Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (CBCSS- Reg./Supple./Improv.) Examination, May 2017
COMPLEMENTARY COURSE IN MATHEMATICS
2C02 MAT-PH : Mathematics for Physics and Electronics – 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 $\displaystyle\int_{0}^{\pi/2} \sin^8 x \, dx$.

2. What do you mean by the rank of a matrix ?

3. Evaluate $\begin{vmatrix} \cos \alpha & \sin \alpha \\ \sin \beta & \cos \beta \end{vmatrix}$.

4. Find the spectrum of the matrix $\begin{bmatrix} 4 & 0 \\ 2 & -4 \end{bmatrix}$.

(1×4=4)

SECTION – B

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

5. Find the value of $\displaystyle\int_{0}^{\pi/2} \cos^3 x \, \cos 2x \, dx$.

6. Find the area bounded by the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$.

7. Find the whole length of the astroid $x^{2/3} + y^{2/3} = a^{2/3}$.

8. Find the volume of the solid generated by rotating completely about X-axis the area enclosed between $y^2 = x^3 + 5x$ and the lines $x = 2$ and $x = 4$.

9. Evaluate : $\int_{0}^{1} \int_{0}^{1} (x^2 + y^2)\, dxdy$.

10. Find the inverse of the matrix $\begin{bmatrix} 3 & 8 \\ 2 & 1 \end{bmatrix}$.

11. Find the eigenvalues of the matrix $\begin{bmatrix} -2 & -1 \\ 5 & 4 \end{bmatrix}$.

12. Verify the Cayley-Hamilton theorem for the matrix $\begin{bmatrix} 1 & 3 \\ -2 & 2 \end{bmatrix}$.

13. Prove that eigenvectors of a symmetric matrix corresponding to different eigenvalues are orthogonal.

$(2 \times 7 = 14)$

SECTION – C

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

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

15. 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.

16. Evaluate $\int_{0}^{\pi/2} \int_{0}^{\pi/2} \sin x \, \sin^{-1}(\sin x \sin y)\, dx\, dy$.

17. Evaluate the following determinant by reducing it to triangular form

$$\begin{vmatrix} 2 & 0 & -4 & 6 \\ 4 & 5 & 1 & 0 \\ 0 & 2 & 6 & -1 \\ -3 & 8 & 9 & 1 \end{vmatrix}.$$

18. Find the inverse of the matrix $\begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$.

19. Find the eigenvalue and its algebraic and geometric multiplicities of the matrix

$\begin{bmatrix} 3 & 2 \\ 0 & 3 \end{bmatrix}$.   **(3×4 =12)**

SECTION – D

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

20. Find the area common to the circles $r = a\sqrt{2}$ and $r = 2a\cos\theta$.

21. Find the volume of the solid obtained by the revolution of the cossoid $y^2 (2a - x) = x^3$ about its asymptote.

22. Solve the following system of equations :

$3x + 7y - 4z = -46$

$5w + 4x + 8y + z = 7$

$8w + 4y - 2z = 0$

$-w + 6x + 2z = 13$

23. Diagonalize the matrix $\begin{bmatrix} 7.3 & 0.2 & -3.7 \\ -11.5 & 1.0 & 5.5 \\ 17.7 & 1.8 & -9.3 \end{bmatrix}$.   **(5×2=10)**

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