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SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2015

(CUCBCSS—UG)

Complementary Course

Mathematics

MAT 2C 02—MATHEMATICS

me : 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*.
11. Find $\lim_{(x,y)\to(0,0)} \frac{x - xy + 3}{x^2 + 5xy + y^3}$.
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 × 1 = 12 marks)

Turn over

Part B

Answer any **nine** *questions.*

13. Find the volume of the solid generated by revolving the region between the parabola $x = y^2 +$

and the line $x = 3$ about the line $x = 3$.

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

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

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

17. Find $\lim_{n\to\infty} 1/2^n$.

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

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

20. Find $\lim_{(x,y)\to(1,1)} \frac{xy - y - 2x + 2}{x - 1}$.

21. Find f_x if $f(x, y) = x^2 + 3xy + y - 1$.

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

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

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

(9 × 2 = 18 m

Part C

Answer any **six** *questions.*

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

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26. Find the lateral surface area of the cone generated by revolving the line segment $x = 1 - y,\ 0 \le y \le 1$ 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 $\sum_{n=0}^{\infty} \frac{x^n}{n!}$.

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 × 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 $w = x^2 + y^2$ $x = r - s,\ y = r + s$.

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

(2 × 10 = 20 marks)