

Jaypee University of Information Technology, Waknaghat

TEST - III, December 2018

B.Tech (ECE/CSE/CE/IT)

Course Code: 18B11MA111

Max. Marks: 35

Course Title: Engineering Mathematics - I

Max. Time: 2 Hours

Course Credits: 4

Instructions: ALL questions are compulsory. Use of calculator is not allowed.1. Find maximum and minimum distances of point (3, 4, 12) from $x^2 + y^2 + z^2 = 1$. (5 Marks) [CO-2]2. Change the order of integration in $\int_0^1 \int_{x^2}^{2-x} xy \, dy \, dx$ and hence evaluate it. (5 Marks) [CO-3]3. Consider the *piecewise continuous* function: (3 Marks) [CO-5]

$$f(t) = \begin{cases} 2 & , 0 \leq t < 1 \\ 3-t & , 1 \leq t < 3 \\ 0 & , 3 \leq t < \infty \end{cases}$$

(a) Express $f(t)$ in terms of *unit-step* function.(b) Finally determine the Laplace transform of $f(t)$ by using a suitable *shifting* property.4. Find the inverse of $\frac{3s}{(s^2 + 1)^2}$ using Laplace convolution. (4 Marks) [CO-5]5. Use Laplace transform to solve $\frac{d^2 y}{dt^2} - 4 \frac{dy}{dt} + 4y = 0$ with $y(0) = 1$, $y'(0) = 1$. (5 Marks) [CO-5]

6. Solve the following system of equations using Gaussian elimination method: (4 Marks) [CO-6]

$$\begin{aligned} x + y + z &= 3 \\ x + 2y + 2z &= 5 \\ 3x + 4y + 4z &= 11 \end{aligned}$$

7. Consider the following 3×3 matrix: (5 Marks) [CO-6]

$$A = \begin{bmatrix} 0 & 0 & -2 \\ 1 & 2 & 1 \\ 1 & 0 & 3 \end{bmatrix}$$

(a) Find the *eigenvalues* and *eigenvectors* of A .(b) Find an invertible matrix P and a diagonal matrix D such that $A = PDP^{-1}$.8. Consider the following 2×2 matrix: (4 Marks) [CO-6]

$$B = \begin{bmatrix} 5 & 6 \\ 1 & 2 \end{bmatrix}$$

(a) Verify Cayley-Hamilton theorem for B .(b) Hence deduce the inverse of B .