B-Tech. sem-I (Electrical & Computer Engg.) (Course-2021) winter-2022

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2021-COURSE)

B. Tech. Sem - I Electrical & Computer Engineering : WINTER- 2022

SUBJECT : PARTIAL DIFFERENTIATION & COMPLEX NUMBERS

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

Date : 9/1/2023 | **W-25143-2022** | 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) Draw neat and labeled diagram **WHEREVER** necessary.
5) Assume suitable data if necessary.

Q.1 Expand $(1+x)^{1/x}$ upto the term containing x^2. **[10]**

OR

Q.1 Expand $e^{x\cos x}$ upto x^4. **[10]**

Q.2 If $u = t^n e^{-r^2/4kt}$, then find the value of n for which $\frac{\partial u}{\partial t} = k\left(\frac{\partial^2 u}{\partial r^2} + \frac{2}{r}\frac{\partial u}{\partial r}\right)$, k is constant. **[10]**

OR

Q.2 If $u = \cos ec^{-1}\sqrt{\frac{x^{1/3}+y^{1/3}}{x+y}}$

find $x^2u_{xx} + 2xyu_{xy} + y^2u_{yy}$ **[10]**

Q.3 Find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ for $u^3+v^3+w^3 = x+y+z$

$u^2+v^2+w^2 = x^3+y^3+z^3$

$u+v+w = x^2+y^2+z^2$ **[10]**

OR

Q.3 Find the maximum and minimum values of $x^3+3xy^2-3x^2-3y^2+7$ **[10]**

Q.4 Verify divergence theorem for $\bar{F} = 2y^2x\bar{i} + (xz^2-y^3)\bar{j} + z^3\bar{k}$ over the volume of a cube with edges of length unity parallel to the co-ordinate axes. **[10]**

OR

Q.4 Verify Green theorem for $\bar{F} = (xy+y^2)\bar{i} + x^2\bar{j}$ $C: y = x$ and $y = x^2$ **[10]**

Q.5 Show that $u = \frac{1}{2}\log(x^2+y^2)$ is harmonic and find its harmonic conjugate function. **[10]**

OR

Q.5 If f(z) is an analytic function with constant modulus, show that f(z) is constant. **[10]**

Q.6 Use residue theorem to evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5-4\cos\theta} d\theta$ **[10]**

OR

Q.6 Solve $\oint_C f(z)dz$ where $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ and $C: |z-2| = 3$. **[10]**

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