

OBJECTIVE

NOTE: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

QUESTION NO. 1

- (1) Domain of $f(x) = \frac{x-1}{x-4}$ is (A) 4 (B) 1 (C) $R - \{1\}$ (D) $R - \{4\}$
- (2) $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$ (A) $\frac{a}{b}$ (B) $\frac{b}{a}$ (C) ab (D) $-ab$
- (3) $\frac{d}{dx}(e^{x^2+1}) =$ (A) $2e^{x^2+1}$ (B) $2xe^{x^2+1}$ (C) e^{x^2+1} (D) xe^{x^2+1}
- (4) $\frac{d}{dx}(\tan^{-1} 4x) =$ (A) $\frac{-1}{1+16x^2}$ (B) $\frac{4}{1+16x^2}$ (C) $\frac{1}{1+16x^2}$ (D) $\frac{-4}{1+16x^2}$
- (5) $\frac{d}{dx}(\sinh^{-1} x) =$ (A) $\frac{1}{\sqrt{1-x^2}}$ (B) $\frac{-1}{\sqrt{1-x^2}}$ (C) $\frac{-1}{\sqrt{1+x^2}}$ (D) $\frac{1}{\sqrt{1+x^2}}$
- (6) $Y = e^{2x}, Y_4 =$ (A) $8e^{2x}$ (B) $16e^{2x}$ (C) e^{8x} (D) e^{16x}
- (7) $\int e^{2x} (-\sin x + 2 \cos x) dx =$ (A) $e^{2x} \cos x + C$ (B) $e^{2x} \sin x + C$
(C) $-e^{2x} \cos x + C$ (D) $2e^{2x} \cos x + C$
- (8) $\int_0^{\pi} \sin x dx =$ (A) 1 (B) 0 (C) 2 (D) π
- (9) $\int_0^{\pi/4} \sec^2 x dx =$ (A) 5 (B) 4 (C) 2 (D) 1
- (10) $\int_0^{\sqrt{2}} \frac{dx}{\sqrt{1-x^2}} =$ (A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) π
- (11) Distance between the points (2,3) and (3,2) is (A) $\sqrt{2}$ (B) 2 (C) 1 (D) $2\sqrt{5}$
- (12) Slope-intercept form of straight line is (A) $x=0$ (B) $\frac{x}{a} + \frac{y}{b} = 1$ (C) $y = mx + c$ (D) $y = 0$
- (13) The slope of line $-ax + by - c = 0$ is (A) $\frac{a}{b}$ (B) $\frac{-a}{b}$ (C) $\frac{b}{a}$ (D) $\frac{a}{c}$
- (14) The point of intersection of medians of a triangle is (A) centroid (B) orthocenter (C) circumcenter (D) incentre
- (15) Solution of inequality $x+2y < 6$ is (A) (1,3) (B) (1,1) (C) (1,4) (D) (1,5)
- (16) The radius of the circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is
(A) $\sqrt{g^2 + f^2 + c}$ (B) $\sqrt{g^2 - f^2 + c}$ (C) $\sqrt{g^2 - f^2 - c}$ (D) $\sqrt{g^2 + f^2 - c}$
- (17) The length of the diameter of the circle $x^2 + y^2 = a^2$ is (A) 1 (B) 2 (C) $2a$ (D) a
- (18) If a circle and a line intersect in two points, then the line is called (A) chord (B) secant (C) radius (D) diameter
- (19) If $\underline{V} = -\underline{i} - 2\underline{j} - 3\underline{k}$, then $|\underline{V}| =$ (A) $-\sqrt{6}$ (B) -14 (C) $\sqrt{14}$ (D) 6
- (20) If $\overrightarrow{OA} = \underline{a}$, $\overrightarrow{OB} = \underline{b}$ then \overrightarrow{AB} is (A) $\underline{a} + \underline{b}$ (B) $\underline{a} \cdot \underline{b}$ (C) $\underline{a} - \underline{b}$ (D) $\underline{b} - \underline{a}$

QUESTION NO. 2 Write short answers any Eight (8) questions of the following

16

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| 1 | Express the perimeter "P" of square as a function of its area, "A". |
| 2 | Evaluate $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$ |
| 3 | Give the criterion for Existence of limit of a function |
| 4 | Give the definition of Derivative of function $f(x)$ |
| 5 | Find the derivative of $y = (x^2 + 5)(x^3 + 7)$ w.r.t. x |
| 6 | If $y = \sqrt{x + \sqrt{x}}$ find $\frac{dy}{dx}$ by making suitable substitution. |
| 7 | Differentiate $\sin x$ w.r.t. $\cot x$. |
| 8 | Find $f'(x)$ if $f(x) = \ln(e^x + e^{-x})$ |
| 9 | Find $\frac{dy}{dx}$, if $y = \sin h^{-1}(x^3)$ |
| 10 | Find y_2 if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$ |
| 11 | Define increasing and decreasing functions. |
| 12 | Find extreme values of $f(x) = 5x^2 - 6x + 2$ |

