SE-Sem-III – Old - Civil-AM-III 12/5/17

Q. P. Code : 11583

Old Course

(3 Hours) [Total Marks : 100

1. Q1 is compulsory
2. Solve any four out of the remaining from Q.2 to Q. 7.
3. Figures on the right hand side indicate marks.

Q.1.

a. Find the Laplace transform of $te^{3t}\sin t$ 5

b. Determine the values of k if $f(z)=\frac{1}{2}\log(x^2+y^2)+i\tan^{-1}\frac{kx}{y}$ is analytic. 5

c. Prove that the set of functions $\cos x, \cos 2x, \cos 3x \ldots\ldots$, is orthogonal,

on $(-\pi,\pi)$. 5

d. If $A=\begin{bmatrix}3&2&2\\1&3&1\\5&3&4\end{bmatrix}$, find B such that $AB=\begin{bmatrix}6&6&2\\2&9&1\\10&9&4\end{bmatrix}$ 5

Q.2. a. Reduce the Matrix to normal form and hence find the Rank of A.

$$\begin{bmatrix}1&2&-2&3\\2&5&-4&6\\1&-3&2&-2\\2&4&-1&6\end{bmatrix}$$ 6

b. Find the inverse Laplace transform using convolution theorem,

$$f(s)=\frac{(s+2)^2}{(s^2+4s+8)^2}$$ 6

c. Find the Fourier series for $f(x)=\left(\frac{\pi-x}{2}\right)^2,\ 0<x\leq 2\pi$, and prove that $\frac{\pi^2}{6}=\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}\ldots\ldots$ 8

TURN OVER

Q.3. a. Find the bilinear transformation which maps the points z=1, i,-1 on to the points w=0,1,∞. 6

b. Find the complex form of Fourier series $f(x) = e^{ax}$, in $(-\pi , \pi)$. 6

c. Find the Eigen values and Eigen vectors of A and $A^2 - 2A + I, if \ A = \begin{bmatrix} 2 & 3 & 4 \\ 0 & 4 & 2 \\ 0 & 0 & 3 \end{bmatrix}$. 8

Q.4. a. Verify Cayley Hamilton Theorem for $A=\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and find A^{-1}. 6

b Find the image of the region bounded by x=0,x=1,y=0,y=2, in z plane under the transformation w=(1+i)z +(2-i). 6

c. Find, 1. $L[\int_0^t \frac{\sin 3u}{u} du]$, 2. $L^{-1}[\log\frac{(s+a)}{(s+b)}]$ 8

Q.5. a. Find the non singular matrices P and Q such that PAQ is in Normal form, hence find Rank of A. Where

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

b. Find $L^{-1}\left(tan^{-1}\frac{2}{s^2}\right)$ 6

c. Find the analytic function f (z) = u+iv, where u + v = $e^x(\cos y + \sin y)$. 8

Q.6. a. Prove that every square matrix can be uniquely expressed as sum of hermitian and skew hermitian matrices. 6

b. Find the half range cosine series for f(x) = lx-x^2, in $(0, l)$. 6

c. Solve using Laplace transform,

$(D^2 - D - 2)y = 20sin2t$, y (0) =1, y' (0) =2 8

TURN OVER

Q.7.a. If A is orthogonal Matrix then find values of a, b, c. A= $\begin{bmatrix} \frac{1}{3} & \frac{2}{3} & a \\ \frac{2}{3} & \frac{1}{3} & b \\ \frac{2}{3} & -\frac{2}{3} & c \end{bmatrix}$ 6

b. Find the Fourier series for f(x) =$x + x^2$, in the interval $-\pi \leq x \leq \pi$. 6

c. Solve the following system of equations, if consistent.

$x + y + z = 6$, $x - y + 2z = 5$, $3x + y + z = 8$, $2x - 2y + 3z = 7$ 8

61AC8839263EA0EEC2531F7FD587BF56