K17U 1040

Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (C.B.C.S.S. – Reg./Supple./Improv.)
Examination, May 2017
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT-CS : Mathematics for Computer Science – II

Time : 3 Hours   Max. Marks : 40

SECTION – A

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

1. Evaluate $\int\limits_{0}^{\pi/2} \sin^7 x \, dx$.

2. Give an example of a 3×3 diagonal matrix which is not a scalar matrix.

3. Define the rank of a matrix.

4. Find the algebraic multiplicity of the eigen value of the matrix $\begin{bmatrix} 3 & 2 \\ 0 & 3 \end{bmatrix}$.   **(1×4=4)**

SECTION – B

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

5. Evaluate $\int\limits_{0}^{a} \dfrac{x^4 \, dx}{\sqrt{a^2 - x^2}}$.

6. Find the area bounded by the ellipse $x^2/a^2 + y^2/b^2 = 1$.

7. Find the length of the curve $y = \log \{(e^x - 1)/(e^x + 1)\}$ from $x = 1$ to $x = 2$.

8. Find the volume of the solid obtained by revolving one arc of the cycloid.
   $x = a (\theta + \sin \theta)$, $y = a (1 + \cos \theta)$ about x – axis.

P.T.O.

9. Evaluate $\int\limits_{1}^{2} \int\limits_{0}^{3y} y \, dy \, dx$.

10. For the matrix $\begin{bmatrix} 1 & -2 \\ 0 & 0 \\ -3 & 6 \end{bmatrix}$ find the rank and a basis for the column space.

11. Do there exist skew symmetric orthogonal 3×3 matrices ? Justify.

12. Find the spectrum of $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$.

13. Find the eigen vector of $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$.

(2×7=14)

SECTION – C

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

14. If $\phi(n) = \int\limits_{0}^{\pi/4} \tan^n x \, dx$, show that $\phi(n) + \phi(n-2) = \dfrac{1}{n-1}$ and deduce the value of $\phi(5)$.

15. The area included between the curves $y^2 = x^3$ and $x^2 = y^3$ is rotated about the x-axis. Find the volume of the solid generated.

16. Show by double integration that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $(16/3)a^2$.

17. Solve by Gauss Elimination method :

   $y + z = -2$

   $4y + 6z = -12$

   $x + y + z = 2$.

18. Find the inverse of $\begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$.

19. Find an eigen basis and diagonalize $\begin{bmatrix} 3 & 2 \\ 2 & 6 \end{bmatrix}$.

(3×4=12)

SECTION – D

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

20. Obtain the intrinsic equation of the cycloid $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$, the fixed point being the origin.

21. Evaluate $\iiint\limits_V (x^2 + y^2 + z^2)\, dx\, dy\, dz$ where V is the volume of the cube bounded by the coordinate planes and the planes $x = y = z = a$.

22. Solve by Cramers rule :

$3y + 4z = 14.8$

$4x + 2y - z = -6.3$

$x - y + 5z = 13.5$.

23. Find the eigen vectors of $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

(5×2=10)

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