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Odd Semester Examination-2024 (Backlog)

Paper Name: Mathematics-I

Time: 3 Hours

Paper Code: BTCSE 102/BTCSEAI 102/BTECE 102 (Backlog)

M M: 60

Section –A

(All questions are compulsory)

(4 X 5 = ~~35~~ 20)

S. No	Questions	Marks	Course Outcomes	Blooms Taxonomy Level
Q.1	Find the rank of the matrix $A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 10 \\ 4 & 4 & 4 & 9 \end{bmatrix}$	5	CO5	L3
Q.2	Find the directional derivative of the function $f(x, y, z) = 2x^2yz + z^2$ at the point (1,0,1) in the direction of $\hat{i} - \hat{j} - \hat{k}$.	5	CO4	L3
Q.3	Test the convergence of the following infinite series $\sum_{n=1}^{\infty} \left(\frac{n}{n+1}\right)^{n^2}$	5	CO3	L4
Q.4	Solve the system of linear equations $x - y + z = 5, x + 2y - 3z = 10$ and $2x - 2y - 4z = 16.$	5	CO5	L4

Section – B

(Attempt any Four Questions out of Six)

(4 X 10 = 40)

S. No	Questions	Marks	Course Outcomes	Blooms Taxonomy Level
Q.1	Show that the matrix $A = \begin{bmatrix} 3 & 1 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 2 \end{bmatrix}$ is diagonalizable. Hence find a non-singular matrix P such that $P^{-1}AP$ is a diagonal matrix.	10	CO5	L4

Q.2 (a)	Prove that $\lim_{(x,y) \rightarrow (0,0)} \frac{xy}{\sqrt{x^2+y^2}} = 0$.	5	CO4	L4
(b)	State Euler's theorem for homogeneous function of two variables. If $u = \tan^{-1} \frac{x^2+y^2}{x-y}$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin u$.	5	CO4	L4
Q.3	Find the volume of solid generated by revolving the area bounded by parabola $y^2 = 4x$ and its latus rectum about the y axis.	10	CO1	L3
Q.4	Verify Cayley's Hamilton theorem for the matrix $A = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 1 & 0 \\ 2 & 1 & 1 \end{bmatrix}$. Hence, compute A^{-1}	10	CO5	L4
Q.5	Find the Fourier series for the function $f(x) = x$, where $-\pi \leq x \leq \pi$.	10	CO3	L3
Q.6 (a)	Using Maclaurin's series expansion prove that $\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$	5	CO2	L3
(b)	Evaluate $\lim_{x \rightarrow 0} \frac{\sin x}{x}$	5	CO2	L5

BL – Bloom's Taxonomy Levels (1- Remembering, 2- Understanding, 3- Applying, 4- Analyzing, 5- Evaluating, 6- Creating)

CO-Course Outcomes

*****End of Paper*****