

K20U 0473

Reg. No. :

Name :

II Semester B.Sc. Degree (CBCSS (OBE) – Regular) Examination, April 2020
(2019 Admission)

COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
2C02 MAT-CS : MATHEMATICS FOR COMPUTER SCIENCE – II

Time : 3 Hours

Total Marks : 40

PART – A

Answer any four questions.

(1×4=4)

1. Evaluate $\int_0^{\frac{\pi}{2}} \cos^4 x \, dx$.

2. Plot the set of points whose polar co-ordinates satisfy $2 \leq r \leq 3$ and $0 \leq \theta \leq \frac{\pi}{4}$.

3. Find the value of $\int_0^1 \int_0^2 \int_0^3 dx \, dy \, dz$.

4. If λ is an eigen value of the matrix A, show that λ^2 is an eigen value of the matrix A^2 .

5. Is the identity matrix diagonalizable ? Justify your claim.

PART – B

Answer any 7 questions.

(2×7=14)

6. Let $u = x^y$. Find the value of $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$.

7. If $x^3 + 3x^2y + 6xy^2 + y^3 = 1$, find $\frac{dy}{dx}$.

8. Let $u(x, y) = a^2 \sin^{-1}\left(\frac{y}{x}\right)$. Find the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$.

9. Find the value of $\int_0^{\pi/2} \cos^{10} x \, dx$.

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10. Evaluate $\int_0^{\pi/2} \sin^5 \theta \cdot \cos^3 \theta \, d\theta$.

11. Calculate the value the integral $\int_0^{\pi/2} \sin^6 \theta \cdot \cos^5 \theta \, d\theta$.

12. Using reduction formula, find $\int \tan^6 x \, dx$.

13. Find all polar co-ordinates of the point $P(3, \pi/6)$.

14. Evaluate $\iint xy \, dx dy$ over the positive quadrant of the disc $x^2 + y^2 \leq a^2$.

15. Find eigen values of the matrix $A = \begin{bmatrix} 4 & 6 & 3 \\ 0 & 6 & 1 \\ 0 & 0 & 4 \end{bmatrix}$.

PART - C

Answer any 4 questions.

(3×4=12)

16. If $z = \log(\sqrt{x^2 + y^2})$, prove that $\frac{\partial^2 z}{\partial^2 x^2} + \frac{\partial^2 z}{\partial^2 y^2} = 0$.

17. If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$.

18. If $I_n = \int_0^{\pi/4} \tan^n x \, dx$, prove that $I_n + I_{n-2} = \frac{1}{n-1}$.

19. Evaluate $\int_0^{\pi} \sin^6 \theta \cos^3 \theta \, d\theta$.

20. Find the length of the cardioid $r = 4(1 - \cos \theta)$.

21. Using Cayley-Hamilton theorem, find the inverse of the matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$.

22. Find the nature of the quadratic form $x^2 + 5y^2 + z^2 + 2xy + 2yz + 6zx$.



PART – D

Answer **any 2** questions.

(5×2=10)

23. If $u = \tan^{-1} \left(\frac{x}{y} \right)$, verify that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$.

24. Evaluate $\int \cos^7 x \, dx$.

25. By changing the order of integration, evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} \, dx \, dy$.

26. Find the characteristic values and characteristic vectors of the matrix

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}.$$
