Hall Ticket No | | | | | | | | | | | Question Paper Code: AHS011

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech I/II Semester Supplementary Examinations - July, 2017

Regulation: IA-R16

MATHEMATICAL TRANSFORM TECHNIQUES

[II Semester - (Electrical and Electronics Engineering)]

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Obtain the Fourier series for in $f(x) = 1 - x^2$ in (-1,1). **[7M]**
   (b) Determine the half range sine series in $f(x) = e^x$ in (0,1). **[7M]**
2. (a) Determine the Fourier series for $f(x) = |x|$ in $(-\pi, \pi)$. **[7M]**
   (b) Obtain the half range sine series $f(x) = x^2$ in (0,4). **[7M]**

UNIT – II

3. (a) Express $f(x) = \begin{cases} 1 & for\ 0 \le x \le \pi \\ 0 & for\ x > \pi \end{cases}$ as Fourier sine integral and hence evaluate $\int_0^\infty \frac{1-\cos(\pi\lambda)}{\lambda} \sin(x\lambda)d\lambda$. **[7M]**
   (b) Determine the Fourier cosine transform of $f(x) = \begin{cases} \cos x & for\ 0 < x < 1 \\ 0 & for\ x > 1 \end{cases}$ **[7M]**
4. (a) Find the Fourier cosine transform of **[7M]**

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

   (b) Determine the inverse Fourier transform $f(x)$ of $f(p) = e^{-|p|y}$ **[7M]**

UNIT – III

5. (a) Find the Laplace transform of the full wave rectifier function defined by $f(t) = E\sin\omega t$ for $0 < t < \frac{\pi}{\omega}$ having period $\frac{\pi}{\omega}$. **[7M]**
   (b) Find the Laplace transform of $\sinh 3t\cos^2 t$. **[7M]**
6. (a) Find $L^{-1}\left\{S\log\left(\frac{S+4}{S-4}\right)\right\}$. **[7M]**

(b) Using Convolution, find $L^{-1}\left\{\frac{4S+5}{(S-1)^2(S+2)}\right\}$. **[7M]**

UNIT – IV

7. (a) Find the Z - transform of $\sin(3n+5)$. **[7M]**

   (b) If the Z -transform of U_n is $\frac{2z^2+3z+4}{(z-3)^3}$, compute U_1 and U_2. **[7M]**

8. (a) Using convolution theorem, determine the inverse Z- transform of $\frac{z^2}{z^2-8z+12}$. **[7M]**

   (b) Using Z - transform, determine the response of the system $u_{n+2} - 5u_{n+1} + 6u_n = 1$ with $u_0 = 0$, $u_1 = 1$. **[7M]**

UNIT – V

9. (a) Solve the partial differential equation $x^2(y-z)p + y^2(z-x)q = z^2(x-y)$. **[7M]**

   (b) Solve $y\frac{\partial u}{\partial x} + x\frac{\partial u}{\partial y} = 3u$ and $u(x,\ 0) = e^{x^2}$ by the method of separation of variables. **[7M]**

10. (a) Using Charpit's method, solve $2x\left(z^2q^2+1\right) = pz$. **[7M]**

    (b) Find the solution of the wave equation subjected to the conditions. $\begin{matrix} y = P_0\cos Pt, x = l \\ y = 0, x = 0 \end{matrix}$. **[7M]**

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