Name..

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

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2013

(U.G.—CCSS)

(Complementary Course)

MM 3C 03—MATHEMATICS

Time : Three Hours Maximum : 30 Weightage

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

Each question of weightage

1 Check for exactness :

$(x^3 + 3xy^{\hat{}} \quad dx + (3x^2 y \quad y^{\hat{}})dy = 0.$

2 Curves that intersect a given curve at right angels are called ____________

3 Solve y c = log x.

4 When is a square matrix A said to be non-singular ?

5 Find the characteristic roots of $\begin{matrix} 1 & 3 \\ [10 & 21 \end{matrix}$

6 If '2' is an eigenvalue of a square matrix A, give one root of AT.

7 Define a solenoidal vector.

8 When are two vectors a and $\vec{b}$ said to be orthogonal ?

9 What is the divergence of $\vec{a} = [x^2, y^2 \ z^2$?

10 Find a unit normal vector to the surface S $x^2 + y^2 + z^2 \quad a^2$.

11 Give the parametric representation of the plane 3x + 2y + z = 6.

12 If = grad $f, f = x^2 + y^2 + 2z^2$, find $\int \vec{F}$ od where C has initial point A (0, 0, 0) and terminal point B : (2, 2, 2).

(12 X ¼ = 3 weightage)

Turn over

II. Short Answer Type Questions : Answer *all* questions.

Each question of weightage 1.

13 Find the rank of the following matrix

$$A = \begin{vmatrix} 4 & 7 & 6 \\ 8 & 14 & 12 \\ L1 & 1 & 1 \end{vmatrix}$$

14 State Cayley Hamilton Theorem.

15 Solve $(1+x^2) \quad dx \quad - 1 + y^2$, $y(0) = 1$.

16 Find an integrating factor for 2x tan y $dx + \sec^t y \, dy = 0$.

17 Find the work done by $\vec{p} = [2, 6, 6\}$ if it displaces a body from A : (3, 4, 0) to B : (5, 8, 0

18 Prove that $\text{div}[\text{grad}\, f] = V^2 f.$

19 Find the tangential and normal accelerations of $\vec{r}(t) = [b \cos t, b \sin t, c]$.

20 Check for path independence :

$\sinh xz\,(zdx - xzdz)$.

21 **Use Green's Theorem to evaluate F** od $\vec{r}$, where F = **grad** (sin x cos y) and C is the ellipse

$25x^2 \ 9y^2 = 225$.

(9 x 1 = 9 weightage)

III. Short Essay or Paragraph Questions : Answer any *five* questions :

Each question of weightage 2.

22 Solve $2xyy' = y^2 \quad x^2$.

23 Find the rank by reducing to normal form :

$$A = \begin{vmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 5 & 4 \\ 4 & 8 & 13 & 12 \end{vmatrix}$$

24 **Find the eigenvalues of A =** $\begin{vmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{vmatrix}$

25 Find the directional derivative of $f\ (x^2 + y^2 + z^2\ \ 2$ at $(3, 0, 4)$ along $\vec{a} = [1, 1, 1]$.

26 Find the length of the hypocycloid $(t) = a \cos\ t\ \imath + a \sin\ t\ J$.

27 Test for exactness and hence evaluate :

$$\int^{(4,\ \frac{1}{2})} 2x \sin \pi y\, dx + \pi x\ \cos \pi y\, dy.$$

28 Evaluate using the Gauss Divergence Theorem : on dA $\vec{F} = [x^3\ y^3, z^3]$ and S is the

surface of the sphere $x^2 + y^2 + z^2 = 9$.

(5 x 2 = 10 weightage)

IV Essay Questions : Answer any *two* questions.

Each question of weightage 4.

29 Find the Orthogonal Trajectories of $y = c\sqrt{x}$

30 Use Cayley Hamilton Theorem to find A^3 and A^4 if $A = \begin{vmatrix} 1 & 1 & 2 \\ 3 & 1 & 1 \\ 2 & 3 & 1 \end{vmatrix}$.

31 Verify Stokes' Theorem for $\vec{F} = [\ , z, x]$ and S is the portion of the paraboloid

$z = 1 - x^2 + y^2),\ z\ \ 0.$

(2 x 4 = 8 weightage)