Register Number: ………………

B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2010

Third Semester

MAT105: TRANSFORM METHODS IN ENGINEERING

Common to

(Computer Science & Engineering, Information Technology)

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. If f(x) = Sinhx is defined in ($-\pi$,π), then the values of a_0 and a_n are -----------

a) $a_0 = 0, a_n = 0$ b). $a_0 \neq 0, a_n = 0$ c). $a_0 = 0, a_n \neq 0$ d) $a_0 \neq 0, a_n \neq 0$

2. If f(x) is continuous at $x = x_0$, then the sum of the Fourier series at $x = x_0$ is ----------

a) $f'(x_0)$ b). $f(x_0)$ c). f(x) d). f '(x)

3. $L(e^{at} t^n)$ = -----------

a). $\frac{n!}{(s+a)^{n+1}}$ b). $\frac{n!}{(s-a)^{n-1}}$ c). $\frac{n}{(s-a)^{n+1}}$
d). $\frac{n!}{(s-a)^{n+1}}$

4. If L (f (t)) = F(s) then $\lim_{t\to 0} f(t)$ = -----------

a). $\lim_{s\to\infty} F(s)$ b). $\lim_{s\to\infty} sF(s)$ c). $\lim_{s\to 0} F(s)$ d). $\lim_{s\to 0} sF(s)$

5. $L^{-1}(e^{-2s})$ = ----------

a) δ (t-2) b) δ (t+2) c) δ (t) d). δ (t-1)

6. $L^{-1}\left(\frac{F(s)}{s}\right)$ = -----------------

a) $\int_0^\infty L^{-1}(F(s))dt$ b) $\int_0^t L^{-1}(F(s))$ c) $\int_0^t L^{-1}(F(s))dt$ d) $\int_{-\infty}^\infty L^{-1}(F(s))dt$

7. The Fourier transform of f(x-a) is ------------

a) e^{isa} F(s) b) e^{-isa} F(s) c) e^{i} F(s) d) e^{s} F(s-a)

8. The Fourier Cosine transform of e^{-x} is --------------

a) $\frac{\sqrt{2}}{\pi}\frac{s}{(s^2+1)}$ b). $\frac{2}{\pi}\frac{1}{(s^2+1)}$ c). $\frac{2}{\pi}\frac{1}{(s^2-1)}$ d. $\frac{\sqrt{2}}{\pi}\frac{1}{(s^2+1)}$

9. $Z((-1)^n)$ = --------

a) $\frac{z}{z+1}$ b) $\frac{z-1}{z+1}$ c) $\frac{z+1}{z}$ d) $\frac{z^2}{z+1}$

10. $Z\left(\frac{a^n}{n!}\right)$ = ---------

a) $\frac{1}{z}$ b) $e^{\frac{a}{z}}$ c) $\frac{z}{z+1}$ d) $e^{-\frac{a}{z}}$

PART B (10x 2 =20 MARKS)

11. Find a_0 of the Fourier series of $f(x) = x + x^2$ in $-\pi < x < \pi$

12. Find the R.M.S value of $y = x^2$ in $(-\pi, \pi)$

13. Find L $(\text{Cos}^2 3t)$

14. Find L (t Sinat)

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

16. Find $L^{-1}\left(\frac{s+1}{s^2+2s+2}\right)$

17. Find the Fourier Sine transform of e^{-x}

18. Define Parseval's identity of Fourier transform.

19. Find $Z\left(\frac{1}{n+1}\right)$

20. State the convolution theorem of z- transform.

PART C (5x 14 = 70 MARKS)

21. a) (i) Find the Fourier cosine series for f(x) = x in $(0, \pi)$ & deduce $\sum\frac{1}{(2n-1)^4} = \frac{\pi^4}{96}$ (7)

(ii) Find the Fourier series for y = f(x) up to first harmonic from the following data.

x:	0	1	2	3	4	5
y:	9	18	24	28	26	20

(7)

(OR)

b) Find the Fourier series for $f(x) = x^2$ in $(-\pi, \pi)$. Hence show that $\frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \ldots\ldots = \frac{\pi^4}{90}$

22. a) (i) Find L $\left(\frac{1 - \text{Cos}t}{t}\right)$ (7)

(ii) Find L $(e^{-3t}\,\text{Sin}2t)$ (7)

(OR)

22. b) (i) Find the Laplace transform of $f(t) = \begin{cases} 1, & 0 < t < a \\ -1, & a < t < 2a \end{cases}$ given $f(t+2a) = f(t)$ (7)

(ii) Verify initial value theorem for $f(t) = a\, e^{-bt}$ (7)

23. a) (i) Using convolution theorem find $L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$ (7)

(ii) Find $L^{-1}\left[\log\left((s+1)/(s-1)\right)\right]$ (7)

(OR)

b) Solve by using Laplace transform $(D^2+4D+8)\,y = 1$ given $y(0) = 0$, $y'(0) = 1$.

24. a) Find the Fourier transform of the function f(x) defined by

$$f(x) = \begin{cases} 1 - x^2 & \text{if } |x| < 1 \\ 0 & \text{if } |x| > 1 \end{cases}$$

Hence prove that (i) $\int_0^\infty \left(\frac{\sin s - s\cos s}{s^3}\right) \cos\frac{s}{2}\, ds = \frac{3\pi}{16}$

(ii) $\int_0^\infty \left(\frac{\sin s - s\cos s}{s^3}\right)^2 ds = \frac{\pi}{15}$

(OR)

b (i) Find the Fourier cosine transform of e^{-ax}, $a > 0$. (7)

(ii) Evaluate $\int_0^\infty \frac{dx}{(x^2+a^2)(x^2+b^2)}$ by using Fourier cosine transform. (7)

25. a) (i) Using convolution theorem find $Z^{-1}\left[\frac{z^2}{(z-a)(z-b)}\right]$ (7)

(ii) Find $Z(\cos n\theta)$ (7)

(OR)

b) (i) Solve $y_{n+2} + 4y_{n+1} + 3y_n = 2^n$, given $y_0 = 0$, $y_1 = 1$ by using Z- transform. (7)

(ii) Find $Z\left[(n+1)(n+2)\right]$ (7)

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