

**End Semester Examinations - 2015-16 Even Semester - May 2016**

**14MA2003 Mathematical Transforms**

**Set B**

**Time : 3 hrs**  
**Total Marks: 100**

1. (a) Find  $L\left(\sqrt{t} - \frac{1}{\sqrt{t}}\right)$  (10)

(b) Evaluate  $L\left(\frac{e^{-at} - e^{-bt}}{t}\right)$  (10)

**OR**

2. (a) Using periodic function find laplace transform of  $f(t) = \begin{cases} t, 0 < t < \pi \\ \pi - t, \pi < t < 2\pi \end{cases}$  (10)

(b) Find  $L(te^{-t} \cos t)$  (10)

3. (a) Find  $L^{-1}\left(\frac{4s+5}{(s-1)^2(s+2)}\right)$  (10)

(b) Solve  $y'' + y = \sin t$  given  $y(0) = 1$ ,  $y'(0) = \frac{1}{2}$  using laplace transform. (10)

**OR**

4. (a) Using convolution evaluate  $L^{-1}\left(\frac{s}{(s^2 + a^2)^2}\right)$  (10)

(b) Solve  $y'' - 3y' + 2y = e^{3x}$  given  $y(0) = y'(0) = 0$  using laplace transform. (10)

5. (a) Find the Fourier sine and cosine transform of  $f(x) = x^{n-1}$ ,  $n > 0$ . (15)

(b) Show that  $F_s(xf(x)) = -\frac{d}{ds}(F_c(s))$  (5)

**OR**

6. (a) Using Parseval's identity prove that  $\int_0^\infty \frac{dx}{(x^2 + 4)(x^2 + 9)} = \frac{\pi}{2ab(a+b)}$  (15)

(b) Find the Fourier cosine transform of  $f(x) = \begin{cases} x, & 0 < x < 1 \\ 2-x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$  (5)

7.

(a) Derive  $Z(\cos n\theta)$  and  $Z(\sin n\theta)$  and find  $Z\left(\cos\left(\frac{n\pi}{2} + \frac{\pi}{4}\right)\right)$  (10)

(b) Derive  $Z(\cos bt)$  and hence find  $Z(e^{-at} \cos bt)$  (10)

**OR**

8.

(a) Deriving appropriate terms find  $Z(n^2 - n + \sin(3n + 5))$  (10)

(b) Derive  $Z(na^n)$  (5)

(c) Prove that  $Z\left(\cos \frac{n\pi}{2}\right) = \left(\frac{z^2}{z^2 + 1}\right)$  (5)

9.

(a) Solve  $y_{n+2} - 5y_{n+1} + 6y_n = u_n$  given  $y_0 = 0, y_1 = 1, u_n = 1$  (10)

(b) Use convolution theorem to evaluate  $Z^{-1}\left(\frac{z^2}{(z-a)(z-b)}\right)$  (5)

(c) Using partial fraction method find  $Z^{-1}\left(\frac{2z^2 + 3z}{(z+2)(z-4)}\right)$  (5)

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**Wishing you All the Best**

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