

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2014

(U.G.—CCSS)

Core Course—Mathematics

MM 3B 03—CALCULUS

Time : Three Hours

Maximum : 30 Weightage

Answer *all* questions :—1 Let $F(t) = 2(t - 1) + 3$. Evaluate F at the input value $x + 2$.2 If $f(x) = \sqrt{x}$ and $g(x) = x + 1$ find $(f \circ g)(x)$.3 Find the domain and range of $f(x) = 1 + x^2$.4 Evaluate $\lim_{x \rightarrow -2} \frac{2x - 4}{x^3 + 2x^2}$.5 At what points are the function $y = \frac{1}{x - 2}$ continuous.

6 State Rolle's theorem.

7 What are the critical points of f given

$$f'(x) = (x - 1)(x + 2)(x - 3).$$

8 Evaluate $\lim_{x \rightarrow \infty} \frac{5x^2 + 8x - 3}{3x^2 + 2}$.9 Find dy if $y = \frac{2x}{1 + x^2}$.10 Find the intervals in which the function f is increasing. Given $f(x) = x(x - 1)$.

11 The length of the longest sub interval of a partition is called its _____

12 Evaluate $\int_0^{\pi/3} 2 \sec^2 x \, dx$.

(12 x $\frac{1}{4}$ = 3 weightage)

IL Answer all *nine* questions.

13 Find the volume of the solid generated by revolving the region bounded by the lines $y = 0$, $x = 2$ and the curve $y = x^3$.

14 Find $\frac{dy}{dx}$ if $y = \int_1^{x^2} \cos t \, dt$.

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

16 Evaluate $\sum_{k=1}^6 (3 - k^2)$.

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

18 Find the absolute maximum and minimum values of $f(x) = -x^2 - 4$, $-4 \leq x \leq 1$.

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

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

21 Evaluate $\int_0^{\pi/4} \tan x \sec^2 x \, dx$.

(9 x 1 = 9 weightage)

III. Answer any *five* questions :-

22 Find the lateral surface area of the cone generated by revolving the line segment $y = 2 - x$, $0 \leq x \leq 4$, about the y-axis.

23 Find the length of the curve $y = \tan x$, $0 \leq x \leq \frac{\pi}{4}$.

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

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

26 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 $x = 3$.

27 Find the intervals on which the function $g(t) = -t^2 - 3t + 3$ is increasing and decreasing.

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

(5 x 2 = 10 weightage)

IV. Answer any *two* questions :—

29 Find the length of the curve $y = \frac{4\sqrt{2}}{3} x^{3/2} - 1$, $0 \leq x \leq 1$.

30 Show that the centre of mass of a straight, thin strip or rod of constant density has halfway between its two ends.

31 State and prove the fundamental theorem of calculus.

(2 x 4 = 8 weightage)