BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - II Computer Science & Engineering : WINTER- 2022
SUBJECT : MATHEMATICS FOR COMPUTING-II

Day : Thursday — Time : 10:00 AM-01:00 PM

Date : 24-11-2022 — **W-24024-2022** — Max. Marks : 60

N. B. :

1) All questions are **COMPULSORY**.
2) Figures to the right indicate FULL marks.
3) Use of non-programmable calculator is **ALLOWED**.
4) Assume suitable data, if necessary.

Q. 1 Find cosine series for $\sin x$ *in* $0 < x < \pi$. Hence deduce that **(10)**

$$1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\ldots=\frac{\pi}{4}.$$

OR

Find the Fourier series of $f(x)=\pi^2-x^2$ in $(-\pi,\pi)$. Deduce that

$$\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\ldots=\frac{\pi^2}{12}.$$

Q. 2 Using inverse sine transform find $f(x)$, if $F_s(\lambda)=\dfrac{e^{-a\lambda}}{\lambda}$ **(10)**

OR

Solve the integral equation:

$$\int_0^\infty f(x)\cos\lambda x\,dx=\begin{cases}1-\lambda, & 0\le\lambda\le1\\ 0, & \lambda\ge1\end{cases}$$

Q. 3 Find the Laplace transform of : **(10)**

i) $\dfrac{1-\cos t}{t}$

ii) $\dfrac{\sin^2 t}{t^2}$

OR

Obtain the inverse transform of :

i) $\cot^{-1}s$

ii) $\log\left(\dfrac{s+3}{s+5}\right)$

Q. 4 Solve $\displaystyle\int_0^a\int_{\frac{y^2}{a}}^{y}\frac{y\,dxdy}{(a-x)\sqrt{ax-y^2}}$ **(10)**

OR

Evaluate $\iint_A \sqrt{xy(1-x-y)}\,dxdy$, where A is area bounded by $x=0$, $y=0$, and $x+y=1$.

Q. 5 Show that $\overline{F} = (ye^{xy} \cos z)\hat{i} + (xe^{xy} \cos z)\hat{j} - e^{xy} \sin z\,\hat{k}$ is irrotational. Find scalar ϕ such that $\overline{F} = \nabla\phi$ **(10)**

OR

a) Find $\nabla^2 f(r)$ where $r = \sqrt{x^2 + y^2 + z^2}$. **(05)**

b) Find $\nabla^4 (e^r)$ where $r = \sqrt{x^2 + y^2 + z^2}$. **(05)**

Q. 6 Verify Divergence theorem for $\overline{F} = 4xz\,\hat{i} - y^2\,\hat{j} + yz\,\hat{k}$ and S, the surface of the cube bounded by planes $z = 0,\ x = 0,\ y = 0,\ x = 2,\ y = 2,\ z = 2$. **(10)**

OR

Verify Green's theorem for the field $\overline{F} = x\,\hat{i} + y^2\,\hat{j}$ over the first quadrant of the circle $x^2 + y^2 = 1$.

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