B.TECH SEM - III (2007 COURSE) (COMPUTER ENGG.) /ELECTRICAL ENGG / ELECTRONIC ENGG./INF. TECH./BIOMEDICAL ENGG./ E & TC ENGG.) : WINTER - 2017

SUBJECT: ENGINEERING MATHEMATICS-III

Day: Friday **Time:** 10.00 AM TO 01.00 PM

Date: 12/01/2018 **W-2017-2362** **Max. Marks: 80**

N.B:

1) **Q. No.1** and **Q. NO.5** are **COMPULSORY.** Out of remaining questions attempt **ANY TWO** questions from each section.
2) Answer to both the sections should be written in **SEPARATE** answer books.
3) Use of non programmable **CALCULATOR** is allowed.
4) Figures to the right indicate **FULL** marks.
5) Assume suitable data if necessary.

SECTION-I

Q.1

a) Solve $\frac{dx}{xz}=\frac{dy}{yz}=\frac{2dz}{(x+y)^2}$ **(04)**

b) Evaluate $\int_0^{2\pi}\frac{d\theta}{5+4\sin\theta}$ **(05)**

c) Find the Fourier sine transform of the following function. **(05)**

$$f(x)=\begin{cases} x, & 0\le x\le 1 \\ 2-x, & 1\le x\le 2 \\ 0, & x>2 \end{cases}$$

Q.2 Solve **ANY THREE** of the following: **(13)**

a) $(D^2+2D+1)y=4\sin 2x$

b) $(D^4-m^4)y=\sin mx$

c) $(D^2-D+1)y=x^3-3x^2+1$

d) $(D^2+3D+2)y=e^{e^x}$ (By method of variation of parameters)

Q.3

a) If $u=\frac{1}{2}\log(x^2+y^2)$, find v such that $f(z)=u+iv$ is analytic. Determine f(z) in terms of z. **(05)**

b) Evaluate $\int_c f(z)\,dz$ where $f(z)=\frac{e^z}{(z+2)}$ 'C' is the circle $|z+2|=2$. **(04)**

c) Find the map of the straight line y = x under the transformation $w=\frac{z-1}{z+1}$. **(04)**

Q.4

a) Find the Fourier sine transform of the function $f(x)=e^{-x}$ and hence show that $\int_0^{\infty}\frac{x\sin mx}{1+x^2}dx=\frac{\pi}{2}e^{-m}$ **(05)**

b) Find $z\{f(k)\}$ if $f(k)=\left(\frac{1}{4}\right)^{|k|}$ for all k. **(04)**

c) Find $z\{f(k)\}$ where $f(k)=\cos\left(\frac{k\pi}{4}+\alpha\right)$, $k\ge 0$ **(04)**

P.T.O.

SECTION-II

Q.5 **a)** Find the Laplace transform of the following: **(05)**

i) $\sin(\omega t+\alpha)$ ii) $\cos 3t \cos 2t$

b) If $\vec{r}\times\frac{d\vec{r}}{dt}=0$, show that $\vec{r}$ has a constant direction. **(04)**

c) Evaluate $\oint_c (\cos y\,\vec{i}+x(1-\sin y)\,\vec{j}).d\vec{r}$ for a closed curve which is given by $x^2 + y^2 = 1$, $z = 0$. **(05)**

Q.6 **a)** Use Laplace transform to Evaluate $\int_0^{\infty}\frac{\cos 6t-\cos 4t}{t}$ **(04)**

b) Using partial fractions, find the inverse Laplace transform of $\frac{3s+1}{(s-1)(s^2+1)}$ **(04)**

c) Solve the differential equation by using Laplace transform $\frac{d^2y}{dt^2}+2\frac{dy}{dt}+y(t)=te^{-t}$, $y(0)=1$, $y'(0)=-2$. **(05)**

Q.7 **a)** The directional derivative of $\phi(x,y)$ at the point A (3,2) towards the point B (2,3) is $3\sqrt{2}$ and towards the point C (1,0) is $\sqrt{8}$. Find the directional derivative at the point A towards the point D (2,4). **(05)**

b) Show that $\nabla^2\left(\frac{\bar{a}\,.\,\bar{b}}{r}\right)=0$. **(04)**

c) If $\vec{F}=(x^2-y^2+2xz)\vec{i}+(xz-xy+yz)\vec{j}+(z^2+x^2)\vec{k}$, then show that curl $\vec{F}$ at (1, 2, -3) and (2, 3, 12) are orthogonal. **(04)**

Q.8 **a)** Use the divergence theorem to evaluate $\iint_s (y^2 z^2\,\vec{i}+z^2 x^2\,\vec{j}+x^2 y^2\,\vec{k}).d\vec{s}$, where S is the upper part of the sphere $x^2 + y^2 + z^2 = 9$ above the xoy plane. **(07)**

b) Evaluate $\iint_s (2xy\,\vec{i}+yz^2\,\vec{j}+xz\,\vec{k}).d\vec{s}$ over the surface of region bounded by $x = 0$, $y = 0$, $y = 3$, $z = 0$ and $x + 2z = 6$. **(06)**

* * * * *