This Question Paper contains 20 printed pages.
(Part - A & Part - B)
Sl.No.

050 (E)

(MARCH / APRIL, 2015)

Part - A : Time : 1 Hour / Marks : 50
Part - B : Time : 2 Hours / Marks : 50

પ્રશ્ન પેપરનો સેટ નંબર Set No. of Question Paper:
09

(Part - A)

Time : 1 Hour] ***[Maximum Marks : 50***

Instructions :

1) **There are 50 objective type (M.C.Q.) questions in Part - A and all questions are compulsory.**
2) **The questions are serially numbered from 1 to 50 and each carries 1 mark.**
3) **Read each question carefully, select proper alternative and answer in the O.M.R. sheet.**
4) **The OMR sheet is given for answering the questions. The answer of each question is represented by (A) O, (B) O, (C) O, (D) O. Darken the circle ● of the correct answer with ball-pen.**
5) **Rough work is to be done in the space provided for this purpose in the Test Booklet only.**
6) **Set No. of Question Paper printed on the upper-most right side of the Question Paper is to be written in the column provided in the OMR sheet.**
7) **Use of Simple Calculator and log table is allowed, if required.**

Rough Work

1) $\lim_{x \to a} \frac{\cos x - \cos a}{x - a} =$ _____

(A) $-\sin a$ (B) $-\sin x$

(C) $\cos x$ (D) $\cos a$

2) $\lim_{x \to 0} \frac{1 - \cos 4x}{1 - \cos 2x} =$ _____.

(A) 2 (B) -4

(C) 4 (D) 1

Rough Work

3) $\lim_{x \to 16} \frac{x^{\frac{1}{4}} - 2}{\sqrt{x} - 4} =$ _____.

(A) 2

(B) $-\frac{1}{2}$

(C) $\frac{1}{4}$

(D) 1

4) $\lim_{x \to 0} \frac{\tan x - 20x}{9x - \sin x} =$ _____.

(A) $\frac{9}{20}$

(B) $\frac{20}{9}$

(C) $-\frac{19}{8}$

(D) 0

5) $\lim_{x \to \frac{\pi}{4}} \frac{\sqrt{2}\sin x - 1}{\cos 2x} =$ _____

(A) $-\frac{1}{2}$

(B) $\frac{1}{2}$

(C) $\sqrt{2}$

(D) $\frac{1}{\sqrt{2}}$

Rough Work

6) If $f(x) = x^{100} + x^{99} + x^{98} + - - - + 1$ then $f'(1) =$ _____.

(A) 505

(B) 5000

(C) 5050

(D) 5500

7) If $f(x) = \cos^2 x$ then $f'(\pi/6) =$ _____.

(A) $\frac{1}{2}$

(B) $\sqrt{3}$

(C) $\frac{\sqrt{3}}{2}$

(D) $-\frac{\sqrt{3}}{2}$

8) $\frac{d}{dx}\left(\sin^2(x^4) + \cos^2(x^4)\right) =$ _____

(A) 0

(B) 1

(C) -1

(D) $2(\sin x^4 + \cos x^4)$

9) $\frac{d}{dx}(\cot x^\circ) =$ _____.

(A) $-\frac{\pi}{180}\operatorname{cosec}^2 x^\circ$

(B) $-\operatorname{cosec}^2 x^\circ$

(C) $\frac{\pi}{180}\operatorname{cosec}^2 x^\circ$

(D) 0

Rough Work

10) $\frac{d}{dx}(x|x|) =$ _____ (where $x < 0$)

(A) 0

(B) $2x$

(C) -2

(D) $-2x$

11) $P(n) : n^2 - n + 41$ is a prime is false for $n =$ _____

(A) 3

(B) 1

(C) 2

(D) 41

12) $\left[i^{19} + \left(\frac{1}{i}\right)^{25}\right]^2 =$ _____

(A) -4

(B) 4

(C) $2i^2$

(D) $-2i$

13) If $x + 2yi = xi + y + 3$ then values of x and y are respectively _____ and _____.

(A) $-6, 3$

(B) $6, 3$

(C) $4, 2$

(D) $3, 6$

14) Find the multiplicative inverse of $Z = 3 - 4i$.

(A) $\frac{3}{25} - \frac{4i}{25}$

(B) $-\frac{3}{25} + \frac{4i}{25}$

(C) $-\frac{3}{25} - \frac{4i}{25}$

(D) $\frac{3}{25} + \frac{4i}{25}$

Rough Work

15) If $(a+ib)^2 = \frac{1+i}{1-i}$ then $a^2+b^2 =$ _____.

