BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)
B. Tech. Sem - I MECHANICAL :SUMMER- 2022
SUBJECT : LINEAR ALGEBRA, CALCULUS & COMPLEX VARIABLES

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

Date : 18-07-2022 — **S-24057-2022** — 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 Solve : **(10)**

$$x+2y-z=2$$
$$3x+8y+2z=10$$
$$4x+9y-z=12$$

OR

Q.1 Define linear dependence and independence of vectors. Examine for linear dependence of vectors (1,2,–1,0), (1,3,1,2), (4,2,1,0), (6,1,0,1) and find a relation between them if dependent. **(10)**

Q.2 Find $\frac{du}{dx}$ given that u=$x\log xy$ and $x^3+y^3=-3xy$. **(10)**

OR

Q.2 If $\phi(x,y,z)=0$ then find $\left(\frac{\partial z}{\partial y}\right)_x \left(\frac{\partial x}{\partial z}\right)_y \left(\frac{\partial y}{\partial x}\right)_z$. **(10)**

Q.3 Find the directional derivable of $\phi=xy^2+yz^3$ at (1,-1,1) along the direction normal to the surface $x^2+y^2+z^2=9$ at (1,2,2). **(10)**

OR

Q.3 Find $\nabla^2 f(r)$ where $\bar{r}=xi+yj+zk$. **(10)**

Q.4 Find the work done by the force $\bar{F}=(2x+y)i+(3y-z)j$ and c is the curve straight line joining (0, 0) and (3, 2). **(10)**

OR

Q.4 Find $\iint_s (\nabla \times \bar{F}).\hat{n}\, ds$ where the surface s is the cube x=0, y=0, z=0, x=2, z=2, y=0 above the xy-plane i.e. open at the bottom. **(10)**

Q.5 If u = $x^4-6x^2y^2+y^4$, find v such that f(z) = u+iv is analytic. **(10)**

OR

Q.5 Determine k such that $f(z)=\frac{1}{2}\log(x^2+y^2)+i\tan^{-1}\left(\frac{ky}{x}\right)$ is analytic. **(10)**

Q.6 Evaluate $\int_c \frac{e^z}{(z+1)^3(z-1)^2}dz$ where c is $|z+1|=\frac{1}{2}$. **(10)**

OR

Q.6 Find the bilinear transformation which maps the points 1,i,–1 of z-plane to i, 0,–i of w-plane. **(10)**

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