

**BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)**  
**B. Tech. Sem - II Computer Science & Engineering : WINTER : 2024**  
**SUBJECT: MATHEMATICS FOR COMPUTING-II**

Day : Saturday  
 Date : 30/11/2024

**W-24024-2024**

Time : 10:00 AM-01:00 PM  
 Max. Marks : 60

**N.B.**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data **WHEREVER** necessary.
- 4) Draw neat diagrams **WHEREVER** necessary.

Q.1 Prove that in the interval  $-\pi < x < \pi$ ,  $x \sin x = 1 - \frac{\cos x}{2} - \sum_{n=2}^{\infty} \frac{2(-1)^n \cos nx}{n^2 - 1}$ . (10)

**OR**

Q.1 Find Fourier cosine series of  $f(x) = \sin^2 x$  in  $(0, \pi)$ . (10)

Q.2 Find Fourier cosine transform of the function  $f(x) = e^{-x}$  and hence show that (10)

$$\int_0^{\infty} \frac{\cos mx}{1+x^2} dx = \frac{\pi}{2} e^{-m}.$$

**OR**

Q.2 Find Fourier cosine transform of the function  $f(x) = e^{-x^2}$ . (10)

Q.3 Find the Laplace transform of  $f(t) = e^{-3t} \frac{t^{121}}{121!}$ . (10)

**OR**

Q.3 Find inverse Laplace transform of  $F(s) = \frac{2s^2 - 1}{(s^2 + 1)(s^2 + 4)}$ . (10)

Q.4 Change the order of  $\int_0^{1/a^2/x} \int_x^{1/a^2/x} f(x, y) dx dy$ . (10)

**OR**

Q.4 Evaluate  $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dx dy$ . (10)

Q.5 Find the directional derivative of  $\phi = 4xz^3 - 3x^2y^2z$  at  $(2, -1, 2)$  along tangent to the curve  $x = e^t \cos t, y = e^t \sin t, z = e^t$  at  $t=0$ . (10)

**OR**

Q.5 Show that  $\nabla^2 f(r) = \frac{d^2 f}{dr^2} + \frac{2}{r} \frac{df}{dr}$ . (10)

Q.6 Find work done by the force  $(x^2 - yz)\bar{i} + (y^2 - zx)\bar{j} + (z^2 - xy)\bar{k}$  in taking a particle from  $(1, 1, 1)$  to  $(3, -5, 7)$ . (10)

**OR**

Q.6 Verify divergence theorem for  $\bar{F} = x^2\bar{i} + z\bar{j} + yz\bar{k}$  taken over the cube bounded by  $x=0, x=1, y=0, y=1, z=0, z=1$ . (10)

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