(A) -1 (B) 1

(C) $\sqrt{2}$ (D) 0

16) The middle term of $\left(x^2+\frac{1}{x^2}\right)^{2n}$ is _____, $(x \neq 0)$

(A) $\binom{2n}{n}\frac{1}{x^{2n}}$

(B) $\binom{2n}{n}x^{2n}$

(C) $\binom{2n}{n-1}$

(D) $\binom{2n}{n}$

17) $\binom{n+1}{1}+\binom{n+1}{2}+\ldots+\binom{n+1}{n} =$ _____ where $n \in$ N

(A) $2^{n+1}-1$ (B) 2^n-1

(C) $2(2^n-1)$ (D) 2^n-2

18) The sum of co-efficients of $a^{11}b^2$ and a^2b^{11} in the expansion of $(a+b)^{13}$ is _____.

(A) $2\binom{13}{2}$ (B) $\binom{13}{11}$

(C) $\binom{13}{10}$ (D) $2\binom{13}{10}$

Rough Work

19) The fifth term in expansion of $(3x - y)^7$ is _____.

(A) $945\, x^4\, y^3$

(B) $945\, x^3\, y^4$

(C) $-945\, x^3\, y^4$

(D) $-2835\, x^4\, y^3$

20) The value of $\sin\left(-\frac{50\pi}{3}\right)$ is _____.

(A) $-\frac{\sqrt{3}}{2}$

(B) $\frac{\sqrt{3}}{2}$

(C) $\frac{1}{2}$

(D) $-\frac{1}{2}$

21) The maximum value of function $f(x) = 5\cos x - 12\sin x - 13$ is _____.

(A) 13

(B) 26

(C) 0

(D) –26

22) If A = 128 and $x = \sin A° + \cos A°$ then _____

(A) $x > 0$

(B) $x < 0$

(C) $x = 0$

(D) $x \geq 0$

Rough Work

23) Minimum value of $f(x) = \sin^4 x + \cos^4 x$ is _____

(A) 1 (B) $\frac{1}{2}$

(C) 0 (D) -1

24) If $\cos\alpha = -3/5, \frac{\pi}{2} < \alpha < \pi$ then the value of $\cos\frac{\alpha}{2}$ is _____.

(A) $-\frac{1}{\sqrt{5}}$

(B) $\frac{1}{\sqrt{5}}$

(C) $\frac{2}{\sqrt{5}}$

(D) $-\frac{3}{10}$

25) One of the root of $8x^3 - 6x = 1$ is _____

(A) $\sin 70°$ (B) $\sin 20°$

(C) $\cos 80°$ (D) $\cos 10°$

26) If $\tan\theta = 3$ then $\tan 4\theta =$ _____

(A) $-\frac{24}{7}$

(B) $\frac{24}{7}$

(C) $-\frac{24}{25}$

(D) $\frac{24}{25}$

Rough Work

27) The value of $\sin 18° \cos 36° + \sin 15° \cos 15°$ is _____

(A) $\frac{1}{2}$

(B) 1

(C) 2

(D) $\frac{1}{4}$

28) If $\sin B = \frac{3}{5}, 0 < B < \pi/2$ then $\sin 2B + \cos 2B =$ _____.

(A) $\frac{24}{25}$

(B) $\frac{31}{25}$

(C) $\frac{7}{25}$

(D) $\frac{17}{25}$

29) The general solution set of $3 \cos \theta - 4 \sin \theta = 6$ is _____.

(A) R

(B) ϕ

(C) $\left\{\frac{\pi}{4}\right\}$

(D) $\left\{k\pi + \frac{\pi}{4} \mid k \in Z\right\}$

Rough Work

30) The solution set of $\sin\theta + \cos\theta = \sqrt{2}$ is _____.

(A) $\left\{k\pi - \frac{\pi}{4} \mid k \in Z\right\}$

(B) $\left\{k\pi + \frac{\pi}{4} \mid k \in Z\right\}$

(C) $\left\{2k\pi - \frac{\pi}{4} \mid k \in Z\right\}$

(D) $\left\{2k\pi + \frac{\pi}{4} \mid k \in Z\right\}$

31) In ΔABC, $A = \frac{\pi}{4}$, $C = \frac{\pi}{3}$ then $2b - a$ is _____.

