Reg. **No..........................**

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2015

(CUCBCSS—UG)

Complementary Course

Mathematics

MAT 2C 02—MATHEMATICS

Time : Three Hours　　　　　　　　　　　　　　　　　　　　Maximum : 80 Marks

Part A

Answer **all** *questions,*

1. Define a smooth curve.
2. Write down the relation connecting $\sin x$ and $\sinh x$.
3. Evaluate $\int_0^1 \frac{dx}{\sqrt{x}}$.
4. Give an example of a non-decreasing sequence.
5. State Sandwich theorem for the sequence.
6. Define absolute convergent sequence.
7. Find the equation for a hyperbola with eccentricity $= 3/2$ and directrix $x = 2$.
8. What is the formula in polar co-ordinates for the area of the surface generated by revolving the curve about the x-axis.
9. Find the equation of the circular cylinder $4x^2 + 4y^2 = 9$ in cylindrical co-ordinates.
10. Define level surface of *f*.

ii Find $\lim\limits_{y)\to(0} \frac{x - xy \pm 3}{X^2 + 5xy + y^3}$

12. Write down the chain rule for finding dw/dt *if* $w = f(x, y, z)$ is differentiale and all x, y, *z* are differentiable functions of *t*.

(12 x 1 = 12 marks)

Turn over

r art B

Answer any **nine** *questions.*

13. 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.

14. Find the length of the curve $y = \frac{4\sqrt{2}}{3} x^{3/2}$

15. Find the area under the curve y $1/\sqrt{x}$ from x = 0 to x=

16. Show that $\lim_{n \to \infty} k = k$.

17. Find $\lim_{n \to \infty} {}^1/{}^{\gamma n}$.

18. Graph the set of points whose polar coordinates satisfy $1 < r < 2,\ 0 < 0 < \pi/2$.

19. Find all Cartesian equation of $r \cos\theta = -4$.

20. **Find** $\lim_{(x,y)\to(1,1)} \frac{{}^{-}y \quad -\underline{2x} + 2}{x--1}$

21. Find f_x if $f(x, y) = x^2 + 3xy + y$

22. Find the length of the curve $r = 1 - \cos 0$.

23. Find the length of curve $y = (x/2)^{2/}$ from x = 0 to x = 2.

24. Find the directrix of the parabola $r = \frac{25}{10 + 10\cos\theta}$

(9 x 2 = 18 marks)

Part C

Answer any **six** *questions.*

25. Compare $\int^{\infty} \frac{dx}{x^2}$ and $\int_1 \frac{dx}{1 + x2}$

26. **Find the lateral surface area of the cone generated by revolving the line segment x =1** y, $0 < y \leq 1$ **about y-axis.**

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

28. **Find the radius of convergence of** $\sum^{\infty} \frac{x^n}{n!}$.

29. **Find the Taylor series generated by** $f(x) = x^3 - 2x + 4$ **about** $a = 2$.

30. **Graph the curve** $r^2 = 4\cos\theta$.

31. **Find the area of the region lie inside** $r = 1$ **and outside** $r = 1 - \cos\theta$.

32. **Show that** $f(x, y) = \frac{2x^2 y}{x^4 + y^2}$ **has no limit as** (x, y) approaches to (0, 0).

33. **Find** dw/dt **at** $t = 0$ **if** $w = xy + z$, $x = \cos t$, $y = \sin t$, $z = t$.

(6 x 5 = 30 marks)

Part D

Answer any two questions.

34. **Write down the shell formula. Using this find the volume of the solid generated for the following problems.**

(a) **The region bounded by** $y = \sqrt{x}$, **the x-axis and the line x = 4 revolved about x-axis.**

(b) **The region in the first quadrant bounded by** $y = x^2$, **y -axis and the line** $y = 1$ **revolved about** $x = 2$.

35. **Define radius and interval of convergence. Investigate the convergence of** $\sum_{n=0}^{\infty} \frac{2^n + 5}{3^n}$, $\sum_{n=1}^{\infty} \frac{n^2}{2^n}$.

36. (a) **Write the chain rule and draw the tree diagram for finding** $\frac{\partial w}{\partial r}$, $\frac{\partial w}{\partial s}$ **if** $w = x^2 + y^2$ **as** $x = r - s$, $y = r + s$.

(b) **Using Implicit differentiation, find** dy/dx **if** $x^2 + \sin y - 2y = 0$.

(2 x 10 = 20 marks)