PAPER ID-311464

Roll No: | | | | | | | | | | | | | |

BCA
(SEM I) THEORY EXAMINATION 2024-25
MATHEMATICAL FOUNDATION

TIME: 3 HRS **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt *all* questions in brief. **02 x 7 = 14**

Q no.	Question	CO	Level
a.	Define Euler graph.	5	K_1
b.	Find the inverse of given matrix $A=\begin{bmatrix}\cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha\end{bmatrix}$.	1	K_2
c.	If $f(x,y)=x^3y-xy^3$, find $\left[\frac{1}{\frac{\partial f}{\partial x}}+\frac{1}{\frac{\partial f}{\partial y}}\right]_{x=1,y=2}$.	3	K_3
d.	Prove that $\overline{\lvert -1/2 \rvert}=-2\sqrt{\pi}$.	4	K_3
e.	Differentiate with respect to x of the function $y=\sqrt{\frac{1-\cos x}{1+\cos x}}$.	3	K_3
f.	File in the blanks: (i) If λ is the eigen value of an orthogonal matrix then other eigen value of same orthogonal matrix is …… . (ii) The characteristic root of a triangular matrix is …… .	1	K_2
g.	Find the order and degree of differential equation: $\left(\frac{d^4y}{dx^4}\right)^3+\frac{d^2y}{dx^2}-2xy=0$	4	K_3

SECTION B

2. Attempt any *three* of the following: **07 x 3 = 21**

Q no.	Question	CO	Level
a.	Find n^{th} derivative of $e^x\sin(bx+c)$.	3	K_4
b.	Evaluate $\int \tan^{-1}x\,dx$.	4	K_3
c.	Using Cayley-Hamilton theorem find A^{-1}, given that $A=\begin{bmatrix}2 & -1 & 3\\ 1 & 0 & 2\\ 4 & -2 & 1\end{bmatrix}$.	2	K_2
d.	Find the rank and nullity of the matrix $A=\begin{bmatrix}-1 & 2 & 3 & -2\\ 2 & -5 & 1 & 2\\ 3 & -8 & 5 & 2\\ 5 & -12 & -1 & 6\end{bmatrix}$.	1	K_2
e.	Find Laplace transform of $t^2\cos at$.	5	K_2

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SECTION C

3. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Investigate the value of λ and μ so that the equations $2x+3y+5z=9$, $7x+3y-2z=8$, $2x+3y+\lambda z=\mu$ have (i) no solution, (ii) a unique solution, (iii) an infinite number solutions.	2	K_2
b.	Find the Jacobian of u, v with respect to x, y for the functions $u=e^x \sin y$ and $v=x\log(\sin y)$.	3	K_4

4. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Using elementary transformation to reduce the following matrix A into triangular form and hence find the rank of matrix $\begin{bmatrix} 2 & 3 & -1 & 1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$.	1	K_3
b.	Solve linear differential equation with constant coefficient, find C.F and P.I.: $\frac{d^2y}{dx^2}-5\frac{dy}{dx}+6y=e^{4x}$.	4	K_4

5. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Define adjacency matrix. Draw the graph represented by the given adjacency matrix $\begin{bmatrix} 1 & 2 & 0 & 1 \\ 2 & 0 & 3 & 0 \\ 0 & 3 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$.	5	K_2
b.	Show that $\overline{\lfloor n}\overline{\lfloor 1-n}=\frac{\pi}{\sin n\pi}$.	4	K_4

6. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	If $u=\log\left(\frac{x^4+y^4}{x+y}\right)$ then show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=3$.	3	K_4

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b.	Change the matrix $A=\begin{bmatrix}1 & 2 & -1 & 3\\ 4 & 1 & 2 & 1\\ 3 & -1 & 1 & 2\\ 1 & 2 & 0 & 1\end{bmatrix}$ into Echelon form and find its rank and nullity.	1	K_3

7. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	Evaluate $L\left\{\frac{\cos at-\cos bt}{t}\right\}$.	5	K_2
b.	Test the consistency and find the solution if it is consistent. $x+y+z=8$ $x-y+2z=6$. $3x+5y-7z=14$	2	K_2