



Reg. No. :

Name :



K23U 1998

**II Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/
Improvement) Examination, April 2023
(2019 Admission Onwards)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
2C02 MAT – BCA : Mathematics for BCA – II**

Time : 3 Hours

Max. Marks : 40

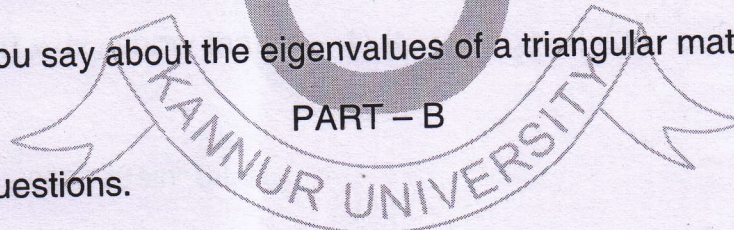


PART - A

Answer any 4 questions.

(4×1=4)

1. Evaluate $\lim_{\substack{x \rightarrow 1 \\ y \rightarrow 1}} \frac{x(y-2)}{y(x-2)}$.
2. Write the reduction formula for $\int \sin^n x \, dx$.
3. State Fubini's theorem.
4. State Cayley-Hamilton theorem.
5. What can you say about the eigenvalues of a triangular matrix ?



PART - B

Answer any 7 questions.

(7×2=14)

6. Evaluate $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ for $z = x^2 + 3xy + y - 1$.
7. If $z = xe^y + y + 1$, find $\frac{\partial^2 z}{\partial x \partial y}$.
8. Integrate xe^x .
9. Integrate $\cos^3 x \sin x$.
10. Integrate $1 - 6x^2y$ over the rectangle $0 \leq x \leq 2, -1 \leq y \leq 1$.

P.T.O.



11. Write an iterated integral for $\iint_R dA$ over the region bounded by $y = \sqrt{x}$, $y = 0$ and $x = 9$ using both vertical and horizontal cross sections.
12. Find the eigenvalues of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.
13. Define similarity of matrices.
14. Find the matrix corresponding to the quadratic form $2xy + 2yz + 2zx$.
15. Prove that any square matrix and its transpose have the same eigenvalues.

PART - C

Answer **any 4** questions.

(4×3=12)

16. If $z = f(x + ct) + \phi(x - ct)$, prove that $\frac{\partial^2 z}{\partial t^2} = c^2 \frac{\partial^2 z}{\partial x^2}$.
17. If $u = \frac{x^3 y^3 z^3}{x^3 + y^3 + z^3} + \log\left(\frac{xy + yz + zx}{x^2 + y^2 + z^2}\right)$, find the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z}$.
18. If $I_n = \int_0^{\pi/3} \tan^n x \, dx$, show that $(n - 1)(I_n + I_{n-2}) = (\sqrt{3})^{n-1}$.
19. Evaluate $\int_0^{\pi/6} \cos^6 3\theta \sin^2 6\theta \, d\theta$.
20. Find the volume of the region bounded by the elliptical paraboloid $z = 10 + x^2 + 3y^2$ and below by the rectangle $0 \leq x \leq 1$, $0 \leq y \leq 2$.
21. Evaluate $\int_0^{\sqrt{2}} \int_0^{3y} \int_{x^2+3y^2}^{8-x^2-y^2} dz \, dx \, dy$.
22. Find the eigenvectors of $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$.



PART – D

Answer any 2 questions.

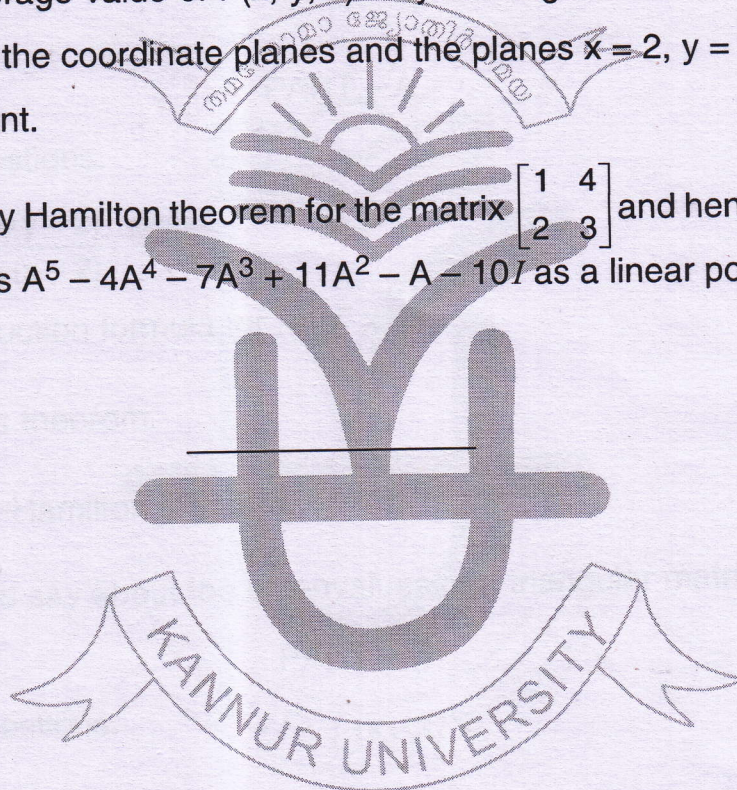
(2×5=10)

23. Transform the equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ into polar coordinates.

24. Evaluate $\int_0^a (a^2 + x^2)^{5/2} dx$.

25. Find the average value of $F(x, y, z) = xyz$ throughout the cubical region D bounded by the coordinate planes and the planes $x = 2, y = 2$ and $z = 2$ in the first octant.

