TB171420D

Reg. No:..........................

Name:..............................

B. Sc DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2018
(2017 Admission Improvement / Supplementary and 2015 & 2016 Admission Supplementary)
SEMESTER I - COMPLEMENTARY COURSE (MATHEMATICS)
MT1CPC01B – CALCULUS
(Common for Physics and Chemistry)

Time: Three Hours **Maximum Marks: 80**

PART A

I. Answer all questions. Each question carries 1 mark

1. Find $\int_0^{\pi}(1+\cos x)\,dx$.
2. Let f be an even function such that $\int_0^1 f(x)\,dx = 3$. Find $\int_{-1}^0 f(x)\,dx$.
3. Find the length of the curve x = 1-t ,y = 2+3t, $\frac{-2}{3} \le t \le 1$
4. If $\lim_{x\to c} f(x) = L$. Find the value of $\lim_{h\to 0} f(h+c)$.
5. Find $\lim_{x\to 1}\frac{x^3-1}{x^2-1}$.
6. State first derivative theorem of local extreme values

(6x1=6)

PART B

II. Answer any seven questions. Each question carries 2 marks

7. Show that the value of $\int_0^1 \sin(x^2)\,dx$ cannot possibly be 2.
8. State Fundamental Theorem of Calculus (Part 1). Use fundamental theorem to evaluate $\frac{d}{dx}\left(\int_0^{\sqrt{x}} \cos t\,dt\right)$
9. Using substitution method evaluate $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \cot\theta\ \operatorname{cosec}^2\theta\,d\theta$
10. Find the length of the curve $y = \frac{4\sqrt{2}}{3}(x)^{\frac{3}{2}} - 1, \quad 0 \le x \le 1$.
11. Define the surface area generated by revolving the curve about the x-axis.
12. If $f(x) = \frac{1}{x}$, $x_0 = 4, \in = 0.05$ and $L = \frac{1}{4}$ find $\delta > 0$ such that $0 \le |x - x_0| < \delta \Rightarrow |f(x) - L| < \in$.
13. Evaluate $\lim_{x\to 2^+}\frac{x-3}{x^2-4}$.
14. For the function $f(x) = \begin{cases} \frac{|x-4|}{x-4}, & x \ne 4 \\ 0, & x = 4 \end{cases}$ does $\lim_{x\to 4} f(x)$ exist
15. Show that the function $f(x) = x^3 + \frac{4}{x^2} + 7$ has exactly one zero in the interval $(-\infty, 0)$
16. Verify Mean Value theorem for f(x) = x(x-1)(x-2) in the interval $[0, \frac{1}{2}]$.

(7x2=14)

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PART C

III. Answer any five questions. Each question carries 6 marks

17. Given $\lim_{x\to c} f(x) = L$ and $\lim_{x\to c} g(x) = M$.Prove that $\lim_{x\to c}[f(x) + g(x)] = L + M$

18. Find c in the Mean Value Theorem $f(b)= f(a)+(b-a)f'(c)$ when $f(x)= x^3-3x^2+2x$, and $a=0, b=1/2$

19. Find the equation of tangent line and normal line at the point (2, 4) to the curve $x^3+y^3- 9xy = 0$

20. Find the critical points of $f(x)=-x^3+12x+5$, $-3\leq x\leq 3$.Identify the intervals on which f is increasing and decreasing. Find the functions local and absolute extreme values.

21. Find the average value of $f(x) = \sqrt{4 - x^2}$ on [-2, 2]

22. Using limit of Riemann sums establish the equation $\int_a^b c\, dx = c(b-a)$.

23. The region between the curve $y = \sqrt{x}$, $0 \leq x \leq 4$ and the x- axis is revolved about the x-axis to generate a solid. Find its volume.

24. A pyramid 3m high has a square base that is 3m on a side. The cross-section of the pyramid perpendicular to the altitude *x* m down from the vertex is a square *x* m on a side. Find the volume of the pyramid.

(5x6=30)

PART D

III. Answer any two questions. Each question carries 15 marks

25. State and prove Mean Value Theorem and hence verify Mean Value Theorem for the function f(x)= log x on the interval [1,e]

26. (a) If $y^3-3ax^2+x^3 = 0$,then prove that $\frac{d^2y}{dx^2}+\frac{2a^2x^2}{y^5} = 0$

    (b) Find the slope of the circle $x^2+y^2= 25$ at the point (-4, 3)

    (c) Show that the (2,4) lies on the curve $x^3+y^3 -9xy = 0$. Then find the tangent and normal to the curve at the given point

27. Find the area between the graph of $y = -x^2-2x$ and x-axis over [-3,2]

28. Find the surface area generated by revolving the curve $y =2\sqrt{x}$, $1 \leq x \leq 2$ about the x-axis

(2x15=30)