

Code: 20BS1404

II B.Tech - II Semester – Regular Examinations – JULY 2022**TRANSFORM TECHNIQUES, NUMERICAL METHODS
AND NUMBER THEORY
(INFORMATION TECHNOLOGY)**

Duration: 3 hours

Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

UNIT – I

1. a) Find the Laplace transform of $\left(\sqrt{t} - \frac{1}{\sqrt{t}}\right)^3$ 7 M
b) Find $L\{te^{-3t}\cos 2t\}$ 7 M

OR

2. a) Find the Laplace transform of
(i) $e^{2t}\sin 2t$ (ii) $\sin^2 2t$ 7 M
b) Find the Laplace transform of
(i) $t\cos(\omega t + \theta)$ (ii) $e^{-3t}u(t - 2)$ 7 M

UNIT – II

3. a) Find (i) $L^{-1}\left\{\frac{s^2}{s^4 - a^4}\right\}$ (ii) $L^{-1}\left\{\frac{s}{(s+3)^2}\right\}$ 7 M
b) Evaluate (i) $L^{-1}\left\{\log \frac{s+1}{s-1}\right\}$ (ii) $L^{-1}\left\{\frac{s}{(s^2-4)^2}\right\}$ 7 M

OR

4. a) Find (i) $L^{-1}\left\{\frac{s}{2s^2-8}\right\}$ (ii) $L^{-1}\left\{\frac{s+1}{s^2+s+1}\right\}$ 7 M

- b) Evaluate $L^{-1} \left\{ \frac{s^2}{(s^2+a^2)(s^2+b^2)} \right\}$ using convolution theorem. 7 M

UNIT-III

5. a) Find the root of the equation $2x - \log_{10} x = 7$ which lies between 3.5 and 4 by Regula falsi method. 7 M
- b) Apply Lagrange's method to find the value of y for $x = 10$ from the following table:

x	5	6	9	11
y	12	13	14	16

7 M

OR

6. a) Find a real root of the equation $x^3 - 5x - 7 = 0$ using the Newton-Raphson method. 7 M
- b) Estimate the values of $f(42)$ from the following data.

x	20	25	30	35	40	45
$y=f(x)$	354	332	291	260	231	204

7 M

UNIT – IV

7. a) Find the value of y for $x = 0.4$ by Picard's method, $y' = x^2 + y^2, y(0) = 0$. 7 M
- b) By modified Euler's method, find $y(0.1), y(0.2)$ and given that $\frac{dy}{dx} = x + y, y(0) = 1$ 7 M

OR

8. a) Using Taylor's series method find an approximate value of y at $x = 0.2$ for the differential equation $y' - 2y = 3e^x, y(0) = 0$. Compare the numerical solution obtained with the exact solution. 7 M
- b) Find $y(0.1)$ using Runge Kutta fourth order formula, 7 M

given that $\frac{dy}{dx} = x^2 - y, y(0) = 1$ and compare the result with analytical method.

UNIT – V

9. a) Define greatest common divisor (GCD) of two integers a and b . Also find GCD of 24 and 96. 7 M
- b) Find all positive integers n for which the congruence $a^{25} \equiv a \pmod{n}$ holds for all integers a . 7 M

OR

10. a) By Fermat's theorem, Find the remainder when 5^{38} is divided by 11. 7 M
- b) Show that if for a positive integer n the number $2^n + 1$ is prime then n must be a power of 2. 7 M