Jaypee University of Information Technology, Waknaghat

TEST - III, December 2017

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

Course Code: 10B11MA111   Max. Marks: 35
Course Title: Mathematics-I
Course Credits: 4   Max. Time: 2 Hours

Instructions: ALL questions are compulsory and carry equal marks. Use of calculator is not allowed.

1. Find the absolute maxima and minima of $f(x, y) = 2x^2 - 4x + y^2 - 4y + 1$ on the closed triangular plate bounded by the lines $x = 0, y = 2, y = 2x$ in the first quadrant.

2. Evaluate $\int_C (xy + y + z) \, ds$, where C is the curve $\vec{r}(t) = (2t)\vec{i} + t\vec{j} + (2 - 2t)\vec{k}$ with $0 \le t \le 1$.

3. Find the general solution of $\dfrac{d^3y}{dx^3} - 6\dfrac{d^2y}{dx^2} + 12\dfrac{dy}{dx} = xe^{2x} - 3$.

4. Find the inverse Laplace transform of $\dfrac{3s + 4}{(s - 2)(s^2 + 7)}$.

5. Use Laplace transform to solve the IVP $y'' - 4y' + 4y = 0$ subject to $y(0) = 0$ and $y'(0) = 1$.

6. (a) Solve the following linear system:

$$
\begin{aligned}
x - 2y + 3z + w &= -3 \\
2x - y + 3z - w &= 0
\end{aligned}
$$

   (b) Determine if the system below has nontrivial solutions and then describe the solution set:

$$
\begin{aligned}
2x + 4y - 6z &= 0 \\
4x + 8y - 10z &= 0
\end{aligned}
$$

7. Consider $\mathcal{A} = \begin{bmatrix} 1 & -6 \\ 2 & -6 \end{bmatrix}$.

   (a) Find the eigenvalues and eigenvectors of $\mathcal{A}$.

   (b) Find matrix $\mathcal{P}$ which diagonalizes $\mathcal{A}$.

* * * * * *