

BACHELOR'S DEGREE EXAMINATION, OCTOBER 2025
2024 ADMISSIONS REGULAR
SEMESTER III - MAJOR (MATHEMATICS)
MT3DSCA01B24 - Perspectives of Mathematics

Time : 1.5 Hours

Maximum Marks : 50

Part A

Answer all questions. Each question carries 1 mark.

(1x10=10)

1. State the formula for area of a region in polar coordinates [CO1,Remember]
2. Sketch the region of integration $-1 \leq x \leq 2$ and $x - 1 \leq y \leq x^2$ [CO1,Apply]
3. State any one property of double integrals [CO1,Remember]
4. Solve $\int_{w=0}^{\pi} \int_{v=0}^{\pi} \int_{u=0}^{\pi} \cos(u + v + w) du dv dw$ [CO2,Apply]
5. State the sum and difference property of triple integrals [CO2,Remember]
6. Solve $\int_0^3 \int_0^2 \int_0^4 4x dx dy dz$ [CO2,Apply]
7. Define Jacobian of the coordinate transformation $x=g(u,v)$ and $y=h(u,v)$ [CO3,Remember]
8. Calculate the determinant of $\begin{bmatrix} 2 & -3 & 1 \\ 2 & 0 & -1 \\ 1 & 4 & 5 \end{bmatrix}$ [CO3,Analyse]
9. Compute $\int_0^2 \int_{-\pi}^0 \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} (\rho^3 \sin 2\phi) d\phi d\theta d\rho$ [CO3,Understand]
10. State the Remainder Theorem [CO4,Remember]

Part B

Answer any 2 questions from the bunch of CO1. Each question carries 5 mark.

(5x2=10)

11. Compute the area enclosed by the lemniscate $r^2 = 4\cos 2\theta$ [CO1,Apply]
12. Illustrate Fubini's first theorem with an example [CO1,Remember]
13. Compute the volume of the solid region bounded above by the paraboloid $z = 9 - x^2 - y^2$ and below by the unit circle in the xy-plane. [CO1,Apply]

Part B

Answer any 2 questions from the bunch of CO2. Each question carries 5 mark.

(5x2=10)

14. Set up the limits of integration for evaluating the triple integral of a function $F(x, y, z)$ over the tetrahedron D with vertices $(0, 0, 0)$, $(1, 1, 0)$, $(0, 1, 0)$ and $(0, 1, 1)$. Use the order of integration $dydzdx$. [CO2,Apply]
15. Compute $\int_1^2 \int_1^x \int_0^y x y z dz dy dx$ [CO2,Apply]
16. Solve $\int_2^3 \int_{-1}^4 \int_0^1 (4x^2y - z^3) dz dy dx$

[CO2,Apply]

Part B

Answer any 2 questions from the bunch of CO3. Each question carries 5 mark.

(5x2=10)

17.

Compute the cylindrical coordinate integral $\int_0^{2\pi} \int_0^3 \int_0^{\frac{z}{3}} r^3 dr dz d\theta$

[CO3,Apply]

18. (a) State any two properties of triple integrals

(b) Compute the Jacobian of $x=u+v$ and $y=2v$

[CO3,Apply]

19. Evaluate the Jacobian $x = u + 2v$, $y = v + 3w$, $z = w + u$

[CO3,Apply]

Part C

Answer any 1 question from the bunch of CO4. Each question carries 10 mark.

(10x1=10)

20. Compute the quotient of $2x^4 - x^3 - 6x^2 + 4x - 8$ by $x^2 - 4$

[CO4,Apply]

21. (a) Define a quartic equation

(b) Produce a quartic equation having the roots $\pm 1, \pm 2$

[CO4,Apply]