26. Verify Cayley Hamilton theorem for the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and hence obtain A^{-1} . Also express $A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$ as a linear polynomial in A.





K22U 1299

Reg. No. :

Name :

**II Semester B.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular/Supplementary/Improvement) Examination, April 2022
(2019 Admission Onwards)**

**COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
2C02 MAT – BCA : Mathematics for BCA II**

Time : 3 Hours

Max. Marks : 40

PART – A

Answer any four questions. Each question carries 1 mark.

1. If z is a homogeneous function of degree n in x and y , then find

$$x^2 \frac{\partial^2 z}{\partial x^2} + 2xy \frac{\partial^2 z}{\partial x \partial y} + y^2 \frac{\partial^2 z}{\partial y^2}.$$

2. Find the value of $\int_0^{\frac{\pi}{2}} \sin x \, dx$.

3. Evaluate $\int \frac{dx}{2x-5}$.

4. Find the Cartesian equation of the polar equation $r = 2$.

5. Calculate the eigenvalues of a diagonal matrix. **(4×1=4)**

PART – B

Answer any seven questions. Each question carries 2 marks.

6. State Euler's theorem on homogeneous function.

7. Find the value of $\lim_{\substack{x \rightarrow 1 \\ y \rightarrow 2}} \frac{3x^3y}{x^2 + 2y^2 + 4}$.

P.T.O.



8. Evaluate $\int_0^1 \frac{2x}{1+x^2} dx$.
9. What is the reduction formula for $\int \tan^n x dx$?
10. Evaluate $\int x \cos x dx$.
11. Find the value of $\int_0^2 \int_0^4 xy dy dx$.
12. Sketch the region of integration $0 \leq x \leq 3, 0 \leq y \leq 2x$.
13. Define eigenvectors.
14. What is meant by similarity of matrices ?
15. Find the matrix corresponding to the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$. (7×2=14)

PART - C

Answer **any four** questions. **Each** question carries **3** marks.

16. Find the value of $\frac{du}{dt}$, given $u = y^2 - 4ax$, $x = at^2$ and $y = 2at$.
17. Evaluate $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ if $z = x^2y - x \sin xy$.
18. Find the value of $\int_0^1 \frac{x^5}{\sqrt{1-x^2}} dx$.
19. Evaluate $\int_{-1}^1 \int_0^1 \int_0^2 (x+y+z) dx dy dz$.
20. Find a polar equation for the circle $(x-3)^2 + (y+1)^2 = 4$.
21. Calculate the eigenvalues and eigenvectors of the matrix $\begin{bmatrix} 10 & 3 \\ 4 & 6 \end{bmatrix}$.
22. Classify the nature of a quadratic form X^TAX . (4×3=12)



PART - D

Answer any two questions. Each question carries 5 marks.

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

24. Integrate $\frac{x+1}{(x-1)^2(x+2)^2}$ with respect to x .

25. Calculate $\iint f(x, y) \, dA$ over $R : 0 \leq x \leq 2, -1 \leq y \leq 1$, where $f(x, y) = 100 - 6x^2y$.

26. Using Cayley Hamilton theorem find the inverse of the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$. Also

express $A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$ as a linear polynomials in A .

(2×5=10)

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-BCA : Mathematics for BCA II

Time : 3 Hours

Max. Marks : 40

PART – A

Answer **any four** questions. **Each** question carries **1** mark.

1. Calculate $\lim_{\substack{x \rightarrow 1 \\ y \rightarrow 2}} \left(\frac{2x^2y}{x^2 + y^2 + 1} \right)$.

2. Show that $\int_0^{\pi/2} \cos^7 x \, dx = \frac{16}{35}$.

3. Evaluate $\int \frac{dx}{3x - 4}$.

4. Find the Cartesian equation of the polar equation $r \sin \theta = 3$.

5. If $\lambda_1, \lambda_2, \dots, \lambda_n$ are the eigen values of a matrix A , then find the eigen values of A^m , where m is a positive integer. **(4×1=4)**

PART – B

Answer **any seven** questions. **Each** question carries **2** marks.

