

3E1636

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B.Tech. III Semester (Main/Back) Examination - 2014

Mechanical Engg.

3ME6A Advanced Engg. Mathematics

Common to 3PI6A and 3AE6A

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Unit - I

1. a) Find the fourier cosine transform of the following function:

$$f(x) = \begin{cases} x, & 0 < x < 1 \\ 2-x, & 1 < x < 2 \\ 0, & x > 2 \end{cases} \quad (8)$$

- b) Find the discrete fourier transform of the sequence:

$$\{g_k\} = \{1, 0, -1\} \quad (8)$$

OR

1. a) Find the fourier transform of the function:

$$f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$$

and hence evaluate: $\int_0^{\infty} \frac{\sin s}{s} ds$ (8)

- b) Solve the following partial differential equation: $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, given that

$$u_x(0,t) = 0, u(x,0) = \begin{cases} x, & 0 \leq x \leq 1 \\ 0, & x > 1 \end{cases} \text{ and } u(x,t) \text{ is bounded and } x > 0, t > 0. \quad (8)$$

Unit - II

2. a) Find the Laplace transform of the following:

i) $t^2 e^{2t}$

ii) $\frac{\sin^2 t}{t}$

(3+5=8)

b) Find the inverse Laplace transform with the help of convolution theorem:

$$\frac{s}{(s^2 + a^2)^2}$$

(8)

OR

2. a) Solve the following differential equation:

$$(D^2 + 3D + 2)x = 1, D \equiv \frac{d}{dt} \text{ with } x(0) = 0, x'(0) = 0$$

b) Solve the following differential equation:

$$\frac{\partial u}{\partial t} = 2 \frac{\partial^2 u}{\partial x^2}, \text{ where } u = u(x, t).$$

Boundary condition: $u(0, t) = 0 = u(5, t)$ and $u(x, 0) = 10 \sin 4\pi x$. (8)

Unit - III

3. a) Calculate the first four moments about the mean for the following distribution:

x: 6 7 8 9 10 11 12

y: 3 6 9 13 8 5 4

(8)

b) A driver has two taxis, which he hires out day by day. The number of demands for a taxi on each day is distributed as a poisson variate with mean 1.5. Calculate the proportion of days on which

i) Neither of the cars is used.

ii) Some demand is refused. (given $e^{-1.5} = 0.2231$) (8)

OR

3 a) Fit a straight line to the following data treating y as the dependent variable:

x: 1 2 3 4 5

y: 5 7 9 10 11

(8)

