K18U 0505

Reg. No. : ..............................

Name : ..................................

# II Semester B.Sc. Degree (C.B.C.S.S. – Reg./Supple./Improv.) Examination, May 2018
## COMPLEMENTARY COURSE IN MATHEMATICS
## 2C02 MAT-CS : Mathematics for Computer Science – II
## (2014 Admn. Onwards)

Time : 3 Hours | Max. Marks : 40

### SECTION – A

**All** the **first 4** questions are **compulsory**. They carry **1** mark **each**.

1. Evaluate $\int_0^{\pi/2} \cos^9 x \, dx$.

2. Find the value of $\int_0^{\pi/2} \sin^4 x \cos^5 x dx$.

3. Give example of a 3×3 lower triangular matrix.

4. When do you say that a square matrix is symmetric ? **(1×4=4)**

### SECTION – B

Answer **any 7** questions from among the questions **5** to **13**. These questions carry **2** marks **each** :

5. Find the area of a loop of the curve $r^2 = a^2 \cos 2\theta$.

6. Transform the double integral $\iint x^{m-1} y^{n-1} dx\, dy$ by the formulae $x + y = u$, $y = uv$, showing that transformed result is $\iint u^{m+n-1} (1-v)^{m-1} v^{n-1} du\, dv$.

7. Find the volume of the solid whose base is in the xy – plane and is the triangle bounded by the x – axis, the line y = x and the line x = 1 while the top of the solid is in the plane z = x + y + 1.

P.T.O.

8. Prove that $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is orthogonal.

9. If $a = \begin{bmatrix} 5 \\ 1 \\ 2 \end{bmatrix}$ and b = [3 0 8], calculate ab and ba.

10. Give an example of a vector space and a basis for the same.

11. Find the characteristic polynomial of $A = \begin{bmatrix} 1 & 3 & 5 \\ 0 & 2 & 6 \\ 0 & 0 & -1 \end{bmatrix}$.

12. Let $A = \begin{bmatrix} -5 & 3 & 0 & 0 \\ 0 & 2 & -2 & 6 \\ 1 & 0 & -\frac{1}{2} & 3 \\ \frac{2}{3} & 1 & 3 & -1 \end{bmatrix}$. Verify that $v = \begin{bmatrix} 3 \\ 1 \\ 0 \\ -1 \end{bmatrix}$ is an eigenvector of A and find the eigenvalue corresponding to v.

13. Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 1 \\ 2 & 1 \end{bmatrix}$. **(2×7=14)**

SECTION – C

Answer **any 4** questions from among the questions **14** to **19**. These questions carry **3** marks **each** :

14. Find the length of the arc of the equiangular spiral $r = ae^{\theta \cot \alpha}$ between the points for the which the radii vectors are $r_1$ and $r_2$.

15. Evaluate $\int \frac{\sin^4 x}{\cos^2 x} dx$.

16. Evaluate the integral $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} \frac{dx\, dy\, dz}{(x+y+z+1)^3}$.

17. Find the area of the surface generated by revolving about the axis of x, the arc of the parabola $y^2 = 4ax$ from the origin to the point where $x = a$.

18. Solve by Cramer's rule :

$3x + 3y + 3z = 190$

$x - y = -3$

$4x - y + z = 1.$

19. Diagonalize the following matrix, if possible. $A = \begin{bmatrix} -2 & 0 & 0 & 0 \\ 0 & -2 & 0 & 0 \\ 24 & -12 & 2 & 0 \\ 0 & 0 & 0 & 2 \end{bmatrix}$. **(3×4=12)**

SECTION – D

Answer **any 2** questions from among the questions **20** to **23**. These questions carry **5** marks **each** :

20. Show that the area bounded by the cissoid $x = a\sin^2 t, y = a\dfrac{\sin^3 t}{\cos t}$ and its asymptote is $\dfrac{3\pi^2}{4}$.

21. Find the volume of the solid obtained by revolving the cardioide $r = a(1 + \cos\theta)$ about the initial line.

22. Find the inverse of the matrix by Gauss-Jordan elimination : $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 2 & 7 & 7 \end{bmatrix}$.

23. Determine the eigenvalues and eigenvectors of $\begin{bmatrix} -3 & 1 & -3 \\ 20 & 3 & 10 \\ 2 & -2 & 4 \end{bmatrix}$. **(5×2=10)**

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