(A) $\sqrt{3}\,c$

(B) c

(C) $\sqrt{2}\,c$

(D) $2c$

32) The number of solutions of the equation $3\cos^2 x - 7\cos x + 2 = 0$ in the interval $[0, 5\pi]$ is _____

(A) 5

(B) 0

(C) 6

(D) 10

Rough Work

33) For equilateral ΔABC if $b = 3$ then circum radius R = _____.

(A) 3

(B) $3\sqrt{3}$

(C) $\sqrt{3}$

(D) 9

34) The sum of first fifteen terms of A.P. 16, 12, 8, 4 - - - - - is _____.

(A) –240

(B) –195

(C) –180

(D) –345

35) The difference of 12th and 21st terms of sequence $\left\{\frac{n-(-1)^n}{11}\right\}$ is _____

(A) 1

(B) 0

(C) –1

(D) 3

36) $\sum_{i=6}^{10}(2i^2+3)$ = _____.

(A) 675

(B) 890

(C) 435

(D) 265

Rough Work

37) For G.P. $t_2 = 7$, $t_5 = -56$ then $t_6 =$ _____.

(A) 112

(B) 56

(C) –48

(D) 128

38) For positive real numbers x, y, z

$(x + y)(y + z)(z + x)$ _____

(A) $< xyz$

(B) $\geq 4xyz$

(C) $\leq 4(x + y + z)$

(D) $\geq 8xyz$

39) For G.P. $4, 4^2, 4^3$ - - - - - - - the sum of first n terms is 340 then value of n is _____.

(A) 2

(B) 1

(C) 4

(D) 6

40) Distance from point to focus, which is on Parabola $y^2 = 8x$ is 6 then find the co-ordinates of points.

(A) $(6, \pm 4\sqrt{3})$

(B) $(2, \pm 4\sqrt{2})$

(C) $(1, \pm 2\sqrt{2})$

(D) $(4, \pm 4\sqrt{2})$

Rough Work

41) Find radius of circle passing through foci of ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ and having centre (0, 5)

(A) $\sqrt{32}$

(B) 25

(C) 16

(D) 9

42) Equation for the circle drawn on a diagonal of the rectangle as it's diametre whose sides are $x = 2$, $x = -4$, $y = 3$, $y = -6$

(A) $x^2 + y^2 + 2x - 3y + 26 = 0$

(B) $x^2 + y^2 - 2x - 3y + 26 = 0$

(C) $x^2 + y^2 - 2x + 3y - 26 = 0$

(D) $x^2 + y^2 + 2x + 3y - 26 = 0$

43) The product of eccentricities of hyperbolas $x^2 - y^2 = 4$ and $x^2 - y^2 = 9$ is _____.

(A) 4 (B) 9

(C) 2 (D) 6

44) The equations $x = 2 \sin^2 t$ and $y = 2 \cos t$, $t \in R$ represents the graph of _____ curve.

(A) Ellipse

(B) Parabola

(C) Circle

(D) Hyperbola

Rough Work

45) The directions of vectors $\overline{x} = (e, \pi, -e)$ and $\overline{y} = (\pi, \frac{\pi^2}{e}, -\pi)$ are _____. Where $e \in R^+$

(A) opposite

(B) same

(C) different

(D) not defined

46) The point on the y-axis at distance $\sqrt{10}$ from the point (3, 2, 1) is _____.

(A) (0, 10, 0)

(B) (0, 2, 0)

(C) (0, 1, 0)

(D) (0, 3, 0)

47) If A(3, –1, 5) and B(7, –1, 2) then $|\overrightarrow{AB}|$ = _____.

(A) 5

(B) –5

(C) 7

(D) 1

Rough Work

48) If $y(1, 2) = x(3, 1) + (1, 3)$ then $x =$ _____ and $y =$ _____.

(A) $\frac{1}{5}, \frac{8}{5}$

(B) 5, 4

(C) $-\frac{1}{7}, \frac{5}{7}$

(D) $-\frac{1}{5}, \frac{7}{5}$

49) A(1, 2, 4), B(1, 2, 0), C(1, 5, 0) are the vertices of _____ triangle.

