POORNIMA
COLLEGE OF ENGINEERING

TUTORIAL SHEETS

TUTORIAL SHEET Unit-IV

SHEET No.............

2017-18.

Campus: P.C.E...... Course: B.Tech.... Class/Section: ...IInd Year (I.T) Date: ....

Name of Faculty: Dr. Shilpi Jain.... Name of Subject: AEM............ Code: 3CS6A/3IT6A

Date of Tut. SheetPreparation:..........................Scheduled Date of Tut.:........................Actual Date of Tut. :.....................

Name of Student:......................................Scheduled & Actual Date of H.A. Submission:...........................&...........................

FIRST 20 MT. CLASS QUESTIONS

Q.1. Find the Laplace transform of $\frac{\cos at - \cos bt}{t}$.

Q.2. Find Laplace transform of

(a) $\frac{e^{-3t}\sin 2t}{t}$ (b) $\frac{\cos 2t - \cos 3t}{t}$

2 HRS. SOLVABLE HOME ASSIGNMENT (H.A.) QUESTIONS

Q.3. Obtain $L\{e^{5t}\cos 9t\}$

Q.4. Evaluate $\int_0^\infty \frac{\sin t}{t}\,dt$

OTHER IMPORTANT QUESTIONS

Q.5. Using Convolution Th. solve

$$L^{-1}\left\{\frac{1}{(s-4)^2}\right\}$$

Solution.

Sol^n. 1

$$L\left\{\frac{\cos at-\cos bt}{t}\right\}=\int_s^\infty\left(\frac{s}{s^2+a^2}-\frac{s}{s^2+b^2}\right)ds$$

$$=\left[\frac{1}{2}\log\left(\frac{s^2+a^2}{s^2+b^2}\right)\right]_s^\infty=-\frac{1}{2}\log\frac{s^2+a^2}{s^2+b^2}$$

$$=\left(\frac{1}{2}\log\frac{s^2+b^2}{s^2+a^2}\right)$$

Sol^n. 2. (a)

$$L\left\{\frac{e^{-3t}\sin 2t}{t}\right\}=\int_s^\infty\frac{1}{(s+3)^2+4}\,ds$$

$$=\left[\tan^{-1}\frac{s+3}{2}\right]_s^\infty=\frac{\pi}{2}-\tan^{-1}\frac{s+3}{2}$$

$$=\cot^{-1}\frac{s+3}{2}$$

(b)

$$L\left\{\frac{\cos 2t-\cos 3t}{t}\right\}=\frac{1}{2}\log\frac{(s^2+9)}{(s^2+4)}$$

Sol^n. 3.

$$L\{e^{5t}\cos 9t\}=\frac{s-5}{(s-5)^2+9^2}\qquad\{\text{using 1st shift}\}$$

Sol^n. 4

$$L\left\{\frac{\sin t}{t}\right\}=\int_s^\infty\frac{1}{s^2+1}\,ds=\left[\tan^{-1}s\right]_s^\infty=\cot^{-1}s$$

Now.

$$\int_0^\infty e^{-st}\frac{\sin t}{t}\,dt=\cot^{-1}s$$

Taking limit $s\to 0$

Sol^n. 5.

$$L^{-1}\left\{\frac{1}{(s-4)^2}\right\}=\int_0^t e^{4u}e^{4(t-u)}\,du$$

$$=e^{4t}\int_0^t e^{4u}.e^{-4u}\,du$$

$$=\left[u e^{4t}\right]_0^t=te^{4t}$$