B.TECH. SEM -IV INFO. TECH. 2014 COURSE (CBCS) :
WINTER - 2017
SUBJECT : ENGINEERING MAHEMATICS – III

Day : **Monday** Time **02.30 PM TO 05.30 PM**
Date : **20/11/2017** **W-2017-2088** Max. Marks : 60

N.B.

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Draw diagrams **WHEREVER** necessary.

Q.1 Solve $(D^4 - 2D^3 - 3D^2 + 4D + 4)y = x^2e^{-x} + \sinh x$ **(10)**

OR

a) Solve $\left(D^2 - 4\right)y = \cos x$ **(05)**

b) Solve $\dfrac{dx}{z(x+y)} = \dfrac{dz}{x^2+y^2} = \dfrac{dy}{z(x-y)}$ **(05)**

Q.2 Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. Hence find the image of $|z|<1$. **(10)**

OR

Evaluate $\oint_c \dfrac{e^{-3z}}{z(z+1)^2(z-2)}dz \quad c: |z| = 4$. **(10)**

Q.3 a) Find the Z-transform of $f(k) = 3^k \cos(4k+2);\ k \geq 0.$ **(05)**

b) Find the Fourier cosine transform of **(05)**

$$f(x) = \begin{cases} 1 & 0 < x < 4 \\ 0 & x > 4 \end{cases}$$

OR

a) Find $z\left\{\dfrac{3^k}{k!}\right\}$; $k \geq 0$ **(05)**

b) Find the Fourier sine transform of $e^{-2x} + e^{-5x}$, $x \geq 0.$ **(05)**

P.T.O.

Q.4 **a)** Find $L\left[\frac{\sin\sqrt{t}}{\sqrt{t}}\right]$ **(05)**

b) Find $L^{-1}\left[\log\frac{s(s+1)}{s^2+4}\right]$ **(05)**

OR

a) Evaluate $\int_0^\infty \frac{e^{-t}-e^{-3t}}{t}dt$ using Laplace transform. **(05)**

b) Find $L^{-1}\left[\frac{s^2+1}{(s^2+4)(s^2+9)}\right]$. **(05)**

Q.5 **a)** Find the directional derivative of $x^2y^3+xyz^3$ at $(2,0-1)$ in the direction of normal to the surface $x^2+y^2+z^2=16$ at $(1,2,-1)$. **(05)**

b) Find $\nabla^2 e^r$. **(05)**

OR

Show that $\overline{F}=(2xz^3+6y)\bar{i}+(6x-2yz)\bar{j}+(3x^2z^2-y^2)\bar{k}$ is irrotational. Find scalar potential ψ such that $\overline{F}=\nabla\psi$. **(10)**

Q.6 **a)** If $\overline{F}=(2x^2-3z)\bar{i}-2xy\bar{j}-4x\bar{k}$ then evaluate $\iiint_V \nabla\bullet\overline{F}dv$, where V is bounded by the planes $x=0, y=0, z=0$ and $2x+2y+z=4$. **(05)**

b) Compute the work done by the force $\overline{F}=(2y+3)\bar{i}+xz\bar{j}+(yz-x)\bar{k}$ when it moves a particle from the point (0,0,0) to the point (2, 1,1) along the curve $x=2t^2, y=t, z=t^3$. **(05)**

OR

Verify Stoke's theorem in the plane $z=0$, for $\overline{F}=(x-y)\bar{i}+2xy\bar{j}$ for the region bounded by $x=1, y=0, y=x$. **(10)**

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