C 24738 **(Pages : 4)** **Name....................................**

Reg. No..................................

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2017

(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 dy if $y = \dfrac{2x}{1+x^2}$.

2. A function with a continuous first derivative is said to be ————.

3. Suppose that $\int_1^3 f(x)\,dx = 6$. Find $\int_1^3 f(u)\,du$.

4. If f is smooth in $[a, b]$ then the length of the curve $y = f(x)$ from a to b is L = ————.

5. Find the intervals in which the function f is increasing given $f'(x) = x(x-1)$.

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

7. Evaluate $\int_0^1 \left(x^2 + \sqrt{x}\right) dx$.

8. Write the sum without sigma notation and then evaluate the sum $\sum_{k=1}^{4} \cos k\pi$.

9. State Rolle's Theorem.

10. What are the critical points of f given $f'(x) = x^{-1/3}(x+2)$.

Turn over

11. Evaluate $\lim\limits_{x\to\infty} \dfrac{\sin 2x}{x}$.

12. Find the linearization of $f(x) = \sqrt{1+x}$ at $x = 0$.

(12 × 1 = 12 marks)

Part B

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

13. Find the absolute maximum and minimum values of $f(x) = -\dfrac{1}{x}, -2 \le x \le -1$.

14. Evaluate $\int\limits_0^{\pi/4} \tan x \sec^2 x \, dx$.

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

16. Suppose that f is continuous and that $\int\limits_0^3 f(x)\,dx = 3$ and $\int\limits_0^4 f(x)\,dx = 7$. Find $\int\limits_4^3 f(x)\,dx$.

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

18. Find the average value of $f(x) = x^2 - 1$ on $\left(0, \sqrt{3}\right)$.

19. Evaluate $\sum\limits_{k=1}^{7} (-2k)$.

20. Find $\dfrac{dy}{dx}$ if $y = \int\limits_1^{x^2} \cos t \, dt$.

21. Show that if f is continuous on $[a, b]\ a \neq b$ and if $\int_a^b f(x)dx = 0$ then $f(x) = 0$ at least once in $[a, b]$.

22. Evaluate $\frac{d}{dt}\int_0^{t^4} \sqrt{u}\, du$.

23. Find the area between $y = \sec^2 x$ and $y = \sin x$ from 0 to $\frac{\pi}{4}$.

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

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

Initial condition : $y(1) = 5$.

(9 × 2 = 18 marks)

Part C

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

25. Find the lateral surface area generated by revolving $xy = 1,\ 1 \leq y \leq 2$ about the y-axis.

26. 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.

27. Evaluate the length of the curve $x = \sqrt{1 - y^2},\ -\frac{1}{2} \leq y \leq \frac{1}{2}$.

28. Find the volume of the solid generated by revolving the region between the y-axis and the curve $x = \frac{2}{y}, 1 \leq y \leq 4$ about the y-axis.

29. Find the asymptotes of the curve $y = \frac{x+3}{x+2}$.

Turn over

30. Find the intervals on which the function $h(x) = -x^3 + 2x^2$ is increasing and decreasing.

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

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

33. Find the value of local maxima and minima of $f(x) = x^2 - 4, -2 \leq x \leq 2$ and 2*ay* where they are assumed.

(6 × 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 $y = 2\sqrt{x}, 1 \leq x \leq 2$ about the x-axis.

35. State and prove the Fundamental Theorem of calculus.

36. Find the centre of mass of a thin plate of constant density δ covering the region bounded by the parabola $y = 4 - x^2$ and below by the x-axis.

(2 × 10 = 20 marks)

C 24738-A (Pages : 4) Name..............................

Reg. No..............................

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2017

(CUCBCSS—UG)

Core Course—Mathematics

MAT 2B 02—CALCULUS

(Multiple Choice Questions for SDE Candidates)

Time : 15 Minutes	Total No. of Questions : 20	Maximum : 20 Marks

INSTRUCTIONS TO THE CANDIDATE

1. This Question Paper carries Multiple Choice Questions from 1 to 20.
2. The candidate should check that the question paper supplied to him/her contains all the 20 questions in serial order.
3. Each question is provided with choices (A), (B), (C) and (D) having one correct answer. Choose the correct answer and enter it in the main answer-book.
4. The MCQ question paper will be supplied after the completion of the descriptive examination.

