C 5597 **(Pages : 4)** **Name.....**

Reg. No.....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2016

(CUCBCSS—UG)

Core Course—Mathematics

MAT 2B 02—CALCULUS

Time : Three Hours Maximum : 80 Marks

Part A

Answer **all** *the twelve questions.*
Each question carries 1 mark.

1. Find the linearization of $f(x) = \cos x$ **at** $x = \frac{\pi}{2}$

2. Evaluate $\int_{2}^{3} \sec x \, dx$.

3. The length of the largest sub-interval of a partition is called its _____

4. Evaluate $\lim \frac{2x^2 - 3}{7x + 4}$

5. What are the critical points of f given $f^1(x) = (x-1)^2 (x+2)$.

6. State the Mean Value Theorem.

7. Find dy if $y = x^5 + 37x$

8. **Write the sums without sigma notation and then evaluate the sum** $\sum_{k=1}^{3} (-1)^{k+1} \sin \frac{}{k}$.

9. **Suppose that** $\int_{2}^{3} f(x)\,dx = 4$. **Find** $\int_{2}^{3} -f(x)\,dx$

10. Find the intervals in which the function f is increasing given $f^1(x) = (x-1)^2 (x+2)$.

Turn over

11. Evaluate $\int_{1}^{32} x^{5}\,dx$.

12. Evaluate $\lim_{x\to\infty} \frac{2x+3}{5x+7}$.

(12 x 1 = 12 marks)

Part B

Answer any **nine** *questions.*
Each question carries 2 marks.

13. Suppose that f is continuous and that $\int_{0}^{3} f(z)\,dz = 3$ and $\int_{0}^{4} f(z)\,dz = 7$. Find $\int_{3}^{4} f(z)\,dz$

14. Find the volume of the solid generated by revolving the region bounded by the line y = 0 and the curve $y = x - x^{2}$.

15. Find the average value of $f(x) = -3x^{2} - 1$ on [0, **1**].

16. Evaluate $\int_{-\frac{\pi}{4}}^{0} \tan x \sec^{2} x\,dx$.

17. Evaluate $\frac{d}{dt}\int_{0}^{t^{4}} \sqrt{u}\,du$.

18. Find the absolute maximum and minimum values of $f(x) = -x - 4, -4 \quad x \quad 1$.

19. Evaluate $\sum_{k=1}^{10} k^{2}$

20. Find $\frac{dy}{dx}$ if $y = \int \cos t\,dt$.

21. Show that the value of $\int_0^1 \sqrt{1+\cos x}\, dx$ cannot possibly be 2.

22. The radius r of a circle increases from $r_0 = 10$ m to 10.1 m. Estimate the increase in the circle's area A by calculating dA.

23. Find the work done by a force of $F(x) = \frac{1}{x^2}$ N along the x-axis is from $x = 1$ m to $x = 10$ m.

24. Find the function $f(x)$ whose derivative is series and whose graph passes through the point (0, 2).

(9 x 2 = 18 marks)

Part C

Answer any six *questions.*
Each question carries 5 *marks.*

25. Find the value of local maxima and minima of $g(x) = x^2 - 4, -2 < x < 2$ and say where they are assumed.

26. Find the surface area of the solid generated by revolving $y = \tan x, 0 \le x \le \frac{\pi}{4}$ about the x - axis.

27. Find the area of the region enclosed by the parabola $y = 2 - x^2$ and the line $y = -x$.

28. Find the intervals on which the function $f(x) = 3x^2 - 4x^3$ is increasing and decreasing.

29. Find the volume of the solid generated by revolving the region between the parabola $x = y^2 + 1$ and the line $x = 3$ about the line $x = 3$.

30. Find the asymptotes of the curve $Y = \frac{x^2 - 3}{2x - 4}$

31. Find the length of the curve $x = \sin y, 0 < y < \pi$

32. Express the solution of the following initial value problem as an integral :

Differential equation • $\frac{dy}{dx} = \tan x$

Initial condition : $y(1) = 5$

33. About how accurately should we measure the radius *r* of a sphere to calculate the surface area $s = 4\pi r^2$ within 1 % of its true value.

(6 x 5 = 30 marks)

Part D

Answer any **two** *questions.*
Each question carries 10 *marks.*

34. Find the area of the surface generated by revolving the curve $Y = x^3$, $0 \le x \le \frac{1}{2}$ about the x-axis.

35. Find the length of the curve $y = \frac{4}{3} x^{3/2}$ $0 \le x \le 1$.

36. Find the area of the region between the x-axis and the graph of $f(x) = x^3 - x^2 - 2x$, $-1 < x < 2$.

(2 x 10 = 20 marks)