B-Tech - sem-I (ECE) (2021-Course) winter-2022
Electronics & Communication Engg.

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - I Electronics & Communication : WINTER- 2022
SUBJECT : LINEAR ALGEBRA, CALCULUS & SOLID GEOMETRY

Day : Monday | Time : 10:00 AM-01:00 PM

Date : 9/1/2023 | **W-24083-2022** | 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 **WHEREVER** necessary.

Q.1 Investigate for what values of a & b, the system have **(10)**

$$2x - y + 3z = 2$$
$$x + y + 2z = 2$$
$$5x - y + az = b$$

i) No solution
ii) A unique solution
iii) An infinite solution.

OR

Q.1 Find the Eigen values and Eigen vectors of the given matrix **(10)**

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}.$$

Q.2 **(10)**

If $u = \cos ec^{-1}\sqrt{\dfrac{\sqrt{x}+\sqrt{y}}{x^{\frac{1}{3}}+y^{\frac{1}{3}}}}$, show that $x^2u_{xx} + 2xyu_{xy} + y^2u_{yy} = \dfrac{\tan u}{144}\left(13 + \tan^2 u\right)$.

OR

Q.2 If $f(x,y)=0$ and $\phi(y,z)=0$ than show that $\dfrac{\partial f}{\partial y}\dfrac{\partial \phi}{\partial z}\dfrac{dz}{dx} = \dfrac{\partial f}{\partial x}\dfrac{\partial \phi}{\partial y}$. **(10)**

Q.3 Find the maximum and minimum values of $f(x,y) = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$. **(10)**

OR

Q.3 If $x = v^2+w^2$, $y = w^2+u^2$, $z = u^2+v^2$, prove that JJ' = 1. **(10)**

Q.4 Find the Fourier series of $f(x) = x^2$, $x \in (0, 2\pi)$. **(10)**

OR

Q.4 Prove that $erf_c(-x) + erf_c(x) = 2$. **(10)**

Q.5 Find the equation of the sphere passing through the points (0,0,0), (0,–1,1), (–1,2,0), (1,2,3). **(10)**

OR

Q.5 Show that the plane $2x-2y+z+12 = 0$ touch the sphere $x^2+y^2+z^2-2x-4y+2z-3 = 0$ and find the point of contact. **(10)**

Q.6 Show that $\int_0^1 \int_{x^2}^{2-x} ydydx = \dfrac{16}{15}$. **(10)**

OR

Q.6 Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \dfrac{dxdydz}{\sqrt{1-x^2-y^2-z^2}}$. **(10)**

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