3. 1.	
14 1/2	



(Weightage 1)

Time: 3 Hours

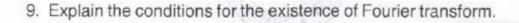
VI Semester B.Sc. Degree (CCSS - Reg./Supple./Improv.) Examination, May 2015 CORE COURSE IN MATHEMATICS 6 B13 MAT : Integral Transforms

Time: 3 Hours	Max. Weightage: 30
1. Fill in the blanks :	
a) Laplace transform of f (t) = 1 is	
b) Example for a periodic function is	

- 2. Define Laplace transform.
- 3. Find L (sin at sinh at).
- 4. Find the inverse Laplace transform of $\frac{s^2}{s^2+6s+18}$
- Explain the expressions for the Fourier coefficients a₀, a_n and b_n of a periodic function f (x) with a period 2L in the interval (-L, L).
- 6. Explain the convergence of Z-transform.
- 8. State convolution theorem for Z-transforms.

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10. Find Fourier sine transform of $f(x) = \begin{cases} x^2 & 0 < x < 1 \\ 0 & 0 < x < 1 \end{cases}$

(Weightage 6×1=6)

Answer any seven from the following: (Weightage 2 each)

- 11. Define unit step function. Also find Laplace transform of f (t)
- 12. Find the inverse Laplace transform of $\frac{2s^2 6s + 5}{s^3 6s^2 + 11s 6}$
- 13. Find the Fourier series expansion of $f(x) = x^2$ from (-1, 1).
- 14. Express f (x) = x sin x as a half range cosine series in $0 < x < \pi$.
- 15. Compute the total square error of F with N = 3 relative to $f(x) = x + \pi, -\pi < x < \pi$ on the interval $-\pi \le x \le \pi$.
- 16. State and prove initial value theorem for the Z-transforms.
- 17. Find the Z-transform of f * g where f(n) = n (n-1) and $g(n) = 3^n$.
- 18. Using long division method, find the inverse Z-transform of $\frac{10z}{z^2 3z + 2}$.
- 19. Find the Fourier sine integral of $f(x) = \begin{cases} \sin x, & 0 < x < \pi \\ 0, & x > \pi \end{cases}$.
- 20. Let f (x) be continuous on the x-axis, f (x) \rightarrow 0 as | x | $\rightarrow \infty$ and f' (x) be absolutely integrable on the x-axis, then prove that $F\{f'(x)\} = iw F\{f(x)\}$. (Weightage 7×2=14)

Answer any three from the following: (Weightage 3 each)

- 21. Using convolution theorem, find the inverse Laplace transform of $\frac{s}{(s+a^2)^2}$.
- 22. Using Laplace transform, solve the initial value problem:

$$y''' + 2y'' - y' - 2y = 0$$
, $y(0) = 0$, $y'(0) = 0$, $y''(0) = 6$.

- 23. Obtain the Fourier series for the function $f(x) = |x|, -\pi < x < \pi$. Deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$
- 24. a) Find Z-transform of rn cos na.
 - b) Find the inverse Z-transform of $\frac{z}{z^2 + 7z + 10}$.
- 25. Deduce complex Fourier integral representation formula from the Fourier integral formula. (Weightage 3x3=9)