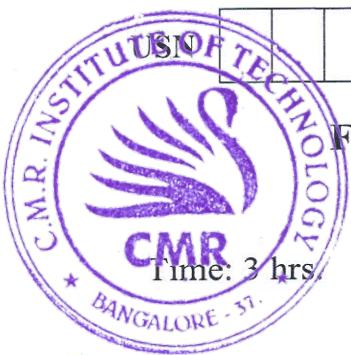


BRIDGE COURSE



Time: 3 hrs.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.

2. Any revealing of identification, appeal to evaluator and /or equations written eg, $42+8=50$, will be treated as malpractice.

MATDIP401

Fourth Semester B.E. Degree Examination, April 2023

Advanced Mathematics – II

Note: Answer any FIVE full questions.

Max. Marks:100

1. a. Find the angle between any two diagonals of a cube. (06 Marks)
 b. Show that the points $A(-4,9,6)$, $B(-1,6,6)$ and $C(0,7,10)$ from a right angled isosceles triangle. (06 Marks)
 c. If $\cos\alpha$, $\cos\beta$, $\cos\gamma$ are direction cosines of a line, then prove that $\sin^2 \alpha + \sin^2 \beta + \sin^2 \gamma = 2$. (08 Marks)

2. a. Find the equation of the plane which passes through the point $(3, -3, 1)$ and is normal to the line joining the points $(3, 2, -1)$ and $(2, -1, 5)$. (06 Marks)
 b. Derive the equation of the plane in the intercept form $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$. (06 Marks)
 c. Find the angle between the planes, $x - y + z = 6$ and $2x + 3y + z = -5$. (08 Marks)

3. a. Find the unit normal to sum of the vectors $4i - j + 3k$ and $-2i + j - 2k$. (06 Marks)
 b. Find $\vec{b} \times (\vec{a} \times \vec{c})$, where $\vec{a} = i + j - k$, $\vec{b} = 2i - j + 2k$, $\vec{c} = 3i - j - k$. (06 Marks)
 c. Find the angle between the vectors $\vec{a} = 5i - j + k$ and $\vec{b} = 2i - 3j + 6k$. (08 Marks)

4. a. A particle moves along the curve $\vec{r} = \cos 2ti + \sin 2tj + tk$. Find its velocity and acceleration. (06 Marks)
 b. If $R = xi + yj + zk$, show that $\nabla \cdot R = 3$. (06 Marks)
 c. Find the $\text{F.curl } \vec{F}$ where $\vec{F} = (x+y+1)i + j - (x+y)k$. (08 Marks)

5. a. A particle moves along the curve $\vec{r} = (1-t^3)i + (1+t^2)j + (2t-5)k$. Determine its velocity and acceleration. (06 Marks)
 b. Show that the vector field, $\vec{F} = (3x+3y+4z)i + (x-2y+3z)j + (3x+2y-z)k$ is solenoidal. (06 Marks)
 c. Find $\text{curl } \vec{A}$ where $\vec{A} = xyi + y^2zj + z^2yk$. (08 Marks)

6. a. Find the Laplace transform of $1 + 3t^2 + 4e^{-3t}$. (06 Marks)
 b. Find the Laplace transform of $\sin 4t + t^3$. (06 Marks)
 c. Find the Laplace transform of $1 + e^{2t} + t^2 + \cosh t$. (08 Marks)

- 7 a. Find the Laplace transform of $e^{-2t} \sin 4t$. (06 Marks)
- b. Find the Laplace transform of $t \sin 2t$. (06 Marks)
- c. Find the inverse laplace transform of $\frac{s+2}{(s-1)(s-3)}$. (08 Marks)
- 8 a. Find the inverse Laplace transform of $\frac{1}{s^2 + 5s + 6}$ (06 Marks)
- b. Find $L^{-1}\left\{\frac{1}{(s^2 + 1)(s^2 + 9)}\right\}$, by using convolution theorem. (06 Marks)
- c. Solve $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 3y = e^{+t}$, $y(0) = y'(0) = 0$ by using Laplace transform method. (08 Marks)

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