6. State Euler's theorem on homogeneous function.

7. Determine whether the function $z = ax^2 + 2hxy + by^2$ is homogeneous or not. If homogeneous write the degree.

8. Evaluate $\int xe^x \, dx$.

9. Find the reduction formula for $\int \tan^n x \, dx$.

10. Calculate $\int_0^{\pi/2} \frac{\cos x}{1 + \sin^2 x} \, dx$.

P.T.O.



11. Find the value of $\int_0^2 \int_{-1}^1 (x - y) dy dx$.
12. Find a polar equation for the circle $x^2 + (y - 2)^2 = 4$.
13. Define eigen vectors.
14. Find the matrix corresponding to the quadratic form $2x_1x_2 + 2x_1x_3 - 2x_2x_3$.
15. What is meant by similarity of matrices ? **(7×2=14)**

PART - C

Answer **any four** questions. **Each** question carries **3** marks.

16. If $u = x \log(xy)$ where $x^3 + y^3 + 3xy = 1$, find $\frac{du}{dx}$.
17. Verify $\frac{\partial^2 z}{\partial y \partial x} = \frac{\partial^2 z}{\partial x \partial y}$ when $z = x^3 + y^3 - 3axy$.
18. Evaluate $\int_0^a \frac{x^4}{\sqrt{a^2 - x^2}} dx$.
19. Find the value of $\int_0^2 \int_0^2 \int_0^2 xyz dx dy dz$.
20. Sketch the region of integration $y^2 \leq x \leq 4, -2 \leq y \leq 2$.
21. Prove that eigen values of a diagonal matrix are just the diagonal elements of the matrix.
22. Classify the nature of a quadratic form X^TAX . **(4×3=12)**

PART - D

Answer **any two** questions. **Each** question carries **5** marks.

23. Show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2u \log u$ where $\log u = \frac{x^3 + y^3}{3x + 4y}$.
24. Integrate $\frac{x^2 + x + 1}{(x + 1)^2 (x + 2)}$ with respect to x .
25. Calculate $\iint f(x, y) dA$ over $R : 0 \leq x \leq 1, 0 \leq y \leq 2$, where $f(x, y) = 6y^2 - 2x$.
26. Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 2 & 2 & 0 \\ 2 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$. **(2×5=10)**



K20U 0474

Reg. No. :

Name :

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

COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
2C02 MAT – BCA : Mathematics for BCA II

Time : 3 Hours

Max. Marks : 40

PART – A

Answer **any four** questions. **Each** question carries **1** mark.

1. Define homogeneous function of degree n in x and y .

2. Calculate the value of $\int_0^{\pi} \sin^7 x \, dx$.

3. Evaluate $\int \frac{1}{x} dx$.

4. Find the Cartesian equation of the polar equation $r \cos \theta = -4$.

5. What is the product of eigen values of a matrix A ? (4×1=4)

PART – B

Answer **any seven** questions. **Each** question carries **2** marks.

6. State Euler's theorem on homogeneous function.

7. Find the first order partial derivatives of $z = x^3 + y^3 - 3axy$.

8. Evaluate $\int_0^{\pi} \frac{\cos x}{1 + \sin^2 x} dx$.

9. What is the reduction formula for $\int \tan^n x \, dx$?

10. Evaluate $\int xe^x \, dx$.

11. Evaluate $\int_1^2 \int_0^4 2xy \, dy \, dx$.

12. Find a polar equation for the circle $x^2 + (y - 3)^2 = 9$.

P.T.O.



13. Define eigen vectors.
14. Find the matrix corresponding to the quadratic form $x_1^2 + 2x_1x_2 + 2x_1x_3 - 2x_2x_3$.
15. What is meant by similarity of matrices ? (7×2=14)

PART – C

Answer **any four** questions. **Each** question carries **3** marks.

16. Given $u = \sin\left(\frac{x}{y}\right)$, $x = e^t$ and $y = t^2$, find $\frac{du}{dt}$ as a function of t .
17. Find the value of $\int_0^1 x^2(1-x^2)^{\frac{3}{2}} dx$.
18. Evaluate $\int \frac{dx}{x^2 + 2x + 2}$.
19. Calculate $\int_0^1 \int_0^1 \int_0^1 (x^2 + y^2 + z^2) dz dy dx$.
20. Sketch the region of integration $-1 \leq x \leq 2$, $x - 1 \leq y \leq x^2$.
21. Prove that eigen values of a diagonal matrix are just the diagonal elements of the matrix.
22. Classify the nature of a quadratic form X^TAX . (4×3=12)

PART – D

Answer **any two** questions. **Each** question carries **5** marks.

23. If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$.
24. Evaluate $\int \frac{1}{x^3(x-1)^2(x+1)} dx$.
25. Calculate $\iint f(x, y) dA$ over $R : 0 \leq x \leq 2, -1 \leq y \leq 1$, where $f(x, y) = 100 - 6x^2y$.
26. Using Cayley Hamilton theorem, show that $A^3 - 6A^2 + 11A - 61 = 0$, where

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 2 & 2 \\ -1 & 1 & 3 \end{bmatrix} \text{ and hence find } A^{-1}. \quad (2 \times 5 = 10)$$