D 31095 **(Pages : 3)** **Name..................................**

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

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2012

Mathematics—Complementary Course

MM 3C 03—MATHEMATICS

Time : Three Hours Maximum : 30 Weightage

I. Answer *all* questions. Each question of weightage

1 When is M (x, *y*) *dx* + *N* (*x*, *y*) *dy* an exact differential equation ?

2 What is the Bernoulli equation ?

3 Solve : y" =

4 Define rank of a non-zero matrix 'A'.

5 Are the matrices $\begin{vmatrix} 1 & 21 \\ 1 & 1 \end{vmatrix}$ and $\begin{vmatrix} 2 & 4 \\ 3 & 3 \end{vmatrix}$ equivalent ?

6 What are the characteristic roots of A = $\begin{vmatrix} 1 & 0 & 0 \\ 4 & 2 & 0 \\ 9 & -5 & 3 \end{vmatrix}$

7 What is the divergence of a = $[3xz, 2xy, -yz]$?

8 What is the volume of a parallel piped with edge vectors $\vec{a}, \vec{b}$ and ?

9 State Laplace's equation.

10 If a surface S is given by $g(x, y, z) = 0$, what is the unit normal vector to S ?

11 Give the parametric representation of the sphere $x^2 + y^2 + z^2 = a^2$

12 Give an example of a non-orientable surface.

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

II. Answer *all* questions. Each question of weightage 1.

13 ~~Solve : (1~~ $\frac{}{dx}$ = 1 + $x.e^x$, $y(0) = 1$

14 Find an integrating factor for (2 cos y $+ 4x) dx = x \sin y \, dy$.

15 Find the rank of A = $\begin{vmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \\ 3 & 7 & 8 \end{vmatrix}$

Turn over

16 If $= \begin{vmatrix} 1 & 2 \\ 2 & 4 \end{vmatrix}$, use Cayley Hamilton theorem to find A^4.

17 If a = [1,1,0], $\vec{b}$ = [3,2,1} and c = [1,0,2], find the angle between a and $\vec{b}$

18 Find the tangential and normal accelerations of $\vec{r}(t) = 5t^2\hat{k}$.

19 Prove that curl (grad f) $= \vec{0}$.

20 Check for path independence : $3z\ dx + 6xzdz$.

21 Use Green's theorem to find the area enclosed by the circle $x^2 + = 9$.

(9 x 1 = 9 weightage)

III. Answer any *five* questions from seven. Each question of weightage 2.

22 Solve : $(2x - 4y + 5)y' + (x - 2y + 3) = 0$.

23 Find the rank by reducing to normal form.:

$$A = \begin{vmatrix} 1. & 2 & 0 & -1 \\ 3 & 4 & 1 & 2 \\ -2 & 3 & 2 & 5 \end{vmatrix}$$

24 Find the eigenvalues of $A = \begin{vmatrix} -2 & -8 & -12 \\ 1 & 4 & 4 \\ 0 & 0 & 1 \end{vmatrix}$

25 Find the directional derivative of $f = xyz$ along [1, —2, 2) at (-1, 1, 3).

26 Test for exactness and hence evaluate :

$$\int_{(0.0,0)}^{(a,b,c)} 2xy\ dx + 2x^2 ydy + dz$$

27 Find the length of the catenary $\vec{r}\ (t) = t\ i + cosht\ j$ from $t = 0$ to $t = 1$.

28 Evaluate $\int_S \circ_n dA$ using the Divergence theorem, where :

$\vec{F} = [\ ^2, 0, z^2]$ and S is the box $|x| \leq |, |y| \leq 3, |z| \leq 2$.

(5 x 2 = 10 weightage)

IV. Answer any *two* questions. Each question of weightage 4.

29 Find the Orthogonal trajectories of y $= c \cdot ex$.

30 Verify Cayley Hamilton theorem for :

$$A = \begin{vmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{vmatrix}$$

31 Verify Stokes theorem for = ^{2}**,5x,0** **and S is the square 0** x $\leq y \leq 1, z$ **=1.**

(2 x 4 = 8 weightage)