

BCA DEGREE (C.B.C.S.S.) EXAMINATION APRIL 2018
(2017 Admission Regular & 2016 Admission Improvement / Supplementary)
SEMESTER II - COMPLEMENTARY COURSE (CT & ISM)
CA2C05TB – FUNDAMENTALS OF MATHEMATICS

Max. Time: Three Hours

Maximum Marks: 80

PART A**I. Answer any six questions. Each question carries 1 mark.**

1. What is inverse of a matrix?
2. Define identity matrix.
3. Differentiate $\cos x$ with respect to x .
4. State Mean Value Theorem.
5. How will you determine the degree and order of the partial differential equation?
6. State Convolution Theorem.

(6 x 1 = 6)

PART B**II. Answer any seven questions. Each question carries 2 marks**

7. If $A = \begin{bmatrix} 1 & 2 \\ 4 & -5 \end{bmatrix}$, find $|A|$.
8. Explain with example triangular matrix.
9. Differentiate $\sin^{-1} \frac{2x}{1+x^2}$.
10. Evaluate $\lim_{x \rightarrow 1} \frac{x-1}{\log x}$.
11. Differentiate $\frac{\sqrt{1+\sin x}}{\sqrt{1-\sin x}}$ with respect to x .
12. Eliminate the arbitrary function from $z = xy + f(x^2 + y^2)$.
13. Obtain the partial differential equations of all spheres whose centres lie on plane $z = 0$ and whose radius is constant and equal to r .
14. Form the partial differential equation by eliminating the arbitrary constants from $z = (x + a)(y + b)$.
15. Find the Laplace transform of $\sin 2t \cos 3t$.
16. Find the inverse transform of the following $\frac{s+1}{s^2+s+1}$.

(7 x 2 = 14)

PART C**III. Answer any five questions. Each question carries 6 marks**

17. If $A = \begin{bmatrix} \cos A & -\sin A \\ \sin A & \cos A \end{bmatrix}$, show that $AA' = A'A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$.
18. Find the inverse of the matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$.
19. If $y = e^{\sin^2 x}$, prove that $y_2 = \frac{y}{2}(1 + 4 \cos 2x - \cos 4x)$.
20. Differentiate w.r.t x , (i) $(x + 1)(x + 2)(x - 1)$ (ii) $x^{\cot x}$.
21. Solve $(mz - ny)p - (nx - lz)q = ly - mx$.

22. If $y = \frac{1}{x} \sin x$, show that $\frac{d^2y}{dx^2} + \frac{2}{x} \frac{dy}{dx} + y = 0$

23. Find the Laplace transforms of: $\left[\frac{\sin^2 t}{t} \right]$.

24. Find the inverse transform of $\frac{3(s^2-1)^2}{2s^5}$.

(5 x 6 = 30)

PART D

IV. Answer any two questions. Each question carries 15 marks

25. a) Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & -3 & -4 \\ 1 & 3 & 1 & -2 \\ 2 & 5 & -2 & -5 \end{bmatrix}$.

b) Solve using Cramer's rule $3x + y + z = 3, 2x + 2y + 5z = -1, x - 3y - 4z = 2$.

26. a) State Rolle's Theorem and examine its truth in the following case, $f(x) = x^2 + 3x + 2$ on the interval $[1,2]$.

b) Find the local minima and maxima of $f(x) = x^3 - 18x^2 + 96x$.

27. Eliminate the arbitrary function(s) from the following and form the partial differential equations: $Z = f(x^2 + y^2 + z^2)$.

28. Using convolution theorem, find the inverse transforms of,

(i) $\frac{1}{s(s^2+a^2)}$

(ii) $\frac{1}{(s^2+a^2)^2}$

(iii) $\frac{s}{(s^2+a^2)^2}$

(2 x 15 = 30)