BACHELOR OF TECHNOLOGY (CBCS) (2021-COURSE)

B. Tech. Sem - II Computer Science & Engineering : WINTER : 2023

SUBJECT : MATHEMATICS FOR COMPUTING-II

Day : Monday

Date : 20-11-2023

W-24024-2023

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) Use of non-programmable calculator is **ALLOWED**.
4) Assume suitable data, if necessary.

Q. 1 Prove that in the interval $(-\pi, \pi)$ **(10)**

$$x\cos x = -\frac{1}{2}\sin x + 2\sum_{n=2}^{\infty}\frac{(-1)^n}{(n^2-1)}\sin nx$$

OR

Expand $f(x) = x\sin x$ *in* $(0, 2\pi)$.

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

OR

Using Fourier interval representation show that

$$\int_0^{\infty}\frac{\lambda^3\sin\lambda x}{\lambda^4+4}\,d\lambda = \frac{\pi}{2}e^{-x}\cos x,\ x > 0.$$

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

i) $t\sin^3 t$

ii) $t\int_0^t e^{-4t}\sin 3t\,dt$

OR

Obtain the inverse transform of :

i) $\dfrac{3s+1}{(s+1)^4}$

ii) $\dfrac{s}{s^2+6s+25}$

Q. 4 Evaluate $\iint_A x^{m-1}\,y^{n-1}\,dxdy$ where A is area bounded by **(10)**

$x + y = k,\ x = 0,\ y = 0.$

OR

Solve $\int_0^a\int_0^x \dfrac{x\,dxdy}{\sqrt{(a^2-x^2)\,(a-y)\,(y-x)}}$

P. T. O.

Q. 5 a) Find tangential and normal components of acceleration at $t = 0$ for the curve $x = t^3 + 1,\ y = t^2,\ z = t$. **(05)**

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

OR

a) Find $\nabla(e^{-r}\, r^3)$ where $r = \sqrt{x^2 + y^2 + z^2}$. **(05)**

b) Find curl curl $\bar{F}$ *at* $(0, 1, 2)$ where $\bar{F} = x^2 y\,\hat{i} + xyz\,\hat{j} + z^2 y\,\hat{k}$. **(05)**

Q. 6 Verify Stoke's theorem for $\bar{F} = xy^2\,\hat{i} + y\,\hat{j} + z^2 x\,\hat{k}$ for the surface of rectangular lamina bounded by $x = 0,\ y = 0,\ x = 1,\ y = 2,\ z = 0$. **(10)**

OR

Verify Green's theorem for the field $\bar{F} = x^2\,\hat{i} + xy\,\hat{j}$ over the region R enclosed by $y = x^2$ and line $y = x$.

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