3051 (Pages : 3) Name......................................

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

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2009

Mathematics—Complementary Course

MM IC 01—MATHEMATICS

(C.S.S.)

pie : Three Hours Maximum Weightage : :30

I. Objective Type Questions - Answer all 12 questions (12 x ¼ = 3 weightage)

1. $P(x)$ **and** $Q(x)$ **are polynomials and** $Q(c) \neq 0$ **then** $\lim_{x \to c} \frac{P(x)}{Q(x)}$ –

2. **3.** $\lim_{x \to 2} \frac{f(x)-5}{x-2}$ = **then** $f(x) = \cdots$

3. **The function** $f(x) = \frac{\cos x}{x}$ **is not continuous at x = ---**

4. **The slope of the curve y =** $\frac{1}{x}$ **at x =1 equals …**

5. **If** $\lim f(x) = \frac{1}{2}$, **then** $\frac{f(x) \cos x}{x-1}$ – ….

6. **The absolute maximum value** of $f(x) = -x-4, -4 \leq x$ **is at x =** …..

7. **If f '(x) > 0 for every** x **in (a, b), then** f **is in (a, b).**

8. **The horizontal asymptote of the curve y** $= \frac{1}{\;}$ **is …**

9. If f **is continuous and** $\int_1 f(x)dx$ **= - 4 and f** $f(x)dx$ **= 6 then** $\int_2 f(x)dx =$.

10. If f **is integrable on [a, b], then the average value off on [a, b] is** $av(f)$

$\frac{d}{dx}\left(\int_0^x \frac{1}{1+t^2}dt\right) =$

12. If f **is smooth on** $[a, b]$, **the length of the curve y =** f **(x) from** a **to** b **is** $L =$

***II.* Short answer type questions – Answer all 9 questions (9 x 1 = 9 weightage)**

13. **If f** $(x) = 2x - 4$ **and** $x_0 = 5$, **E** = **0.2 and** $L = 6$, **find** $\delta > 0$, **such that** $0 < |x - x_0| <$ **implies if (x)** – $< e$.

Turn over

14. For what values of a is $f = \begin{cases} x^2 - 1 & x < 3 \\ 2ax & x \geq 3 \end{cases}$ continuous at $x = 3$?

15. Find the value of c that satisfies the mean value theorem for the function $f(x) = x^2 + 2x - 1$ on $[0,1]$.

16. If x moves from left to right through the point $c = 2$, is the graph of $f(x) = x^3 - 3x + 2$ rising or falling? Justify your answer.

17. Use Sandwich theorem to find the asymptotes of $y = 2 + \frac{\sin}{x}$

18. Find the inflection point of the curve $f(x) = x^3 - 3x + 3$.

19. Consider the function $f(x) = x^2 - 1$ on $[0,2]$. Partition the interval into four subintervals of equal length. Find the Riemann sum $\sum_{k=1}^{4} f(c_k) \Delta c_k$ where c_k is the left end point.

20. State the mean value theorem for definite integrals.

21. Find the area between the curves $y = \sec x$ and $y = \sin x$ from 0 to $\frac{}{4}$

III. Short essay or paragraph questions – Answer any 5 questions from 7 (5 x 2 = 10 weightage)

22. Draw the graph of the function

$$f(x) = \begin{cases} 3 - x, & x < 2 \\ 2, & x = 2 \\ \frac{}{2}, & x > 2 \end{cases}$$

Find the limits or explain why they do not exist?

a) $\lim_{x \to 2^+} f(x)$ b) $\lim_{x \to 2^-} f(x)$

c) Does $\lim_{x \to 2} f(x)$ exist? If so what is it? If not. why?

23. **If a function is differentiable at x = c, prove that it is continuous at $x = c$. Is the converse true? Justify your answer.**

24. **If b, c, d are constants, for what value of b will the curve y = $x^3 + bx \;\; + cx + d$ has a point of inflection at $x = 1$.**

25. **Find the average value of $f(x) = 3x^2 - 3$ on [0,1]. At what points in the interval does this function assume its average value?**

26. **Find the area of the region between the curve y = $4 - x^2$, 0 and the x-axis.**

27. **The region between the curve y = , $0 \le x \le 2$, and the x-axis is revolved about** the **x-axis. Find the volume of the solid generated.**

28. **Applying** L'Hospital's **rule find** $\lim_{x\to\infty}$

IV. Essay questions – Answer 2 questions from 3 (2 x 4 = 8 weightage)

29. **Sketch the graph of y = sin (1/x) and show that y = sin (1/x) has no limit as x approaches zero from either side.**

Or

If f and g are continuous functions, then prove that
a) f + g is continuous **b)** fg **is continuous**

30. **Plot the graph and find the derivative at each critical point and determine the local extreme values.**

$$y = \begin{cases} -x^{-} - 2x + 4, & x \;\; 1 \\ -x^2 + 6x - 4, & x > 1 \end{cases}$$

31. **Use definite integral to estimate the sum of the square roots of the first n positive integers, f + $\quad + \cdots + \sqrt{n}$.**

Or

Find the length of the curve y = $x^{3/2}$ from x = 0 to x=4.