QUESTION NO. 3 Write short answers any Eight (8) questions of the following

16

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| 1 | Find the approximate increase in the volume of a cube if the length of its each edge changes from 5 to 5.02 |
| 2 | Using differential find $\frac{dy}{dx}$ when $x^4 + y^2 = xy^2$ |
| 3 | Evaluate $\int \frac{(1+e^x)^3}{e^x} dx$ |
| 4 | Evaluate $\int \frac{ax+b}{ax^2+2bx+c} dx$ |
| 5 | Evaluate $\int \frac{\cot \sqrt{x}}{\sqrt{x}} dx$ $x > 0$ |
| 6 | Evaluate $\int \frac{\sin \theta}{1+\cos^2 \theta} d\theta$ |
| 7 | Evaluate $\int x^4 \ln x dx$ |
| 8 | Evaluate $\int_0^{\pi/6} x \cos x dx$ |
| 9 | Evaluate $\int_1^2 \frac{x}{x^2+2} dx$ |
| 10 | Find the area bounded by "cos" function from $x = -\pi/2$ to $x = \pi/2$ |
| 11 | Graph the solution set of linear inequality $3x + 7y \geq 21$ |
| 12 | Define a "corner point" |

QUESTION NO. 4 Write short answers any Nine (9) questions of the following

18

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| 1 | The points A (-5, -2), B (5, -4) are end points of the diameter of circle. Find the centre and radius of circle |
| 2 | By means of slopes, show that following points lie on the same line. (-4,6);(3,8);(10,10) |
| 3 | Find an equation of the vertical line through (-5, 3) |
| 4 | Convert into two -intercept form $4x + 7y - 2 = 0$ |
| 5 | Find point of intersection of the lines $3x + y + 12 = 0$ and $x + 2y - 1 = 0$ |
| 6 | Find the focus and the vertex of the parabola $x^2 = 5y$ |
| 7 | Write an equation of parabola with Focus (-3,1); directrix $x = 3$ |
| 8 | Find an equation of the ellipse with foci ($\pm 3, 0$) and length of minor axis 10. |
| 9 | Find center and foci of the ellipse $x^2 + 4y^2 = 16$ |
| 10 | Find the unit vector in the same direction as the vector $\underline{V} = [-2, 4]$ |
| 11 | Find " α ", so that $ \alpha \underline{i} + (\alpha+1) \underline{j} + 2 \underline{k} = 3$ |
| 12 | Find a vector whose magnitude is 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}$ |
| 13 | Find magnitude of the vector \underline{V} and write the direction cosines of \underline{V} where $\underline{V} = 2\underline{i} + 3\underline{j} + 4\underline{k}$ |

SECTION-II

Note: Attempt any Three questions from this section

10 x 3 = 30

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| 5-(A) | Find the value of k. If the function $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2} & , x \neq 2 \\ K & , x = 2 \end{cases}$ is continuous at $x = 2$ |
| (B) | Expand a^x in the Maclaurin series expansion upto 4-terms. |
| 6-(A) | Evaluate the integral $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$ |
| (B) | The point A(-1,2), B(6,3) and C(2,-4) are vertices of a triangle. Show that the line joining the midpoint D of \overline{AB} and the midpoint E of \overline{AC} is parallel to \overline{BC} and $\overline{DE} = \frac{1}{2} \overline{BC}$ |
| 7-(A) | Evaluate $\int_0^{\pi/6} x \cos x dx$ |
| (B) | Maximize $f(x,y) = 2x + 5y$, Subject to the constraints $2y - x \leq 8$ $x - y \leq 4$, $x \geq 0$, $y \geq 0$ |
| 8-(A) | Show that the circles $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y + 9 = 0$ touch externally |
| (B) | Show that the vectors $2\mathbf{i} - \mathbf{j} + \mathbf{k}$, $\mathbf{i} - 3\mathbf{j} - 5\mathbf{k}$ and $3\mathbf{i} - 4\mathbf{j} - 4\mathbf{k}$ form sides of a right triangle. |
| 9-(A) | Find an equation of Hyperbola with given data Foci $(2 \pm 5\sqrt{2}, -7)$, length of transverse axis 10. |
| (B) | In any triangle ABC, Prove that $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ |