QP CODE: 23104796

Reg No : ....

Name : ....

B.Sc DEGREE (CBCS) REGULAR/IMPROVEMENT/REAPPEARANCE EXAMINATIONS, FEBRUARY 2023

First Semester

B.Sc Electronics Model III

Complementary Course - MM1CMT07 - MATHEMATICS -CALCULUS AND TRIGONOMETRY

2017 Admission Onwards

33271FC1

Time: 3 Hours   Max. Marks : 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. If $g(t) = 1/t^2$. Find $g'(-1)$.

2. Find the derivative of $y = \frac{4}{x^{-3}}$

3. Find the slope of the line tangent to the curve $y = sin^5 x$ at the point $x = \frac{\pi}{3}$.

4. Find the derivative of $y = x^{\frac{-4}{3}}$.

5. State mean value theorem.

6. Find the derivative of $w = xy$ with respect to t at $t = \frac{\pi}{2}$ along the path $x = \cos t, \ y = \sin t$.

7. If $f(x, y) = x \, e^{y^2/2}$, evaluate $\frac{\partial^5 f}{\partial x^2 \partial y^3}$.

8. If $x = \cos \theta + i \sin \theta$, find $x^4 + \frac{1}{x^4}$ and $x^4 - \frac{1}{x^4}$.

9. Using Euler's exponential values prove that $\sin(x - y) = \sin x \cos y - \cos x \sin y$

10. Evaluate $\int_0^2 7 \, dx$.

11. Evaluate the double integral $\iint_R y^2 x \, dA$ over the rectangle $R = \{(x, y) : -3 \le x \le 2, 0 \le y \le 1\}$.

12. Evaluate $\int_0^1 \int_0^2 \int_1^2 x^2 yz \, dzdydx$.

<div align="right">(10×2=20)</div>

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Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

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13. Find the derivative of $y = sin(x^2 + 7x)$.

14. Find $\frac{dy}{dx}$ if $x = a \cos t, y = a \sin t$.

15. Show that $f(x) = x^4 + 3x + 1$ has only one zero in [-2,-1].

16. Find f_x, f_y and f_z if $f(x, y, z) = (x^2 + y^2 + z^2)^{-1/2}$.

17. Express $\cos 7\theta$ in terms of $\cos \theta$.

18. If x is real, show that $\sinh^{-1}(x) = \log(x + \sqrt{x^2 + 1})$.

19. Find the area between the x axis and the graph of $y = 3x^2$ .in the interval $[0, 3]$

20. Evaluate the integral by first reversing the order of integration of the double integral $\int_0^4 \int_{\sqrt{y}}^2 e^{x^3} \, dxdy$.

21. Change the cartesian integral into an equivalent polar integral and then evaluate the double integral $\int_0^6 \int_0^y x \, dx \, dy$.

<div align="right">(6×5=30)</div>

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Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

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22. A dynamite blast blows a heavy rock straight up with a launch velocity of 160 ft/sec. It reaches a height of $s = 160t - 16t^2$ ft after t sec. Find
    1. How high does the rock go?
    2. What are the velocity and speed of the rock when it is 256 ft above from the ground on the way up? On the way down?

3. What is the acceleration of the rock at any time t?

4. When does the rock hit the ground again?

23. (a) Find the absolute maximum and mninimum of $f(x) = x^3 - 2x + 4$.

(b) Show that $f(x) = x^3 + 3x + 1 = 0$ has exactly one real solution.

24. (a) Calculate the area of the region bounded by the $x - axis$ and the graph of $y = 3x^2 - 3, x \ is \ in[-2, 2]$.

(b)Evaluate $\int_1^{32} x^{\frac{-6}{5}} dx$.

25. a) Calculate the area of the region bounded by the $x - axis$ and the graph of $y = x^3 - 3x^2 + 2x, x \ is \ in[0, 2]$.

(b)Evaluate $\int_{\frac{\pi}{4}}^{\frac{3\pi}{4}} csc \ \theta \ cot \ \theta d\theta$.

(2×15=30)