MAT 2B 02—CALCULUS

(Multiple Choice Questions for SDE Candidates)

1. Suppose $f'(x) = 5x + x$ and if $f(0) = 0$, then $f(3) =$ ————.

   (A) 15. (B) 15/2.

   (C) 45/2. (D) 45.

2. A differentiable function is always ————.

   (A) Continuous. (B) Not continuous.

   (C) Integrable. (D) Not integrable.

3. $\lim\limits_{x \to \infty} \dfrac{2x+3}{5x+7} =$ ————.

   (A) 2/5. (B) 5/2.

   (C) 3/7. (D) 7/3.

4. The formula for finding the sum of squares of first 'n' natural no's is ————.

   (A) $\dfrac{n(n+1)(2n+1)}{6}$. (B) $\dfrac{n(n-1)(2n-1)}{6}$.

   (C) $\dfrac{n(n+1)}{2}$. (D) $\dfrac{n(n-1)}{2}$.

5. If $\int_1^2 f(x)\,dx = 5$, then $\int_1^2 f(u)\,du =$ ————.

   (A) 20. (B) 15.

   (C) 5. (D) 10.

6. Find dy, if $y = x^6 + 29x^2 + 3$.

   (A) $x^5 + 29x + 3$. (B) $6x^5 + 58x + 3$.

   (C) $6x^5 + 29x + 3$. (D) $6x^5 + 58x$.

7. What are the critical Points of f when $f'(x) = (x-1)(x-2)$.

(A) 0, 1 and 2. (B) 1 and 2.

(C) –1 and –2. (D) None of these.

8. Functions with zero derivatives are ————.

(A) Continuous. (B) Differentiable.

(C) Constant. (D) All the above.

9. Express 1 + 2 + 4 + 8 + 16 + 32 in sigma notation.

(A) $\sum_{1}^{6} 2^n$. (B) $\sum_{1}^{6} 2^{n-1}$.

(C) $\sum_{0}^{5} 2^{n-1}$. (D) $\sum_{0}^{5} 2^n$.

10. Suppose that $\int_{2}^{4} f(x)\,dx = 10$, find $\int_{2}^{4} -f(x)\,dx$

(A) 10. (B) –10.

(C) 20. (D) –20.

11. Find the liberization of $f(x) = x^3$ at $x = 2$.

(A) 2 (6x – 7). (B) 2 (6x + 7).

(C) 0. (D) $3x$.

12. One Newton-metre work is called ————.

(A) Newton-Metre. (B) Joule.

(C) Org. (D) None of these.

13. Let $F(t) = 2(t+1)+3$. Evaluate F at the input value $x + 2$.

(A) $2x + 3$. (B) $2x + 11$.

(C) $2x + 9$. (D) $2x + 7$.

14. The length of the longest sub-interval of a partition is called its ————.

(A) Norm. (B) Tag.

(C) Partition. (D) Uniform Norm.

15. $\int_{3}^{3} f(x)\,dx =$ ————.

(A) 3. (B) $f(3)$.

(C) 0. (D) $f(0)$.

16. Area × height = ————.

(A) Volume. (B) Surface area.

(C) Perimeter. (D) None of these.

17. Find the average value of $f(x) = 2 - x^2$ on $[0, 2]$.

(A) 2. (B) -2.

(C) 4. (D) None of these.

18. $\frac{d}{dx}(\cos x) =$ ————.

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

(C) $-\cos x$. (D) $-\operatorname{cosec} x \cdot \cot x$.

19. $\frac{d}{dy}\left(x^2 + x + 1\right) =$ ————.

(A) $2x + 1$. (B) $2y + 1$.

(C) 0. (D) 1.

20. Evaluate $\int_{-4}^{-1} \frac{\pi}{2}\,dx =$ ————.

(A) $\frac{\pi}{2}$. (B) $\frac{3\pi}{2}$.

(C) $-\frac{3\pi}{2}$. (D) $-\frac{\pi}{2}$.