D 21535 (Pages : 3) Name

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

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2011

(CCSS)

Mathematics—Complementary

MM 3C 03—MATHEMATICS

Time : Three Hours Maximum Weightage : 30

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

1. The degree of the differential equation $(y')^2 + y = x^3 - 4$ is ————————

2. The variable separable form of the differential equation $9yy' + 4x = 0$ is ————

3. The necessary and sufficient condition for the differential equation M (x, y) dx + N (x, y) dy = 0 is exact is that ————

4. The order of the largest square sub matrix whose determinant is not zero is called ————

5. $| A - \quad | = 0$ is called the ———— of A.

6. If $_2$ is a characteristic root of a non-singular matrix A then $1/2$ is the characteristic root of ————

7. If the inner product of two vectors is zero then the two vectors are ————

8. The directional derivative of g, $D_b f$, is maximum when **b** has the direction of ————

9. When the curl of a vector point function f is a zero vector then f is called ————

10. curl $(V\, f) = $ ————

11. The line integral $\int F(r).d\mathbf{r}$ is path independent if and only if **F** is ———— of some function f

12. A domain is called ———— if every closed curve can be continuously shrunk to any point D without leaving D.

(12 x $^1/_4$ = 3)

II. Short Answer Type Questions.
Answer all questions.

13. Solve the initial value proem $y' = -y / x$; y (1) = 1.

14. Find the integrating factor of the differential equation $\dfrac{dy}{dx} + y \tan x = \dfrac{..}{3}$

15. Find the general solution of the differential equation y y = 4.

Turn over

16. Obtain the row equivalent canonical matrix C of $\begin{bmatrix} 1 & 2 & -3 \\ 2 & 5 & -4 \end{bmatrix}$

17. Find the augmented matrix of the following system of equations :

$$x + 2y - 3z = 5$$

$$3x - y = 3$$

$$4x + 3y - z = 2$$

18. Find the eigenvalues of $\begin{vmatrix} 3 & 0 & 0 \\ 5 & 4 & 0 \\ 3 & 6 & 1 \end{vmatrix}$

19. Find a unit vector perpendicular to the vectors [2, 3, 4] and [-2, 1, 1].

20. Find the div $[3x^2, 5xy\hat{}, xyz\hat{}]$ at the point (1, 2, 3).

21. Find the directional derivative off $(x, y, z) = 2x^2 + 3y^2 + z^2$ at the point P (2, 1, 3) in the direction of the vector $i - 2k.$

(9 x 1=9)

III. Short Essay or Paragraph **Questions.**

Answer any **five** *questions.*

22. Solve the following exact equations $(x^3 + 3xy\hat{}) dx + (3x\hat{}y + y\hat{}) dy = 0.$

23. Solve the Bernoulli's equation : $y' - Ay = -By\hat{}$ **A, B** positive.

24. Reduce the matrix A to its normal form.

$$A = \begin{vmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{vmatrix}$$

25. Prove that the following system of equation is inconsistent.

$$x + y + z + 3 = 0$$

$$3x + y - 2z + 2 = 0$$

$$2x + 4y - 7z - 7 = 0.$$

26. Determine the eigenvectors of the matrix $\begin{vmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{vmatrix}$

27. Find the work done in moving a particle in the force field $F = 3x^2 \mathbf{i} + (2xz - y)j + z\mathbf{k}$ along the

   straight line from (0, 0, 0) to (2, 1, 3).

28. Evaluate $\int (z\mathbf{i} + x\mathbf{j} + y\mathbf{k}).\mathbf{n}\, dS$ where S is the quadrant of the circle $x^2 + y^2 = 1$ between the

   positive parts of the axes.

(5 x 2 = 10)

IV. Essay Questions.

Answer any two *questions.*

29. Verify the Cayley-Hamilton theorem and compute the inverse of the matrix

   $$A = \begin{vmatrix} 2 & 6 & -2 \\ 6 & 1 & -4 \\ -2 & -4 & -3 \end{vmatrix}$$

30. Solve: $x + 3y - 2z = 0$, $2x - y + 4z = 0$, $x - 11y \quad 14z = 0$.

31. Verify Stoke's theorem for F $(x^2 + y^2)\, i\, 2\, xyj$ taken round the rectangle bounded by the lines
   $x = a, x = -a, y = 0, y = b.$

2 x 4 = 8)