

Mathematics

Note: Time allowed for Section-B and Section-C is 2 Hours and 40 minutes.

SECTION-B

Q2: Answer any TEN parts. Each part carries FIVE marks.

- 1) Sketch the graph of $\frac{x^2}{9} + \frac{y^2}{16} = 1$.
- 2) Find $f'(x)$, if $f(x) = x\sqrt{2x^2 + 12}$
- 3) If $f(x) = 4\cos(3x+8)$, find 5th derivative.
- 4) Find the velocity and acceleration of the particle at a time $t=0$, whose position vector is $\vec{r} = 5t\hat{i} + 3t\hat{j} - \cos(t)\hat{k}$,
- 5) Evaluate the integral $\int (3x^2 + 8)(x^3 + 8x)^7 dx$
- 6) Find the angle form the line $7x+3y - 2=0$ to the line $5x - 2y + 9 = 0$.
- 7) For what value of n , the line $y = -x + c$, touch the circle $x^2 + y^2 = 16$.
- 8) Find the equation of tangent and normal to parabola $y^2 = 4x$, at $(2,-4)$
- 9) For what value of c the line $y=x+c$, will touch the hyperbola $\frac{x^2}{25} - \frac{y^2}{16} = 1$
- 10) Solve the initial value problem $\frac{dy}{dx} = 3x^2, y(0) = 1$
- 11) Find f_x, f_y at point $(\frac{\pi}{3}, 0)$ in $f(x) = x^2 \sin(x^3 + 3y)$
- 12) Use bisection method to solve $f(x) = e^x - x - 2, [1, 2]$, compute five iterations.
- 13) Find the area of the triangular region whose vertices are $A(-3, 6), B(3, 2), C(6, 0)$.

SECTION-C

Marks: 16

Note: Attempt any THREE questions. All questions carries equal marks.

Q3: (a) Evaluate $\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1}$

(b) Find an equation of tangent and normal to the curve $y = -x^2 + 9$ at $(3, 0), (-3, 0)$

Q4: (a) Evaluate $\int \frac{x+1}{(x^2+2x+2)} dx$ (b) $\int_0^2 12x(x^2-4)^5 dx$

Q5: (a) Find the equation of parabola having focus at $F(0, 3)$, directrix $y = -3$.

(b) Find the point of intersection of the line $y=2x-2$, and the

ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$.

Q6: (a) Solve the differential equation $\frac{dy}{dx} = 3\frac{dy}{dx} - 2y$

(b) Use Simpson's rule to find the solution of $\int_1^3 \frac{dx}{x}, n=6$