(A) isosceles

(B) equilateral

(C) right angled

(D) isosceles right angled

50) $\lim_{x \to (-2)} \frac{x^3 - 3x + 2}{x^3 + x^2 + 4x + 12} =$ _____

(A) $\frac{4}{3}$

(B) $\frac{3}{4}$

(C) 1

(D) 0

050 (E)

(MARCH / APRIL, 2015)

(Part - B)

Time : 2 Hours] *[Maximum Marks : 50*

Instructions :

1) **Write in a clear legible handwriting.**
2) **There are three sections in Part - B of the question paper and total 1 to 18 questions are there.**
3) **All the questions are compulsory. Internal options are given.**
4) **The numbers at right side represent the marks of the question.**
5) **Start new section on new page.**
6) **Maintain sequence.**

SECTION - A

■ **Answer the following (1 to 8) questions as directed in the question. Each question carry 2 marks.** **[16]**

1) Using principle of mathematical induction prove that

$3^{2n} - 8n - 1$ is divisible by 64; $n \in N$

2) Using P.M.I. prove that $2 + 4 + 6 + 8 + - - - - + 2n = n(n + 1), n \in N$

3) Find the complex number Z whose modulus is 4 and principle argument is $\pi/3$.

4) Solve: $\sqrt{3}x^2 - \sqrt{2}x + 3\sqrt{3} = 0, x \in C$

5) If $\sin\theta = \frac{7}{10}\left(0 < \theta < \pi/2\right)$ then find value of

$$\frac{\cos(\pi-\theta)}{\cos(\pi+\theta)} \cdot \frac{\sec(\pi+\theta)}{\sec(-\pi+\theta)} \cdot \frac{\sec(2\pi+\theta)}{\cos(3\pi-\theta)}$$

OR

Prove: $\sqrt{2}\sin 10° + \sqrt{3}\cos 35° = \cos 35° + 2\sin 25°$

6) Find solution set of $4\cos^2\theta - 8\sin\theta + 1 = 0$

7) Find co-ordinates of foci and equations of directrix of hyperbola

$16x^2 - 9y^2 = -144.$

OR

If one of the vertex of focal chord of parabola $y^2 = 8x$ is $\left(\frac{1}{2}, -2\right)$ then find other vertex.

8) Using first principle find derivative of $\sqrt{\tan x}$.

SECTION - B

■ **Answer the following questions (9 to 14) as directed in the question. Each question carry 3 marks.** **[18]**

9) Using P.M.I. prove that

$$\frac{1}{1\cdot2\cdot3} + \frac{1}{2\cdot3\cdot4} + \cdots + \frac{1}{n(n+1)(n+2)} = \frac{n(n+3)}{4(n+1)(n+2)}, (n \in N)$$

OR

Using P.M.I. prove that ${}^nC_0 + {}^nC_1 + {}^nC_2 + \cdots + {}^nC_n = 2^n, (n \in N)$

10) If $\cos(\alpha+\beta)=\frac{4}{5}, \sin(\alpha-\beta)=\frac{5}{13}$ then find value of $\cot 2\alpha$

$$\left(0<\alpha<\frac{\pi}{4}, 0<\beta<\frac{\pi}{4}\right)$$

11) For ΔABC, $\frac{\sin C}{\sin A}=\frac{\sin(B-C)}{\sin(A-B)}$ then prove that c^2, b^2, a^2 are in A.P.

OR

If the length of the two sides of a triangle are the roots of the equation $x^2 - 2\sqrt{3}x + 2 = 0$ and if the included angle between them has measure $\pi/3$ then find perimeter of the triangle.

12) Find the equation of the circle passing through the points (1, 4) and (5, 6) and having centre on the line $x + 4y = 16$. Also find area of circle.

13) Find the equation of the set of points P whose sum of the distances from the points A(4, 0, 0) and B(–4, 0, 0) is 10.

14) If $f(x)=\frac{4x+7\sin x}{15x-8\cos x}$ then find $f'(x)$ hence deduce value of $f'(0)$.

SECTION - C

■ **Answer the following questions (Nos. 15 to 18) as directed. Each question carry 4 marks.** **[16]**

15) Find n, if the ratio of the fourth term to the fourth term from the end in the expansion of $\left(\sqrt[5]{3}+\frac{1}{\sqrt[5]{5}}\right)^n$ is 15:1.

16) Prove: $\tan 142\frac{1}{2}^{\circ} = \left(\sqrt{2}-\sqrt{3}\right)\cot\frac{\pi}{8}$.

OR

If $A + B + C = \pi$ then prove

$$\frac{\sin 2A + \sin 2B + \sin 2C}{\sin A + \sin B + \sin C} = 8\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}.$$

17) Sum of six consecutive terms of an A.P. is 48 and the product of the first and the last numbers is 39 find these numbers.

18) Obtain $\lim_{x\to 0}\frac{\tan 5x - \tan 3x - \tan 2x}{30x^3}$.

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