Reg. No.................................

SECOND SEMESTER B.Sc. DEGREE (SUPPLEMENTARY/IMPROVEMENT) EXAMINATION, APRIL/MAY 2015

(UG—CCSS)

Complementary Course—Mathematics

MM 2C 02—MATHEMATICS

Time : Three Hours Maximum : 30 Weightage

I. Objective Type Questions : (Answer *all* questions.)

1 Differentiate coth 5x.

2 Show that sinh 2x = 2sinh x cosh x.

3 Integrate $\operatorname{sech}^{-}\left(x-\frac{1}{2}\right)$.

4 Evaluate $\int_0^1 \frac{dx}{\sqrt{1-x^2}}$

5 Give an example of a constant sequence.

6 $\lim_{n} \sqrt[n]{n} =$ ________

7 State Alternating Series Test (Leibniz's Theorem).

8 Write the series for in $(1 + x)$.

9 Find the Taylor polynomial of order 0 generated by $f(x) = \sin x$ at $a = \frac{}{4}$.

10 $|r| = 1$ is the equation for a ________

Find $\frac{dy}{dx}$ if $x^2 + \sin y - 2y = 0$.

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12 Define gradient vector.

(12 x ¼ = 3 weightage)

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II. Short Answer Type Questions : (Answer all *nine* questions).

13 Find f_x **if** $f(x, \quad = \frac{2y}{y + \cos x}$

14 Find an equation for the hyperbola with eccentricity $\frac{1}{2}$ **and directrix** $x = 2$.

15 Graph the set of points whose polar co-ordinates satisfy the conditions $-3 \quad r \leq 2$ **and** $0 = {}_{4}$

16 Find the Maclaurin's series for $f(x) = \frac{1}{1 + x}$

17 For what values of x do the power series $\sum_{n=0}^{00} \frac{x^n}{!}$ **converges absolutely.**

18 Given $a_1 = a_2 = 1$, $an_{+2} = an_{+1} + an$• **Write the first 4 terms of the sequence.**

19 Investigate the convergence of $\int^{3} \frac{dx}{(x - 1)}$

20 Evaluate $\int \frac{\cosh(\ln t)}{t} dt.$

21 Use the definition of cosh x and sinh x to show that $\cosh\hat{}\ x \quad \sinh\hat{}\ x = 1$.

(9 x 1 = 9 weightage)

III. Short Essay Questions. *(Answer any five* **questions).**

22 Is the area under the curve $Y = \frac{\text{in } x}{x2}$ **from** $x = 1$ **to** $x =$ **co finite. If so, what is it ?**

23 Investigate the convergence of the series

24 Find the Taylor series generated by :

$$f(x) = x^4 + x^2 + \quad \text{at a} \quad - 2.$$

25 Find a polar equation for the circle $x^2 + (y - 3)^2 = 9$.

26 Show that $f \begin{cases} \dfrac{2xy}{x^2 + y^2} & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$ is continuous at every point except the origin.

27 Express $\dfrac{\partial w}{\partial r}$ and $\dfrac{\partial w}{s}$ in terms of r and s $\quad w\ x^2 + y^2, x = r - s, \ y = r + s.$

28 Find the direction in which $f(x, y) = \dfrac{x^2}{2} + \dfrac{y}{2}$

(a) Increases most rapidly ; and

(b) Decreases most rapidly at the point (1, 1).

(5 x 2 = 10 weightage)

IV. Essay Questions. (Answer any *two* questions)

29 Find the linearization L (x, y, z) of $f(x, y, z) = x^2 - xy + z \sin z$ at the point (2, 1, 0). Find an upper bound for the error occurred in replacing f by L over the rectangle R : $|x - 2| \leq 0.01$, $|y - 1| \leq 0.02$, $|z|\ 0.01$.

30 Find the length of the cardioid $r = 1 - \cos 0$.

31 Evaluate $\displaystyle\int_2^\infty \frac{x+3}{-1)(x^2 + 1)} dx$.

(2 x 4 = 8 weightage)