event "Having 5 Sundays in the month of January 2021?"

- xxii. If $\binom{n}{1} + \binom{n}{2} + \binom{n}{3} + \dots + \binom{n}{n} = 31$, then $n =$ _____.
- xxiii. Find the value of $\sin^2 \frac{\pi}{6} + \cos \frac{\pi}{3} - \tan \frac{\pi}{4}$.
- xxiv. Evaluate : $\sum_{r=1}^{11} (2 + 3^r)$

Section – B

❖ Answer any 11 questions from given questions

(Each carries 2 marks)

[22]

2. Let $A : \{x : x \text{ is a natural number}\}$
 $B : \{x : x \text{ is an even natural number}\}$ and
 $C : \{x : x \text{ is a prime number}\}$
 Find (i) $A - B$ (ii) $C - A$
3. If $A = \{1, 2, 3, 4, 6\}$ and relation $R = \{(a,b) : a, b \in A, b \text{ is divisible by } a\}$, then
 (1) Write R in roster form. (2) Find domain and range of R .
4. In a circle of diameter 40 cm, the length of a chord is 20 cm. Find the length of minor arc of the chord.
5. $\tan x = \frac{-5}{12}$, x lies in second quadrant. Find the values of other five trigonometric functions..
6. Express $z = \frac{5 + \sqrt{2}i}{1 - \sqrt{2}i}$ in $a + ib$ form.
7. Solve the equation : $\sqrt{2}x^2 + x + \sqrt{2} = 0$
8. If ${}^5P_r = 2 \cdot {}^6P_{r-1}$, then find the value of r .
9. In how many ways can a team of 3 boys and 3 girls be selected from 5 boys and 4 girls?
10. Insert two numbers between 3 and 81 so that the resulting sequence is G.P.
11. If three points $(h,0)$, (a,b) and $(0,k)$ lies on a same line, show that $\frac{a}{h} + \frac{b}{k} = 1$.
12. What are the points on the y -axis whose distance from the line $\frac{x}{3} + \frac{y}{4} = 1$ is 4 units?
13. Find the equation of the circle passing through $(0,0)$ and making intercepts a and b on the coordinate axis.
14. Find the equation of hyperbola whose vertices $(\pm 2, 0)$ and foci $(\pm 3, 0)$.
15. Find $\lim_{x \rightarrow 0} \frac{x(e^x - 1)}{1 - \cos x}$.
16. A coin is tossed twice. What is the probability that atleast one tail occurs?
17. If $P(A) = 0.54$, $P(B) = 0.69$, $P(A \cap B) = 0.35$, then find $P(A' \cap B')$ and $P(B \cap A')$.

Section – C

❖ Answer any 8 questions from the following questions.

(Each carries 3 marks)

[24]

18. If $U = \{1,2,3,4,5,6,7,8,9\}$, $A = \{2,4,6,8\}$ and $B = \{2,3,5,7\}$, then verify that...
(1) $(A \cup B)' = A' \cap B'$ (2) $(A \cap B)' = A' \cup B'$
19. Let $f = \{(1,1), (2,3), (0,-1), (-1,-3)\}$ be a linear function from z to z . Find $f(x)$.
20. Prove that : $\cos 6x = 32\cos^6x - 48\cos^4x + 18\cos^2x - 1$
21. Find the modulus and the argument of $z = -\sqrt{3} + i$.
22. How many 4 digit numbers can be formed using the digits 1, 2, 3, 4, 5, if no digit is repeated? How many of these will be even?
23. In how many ways can the letters of the word PERMUTATIONS be arranged, if the...
(i) Words start with P and end with S.
(ii) All the vowels are together.
24. If $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$ is the arithmetic mean of a and b , then find the value of n .
25. If the measure of angle between two lines is θ and $\tan \theta = \frac{1}{3}$ and the slope of a line is double of the slope of another line, then find the slope of two lines.
26. Find the coordinates of the foci, the eccentricity and the length of latus rectum of the ellipse $\frac{x^2}{25} + \frac{y^2}{100} = 1$.
27. If $y = \frac{\sin(x+a)}{\cos x}$, then find $\frac{dy}{dx}$.
28. If $y = (x + \sec x)(x - \tan x)$, then find $\frac{dy}{dx}$.
29. Three coins are tossed once. Find the probability of getting...
(1) atleast two heads.
(2) atleast two tails.

Section – D

❖ Answer any two from the following questions.

(Each carries 5 marks)

[10]

30. Prove that, $\cos^2 x + \cos^2 \left(x - \frac{\pi}{3}\right) + \cos^2 \left(x + \frac{\pi}{3}\right) = \frac{3}{2}$
31. Find the sum of n terms of the sequence 8, 88, 888, 8888,
32. If $f(x) = \begin{cases} mx^2 + n & ; x < 0 \\ nx + m & ; 0 \leq x \leq 1 \\ nx^3 + m & ; x > 1 \end{cases}$

for what integers m and n does both $\lim_{x \rightarrow 0} f(x)$ and $\lim_{x \rightarrow 1} f(x)$ exists?