**C 15751** (Pages 3) Name....................................

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

## SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2011

(CCSS)

Complementary Course

poly MM 2C 02—MATHEMATICS

Time : Three Hours Maximum : 30 Weightage

**I. Objective Type Questions. Answer *all* twelve questions :**

1 Define hyperbolic cosine function in terms of exponential function.

2 If $f$ is continuous on [a, co ), then, $\lim_{-4c} \int_a f(x)\,dx =$ ________

3 The derivative of $\sec h2x$ with respect to x is = ________

4 The value of $\sin h^{-1} 1$ using logarithm is ________

5 When does a sequence of real numbers $\{a_n)$ converge to the number L.

6 The $n^{th}$ term of the sequence 0, 1, 2, 2, 3, 3, 4, 4, is ________

7 Find $\sum_{n=9} \left(\frac{1}{3}\right) 1$.

8 The least upper bound of the sequence $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{n}{n+1}, \ldots$ is ________

9 Define absolute convergence of the series $\sum a_n$ .

10 Define a power series about $x = a$.

11 The cylindrical co-ordinates of (0, 1, 0) (in Cartesian coordinate) is ________

12 State the chain rule for functions of two independent variables.

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

**II. Short Answer questions. Answer *all* nine questions :**

13 Evaluate the integral $\int \sin h2x\,dx$.

14 Use partial fractions to find the sum of the series $\sum \frac{4}{(4n-3)(4n+1)}$ converges.

Turn over

15 Show that $\log_{n \to \infty} \frac{\ln n}{} = 0$.

16 Determine the convergence of the series $\sum_{n=} \frac{1}{12n - 1}$,

17 Prove or disprove that $\sum_{n=1} \left(\frac{2}{3}\right)^n$ converges.

18 State Rearrangement theorem for absolutely convergent series.

19 Define boundary point. Give an example.

20 For what values of x does the following power series converge ?

$$\frac{x^2}{2} \quad \frac{x^3}{3}$$

21 Find the Taylor series expansion of $f(x) = ex$ at $x = 0$.

(9 x 1 = 9 weightage)

III. Short essay questions. Answer any *five* questions :

22 Show that $\sin h \quad x = \ln \left| x + \quad x^{-} + 1 \right)$, $-00 < x < 00$.

23 Determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \left(\frac{1}{n} \frac{1}{n2}\right.$

24 State term by term differentiation theorem. Express $f(x) = \frac{1}{1 - x}$ $|x| < 1$ as a power series.

Use the theorem to find $f'(x)$ and $f''(x)$.

25 Find the length of the asteroid $x = \cos^{-} t$, $y = \sin^{-} t$, $0 < t < 2\pi$.

26 Graph the function $r^2 = \sin 20$.

27 Find the $f_x, f_y$ and $f_z$ for the function $f(x, y, z) = x - V_y 2 \quad z2$

28 Find the linearization $L(x, y, z)$ of the function $f(x, y, z) = ex + \cos(y + z)$ at $(0, 0, 0)$.

(5 x 2 = 10 weightage)

**IV. Essay questions. Answer any *two* questions :**

**29 (a) Test for absolute convergence of the series $\sum_{n=1}^{\infty} \frac{n}{n^2} \sin n$.**

**(b) Identify the function :**

$$f(x) = x - \frac{x^3}{3} + \frac{x^5}{5} - \cdots \quad ; - \quad < x < 1.$$

**30 (a) Find the area of the region in the plane enclosed by the cardioid $r = 2(1 + \cos 0)$.**

**(b) Find the spherical co-ordinate equation for the sphere $x^2 + y^2 + (z - 1)^2 = 1$.**

**31 (a) If $f(u, v, w)$ is differentiable and $u = x - y$, $v = y - z$, and $w = z - x$ then show that**

$$\frac{\partial f}{\partial x} + \frac{\;}{ay} + \frac{\;}{\partial z} - 0$$

**(b) Show that $f(x, y, z) = x^2 + y^2 - 2z^2$ satisfies the Laplace equation.**

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