

BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)
B. Tech. Sem - II Computer Science & Engineering- AI & ML : WINTER : 2023
SUBJECT : MATHEMATICS FOR COMPUTING-II

Day : Monday

Time : 10:00 AM-01:00 PM

Date : 20-11-2023

W-23929-2023

Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** mark.
- 3) Use of non programmable **CALCULATOR** is allowed.
- 4) Draw neat diagrams **WHEREVER** necessary.

Q.1 a) Find fourier series for $f(x) = x^3$ in $(0, 2\pi)$. (10)

OR

b) Obtain half range cosine series for $f(x) = x \sin x$ in $(0, \pi)$. (10)

Q.2 a) Find complex series for $f(x) = e^{3x}$ in $(-\pi, \pi)$. (10)

OR

b) Express the function $f(x) = e^{-x}$ $x \geq 0$ as a fourier cosine intergal and show (10)

$$\text{that } \int_0^{\infty} \frac{\cos wx}{1+w^2} dw = \frac{\pi}{2} e^{-x}.$$

Q.3 a) Find (10)

i) $L \left\{ \int_u^t e^{-3u} \sin 4u \, du \right\}$

ii) $L \{ t e^{-4t} \cos 2t \}$

OR

b) Find (10)

i) $L^{-1} \left\{ \frac{2s+3}{s^2+9} + \frac{s}{s^2+4} \right\}$

ii) Find Laplace Transform of $f(t) = t$ $0 < t < 1$ and $f(t)$ is periodic function of period 1.

Q.4 a) Evaluate (10)

i) $\int_0^2 \int_0^{\sqrt{2x-x^2}} xy \, dy \, dx.$

ii) Evaluate the integral $\iiint_V xyz^2 \, dx \, dy \, dz$ over the region bounded by the planes $x=0$ $x=1$ $y=-1$ $y=2$ $z=0$ $z=3$.

P.T.O.

b) i) Find the volume of the tetrahedron bounded by the planes $x=0$ $y=0$ $z=0$ and $x+y+z=a$ (05)

ii) Find by double integration the total area enclosed by the Lemniscates of Bernoulli $r = a\sqrt{\cos 2\theta}$. (05)

Q.5 a) i) Find the angle between the normals to the surfaces $x^2y + 2xz = 4$ at $(2, -2, 3)$ and to $x^3 + y^3 + 3xyz = 3$ at $(1, 2, -1)$. (05)

ii) Find the directional derivative of $\phi = xy + yz + zx$ at $(1, 2, 3)$ in the direction of $3i + 4j + 5k$. (05)

OR

b) i) Prove that $\vec{F} = (x + 2y + az)i + (bx - 3y - z)j + (4x + cy + 2z)k$ is solenoidal and determine the constants a, b, c if \vec{F} is irrotational. (05)

ii) Show that $\vec{F} = (2xy + z^3)i + x^2j + 3z^2k$ is a conservative field find its scalar potential and also work done in moving a particle from $(1, -2, 1)$ to $(3, 1, 4)$. (05)

Q.6 a) Using Green's theorem Evaluate $\int (2x^2 - y^2)dx + (x^2 + y^2)dy$ where C is the boundary of the surface enclosed by the lines $x=0$ $y=0$ $x=2$ $y=3$. (10)

OR

b) Evaluate $\int \vec{F} \cdot d\vec{r}$ where $\vec{F} = (3x^2 + 6y)i - 14yzj + 20xz^2k$ from $(0, 0, 0)$ to $(1, 1, 1)$ along the curve C $x=t$ $y=t^2$ $z=t^3$. (10)

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