

XAVIER INSTITUTE OF ENGINEERING, MAHIM

SE(IT)

APPLIED MATHEMATICS-III

TEST-I

MM-20

NOTE: All questions are compulsory.

Q.1 a) If  $L(\sin t) = \frac{1}{s^2+1}$ , find  $L(\int_0^t \int_0^t \int_0^t t \sin t dt)$  (2)

b) Express  $f(t) = \begin{cases} t^2 & 0 < t < 1 \\ 4t & t > 1 \\ 0 & \text{otherwise} \end{cases}$  as Heaviside's Unit step function. (2)

c) If  $L(t \sinh 2t) = \frac{4s}{(s^2-4)^2}$ , evaluate the value of  $\int_0^\infty e^{-4t} t \sinh 2t dt$  (2)

d) Find the Laplace transform of  $\frac{1}{t}(e^{2t} \sin^3 t)$  (4)

Q.2 Solve (ANY ONE) (5)

a)  $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 3y = 0$  given at  $x = 0, y = 0, \frac{dy}{dx} = 4$

b)  $\frac{d^2y}{dt^2} + y = t$  given at  $x = 0, y = 1, \frac{dy}{dt} = 0$

Q.3 Find the inverse Laplace transform of (ANY ONE) (5)

a)  $\frac{s^2 + s}{(s^2 + 1)(s^2 + 2s + 2)}$  b)  $\frac{1}{s^3(s-1)}$