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SHAMBHUNATH INSTITUTE OF ENGINEERING AND TECHNOLOGY

Subject Code: BAS 103
Course: B. Tech.

Subject: Engg. Maths I
Semester I

FIRST SESSIONAL EXAMINATION, ODD SEMESTER, (2024-2025)
Branch: COMMON FOR ALL

. Time –1hr. 30 min.

Maximum Marks – 30

1. Attempt any FIVE questions

Q N	QUESTION	Marks	CO	BL
a.	Define rank of Matrix. Find the rank of the matrix $\begin{bmatrix} 2 & -1 & 0 \\ 0 & 3 & 1 \end{bmatrix}$.	2	CO1	
b.	Show that the product of all eigen values of A is equal to determinant of A.	2	CO1	
c.	If the vectors (0,1,a), (1,a,1) and (a,1,0) are linearly dependent then find the value of a.	2	CO1	
d.	Find eigen values of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.	2	CO1	
e.	State Cayley Hamilton theorem. Verify Cayley Hamilton theorem for the matrix $\begin{bmatrix} 2 & 3 \\ 2 & -1 \end{bmatrix}$.	2	CO1	
f.	Verify whether the matrix $\begin{bmatrix} 0 & i & 3 \\ -7 & 0 & 5i \\ 3i & 1 & 0 \end{bmatrix}$ is Hermitian matrix?	2	CO1	

2. Attempt any _ONE_ of the following:

Q N	QUESTION	Marks	CO	BL
a.	Find the inverse of matrix $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & -4 \\ 0 & -1 & 1 \end{bmatrix}$ by employing elementary transformation.	5	CO1	
b.	Verify Cayley Hamilton theorem for the matrix A and hence find A^{-1} for $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$	5	CO1	
c.	Test the consistency and hence, solve the following set of equations $$x + 2y - z = 3, 3x - y + 2z = 1, 2x - 2y + 3z = 2, x - y + z = -1$$	5	CO1	

3. Attempt any *FIVE* questions:

a.	Find the nth derivative of $y = \frac{1}{3-2x}$.	2	CO2
b.	If $y = x^2 e^{2x}$ then find the value of y_n.	2	CO2
c.	If $u = \sin^{-1}\frac{x}{y} + \tan^{-1}\frac{y}{x}$ then find $xu_x + yu_y$	2	CO2
d.	If $z = \cos\frac{y}{x}$, find $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y}$.	2	CO2
e.	If $u = x^3 + y^3$ where $x = a\cos t, y = b\sin t$ find $\frac{du}{dt}$ and verify the result.	2	CO2
f.	If $u = f(r,s), r = x + at, s = y + bt$ then show that $\frac{\partial u}{\partial t} = au_x + bu_y$.	2	CO2

4. Attempt any *ONE* of the following:

Q N	QUESTION	Marks	CO	BL
a.	If $y = (x^2 - 1)^n$, prove that $(x^2 - 1)y_{n+2} + 2xy_{n+1} - n(n+1)y_n = 0$.	5	CO2	
b.	Verify Euler's theorem for $z = \frac{x^{1/3}+y^{1/3}}{x^{1/2}+y^{1/2}}$.	5	CO2	
c	If $u = x^2\tan^{-1}\frac{y}{x} - y^2\tan^{-1}\frac{x}{y}$, find the value of $\frac{\partial^2 u}{\partial x\,\partial y}$.	5	CO2	

Bloom's Taxonomy Level (BL) :-
Remember (L1),   Understanding(L2),   Apply (L3),   Analyze (L4),   Evaluating(L5),   Creating(L6)