



K21U 3473

Reg. No. :

Name :

II Semester B.Sc. Degree (CBCSS-OBE-Reg./Sup./Imp.)
Examination, April 2021
(2019 Admission Onwards)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
2C02 MAT-CS : Mathematics for Computer Science – II

Time : 3 Hours

Max. Marks : 40

PART – A

Answer **any 4** questions :

(1×4=4)

1. Evaluate $\int_0^{\frac{\pi}{2}} \sin^4 x \, dx$.
2. Graph the set of points whose polar co-ordinates satisfy $-2 \leq r \leq 2$ and $\theta = \frac{\pi}{6}$.
3. Evaluate the integral $\int_0^1 \int_0^2 \int_1^3 dx \, dy \, dz$.
4. Define a positive definite quadratic form.
5. Prove that the matrices A and A^T have the same eigen values.

PART – B

Answer **any 7** questions :

(2×7=14)

6. Find the limit of $\frac{x(y-1)}{y(x-1)}$ when $(x, y) \rightarrow (1, 1)$, if the limit exists.
7. If $f(x, y) = x^8 \sin\left(\frac{y}{x}\right)$, find the value of $x \frac{\partial f}{\partial x} + y \frac{\partial f}{\partial y}$.
8. Find $\frac{dz}{dx}$ using chain rule, given that $z = x^2 + \sqrt{y}$ and $y = \sin x$.

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9. Show that $\int_0^{\pi} \sin^7(x/2) dx = \frac{32}{35}$.
10. Evaluate $\int_0^{\pi} \sin^3 \theta \cdot \cos^6 \theta d\theta$.
11. Find the value of $\int \cos^4 x dx$.
12. Show that $\int_0^{\pi/2} \sin^6 \theta \cdot \cos^5 \theta d\theta = \frac{8}{693}$.
13. Write all polar co-ordinates of the point $P(1, \pi/4)$.
14. Find the perimeter of the circle $x^2 + y^2 = 4$.
15. Write the matrix of the quadratic form $x_1^2 + 2x_2^2 - 7x_3^2 - 4x_1x_2 + 8x_1x_3 + 5x_2x_3$.

PART - C

Answer any 4 questions :

(3×4=12)

16. If $u = (y - z)(z - x)(x - y)$, show that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.
17. If $u = \log_e \left(\frac{x^3 - y^3}{x^2 + y^2} \right)$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 1$.
18. Using reduction formula, evaluate $\int \tan^4 x dx$.
19. Evaluate $\int_0^1 x^4 (1-x^2)^{3/2} dx$.
20. Show that $\int_0^3 \int_0^2 \int_0^1 (x+y+z) dz dx dy = 18$.
21. Find the value of the integral $\int_2^a \int_2^b \frac{dx dy}{xy}$.
22. Find the nature of the quadratic form $8x^2 + 7y^2 + 3z^2 - 12xy - 8yz + 4zx$.

PART – D

Answer any 2 questions :

(5×2=10)

23. If $u = \tan^{-1}\left(\frac{x^3 + y^3}{x + y}\right)$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$.

24. Show that $\int_0^1 x^{3/2} (1-x)^{3/2} dx = \frac{3\pi}{128}$.

25. Change the order of integration $\int_0^1 \int_{x^2}^x (2x^2 + y) dy dx$ and hence or otherwise evaluate the same.

26. Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.
