THIRD **SEMSESTER** B.Sc. DEGREE EXAMINATION, NOVEMBER 2012

Mathematics—Core Course

MM 3B 03—CALCULUS

Time : Three Hours   Maximum : 30 Weightage

Part I

I. Answer all the *twelve* questions

1 Write the domain and range of the function $y = \sqrt{1 - x^2}$

2 **If** $f(x) = x + 5$, $g(x) = X^2 - 3$ find (g 0 f) (0).

3 Graph the function $f(x) = \begin{cases} x, & 0 \text{ S } x < 1 \\ 2 - x, 1 \leq x \leq 2 \end{cases}$

4 What real numbers satisfy the equation $\lfloor x \rfloor = 0$?

5 **Find** $\displaystyle \lim_{x \to 2} \left(\frac{x^2 - 3x + 2}{^3 - 4x} \right)$

6 For what value of 'a' *is* $f(x$ $\begin{array}{l} x - 1, x < 3 \\ \text{tax } x \text{ 3} \end{array}$ continuous for every x ?

7 Find the critical points of the function $f(x) = x^4 - 4x^3 + 10$.

8 Define linearization of $f(x)$ at $x = a$.

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

10 Find the average value of $f(x) = x^2 - 1$ is $[0, \sqrt{3}]$.

11 Find the work done by the force $f(x) = 30x$ along x axis from $x = 0$ m to $x = 2$m,

12 Write the shell formula for revolution about y axis.

$(12 \times \tfrac{1}{4} = 3 \text{ weightage})$

Turn over

Part II

II. Answer all the *nine* questions

13 Find the vertex and axis of the parabola $y = -\frac{1}{}x^2 - x + 4.$

14 $f(x$ $\qquad$ $\frac{x+1}{x=1}$. Does $\lim_{-*1} f$ exist ? Why ?

15 At what points does the function $y = [x - 11 + \sin x$ is continuous ?

16 Find the value of c in the mean value theorem for the function $f(x) = x + \frac{1}{}$ in $\left[\frac{1}{2}\right]$

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

18 Evaluate $\int 3x \sqrt{x\ 4\text{-}1} \, dx.$

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

20 Define moment of a system about origin.

21 Write the formula for finding centre of mass of a thin rod along x axis with density $\delta (x)$.

(9 x 1 = 9 **weightage**)

Part III

III. Answer any *five* questions from seven:

22 $f($ $\frac{(x+3) [x+2]}{x+2}$ find $\lim f(^x)$ and $\lim f$

23 Test the continuity of the function $.f(x) = x \sin \frac{1}{}$

24 Find two positive integers whose sum is 20 and whose product is as large as possible.

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

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 line $x = 3$.

2 Find the length of the curve $y = \dfrac{4\sqrt{2}}{3} x^{3/2}$ 1 for $0 < x <$

28 Find the centre of mass of a thin plate of constant density and covering the region bounded by the parabola $y = x - x^2$ and the line $y + x = 0$.

(5 x 2 = 10 **weightage**)

Part IV

Answer any *two* questions from three :-

29 $\lim\limits_{x \to 5} \sqrt{x} - 1 = 2$. Find a $\delta > 0$ that works for e

30 Find the asymptotes of the curve

$$f(x) = \dfrac{x^3 -}{2x -}$$ and find the dominant terms.

31 Find the area of the surface generated by revolving the curve $y = \dfrac{x^3}{9}$, O x I.2 about x axis.

(2 x 4 = 8 **weightage**)