

c. Solve: $(1+x)^2 \frac{d^2 y}{dy^2} + (1+x)\frac{dy}{dx} + y = 2\sin\left[\log(1+x)\right].$

UNIT - III

5 a. Find Laplace transform of :

i)
$$t e^{-t} \sin 3t$$

ii) $\frac{1-\cos 2t}{t}$
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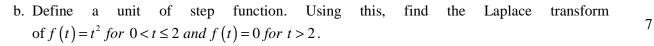
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c. Find the Laplace transform,

$$f(t) = \begin{cases} \sin wt & 0 < t < \frac{\pi}{w}, \\ 0, & \frac{\pi}{w} < t < \frac{2\pi}{w} \end{cases} \text{ and } f(t + \frac{2\pi}{w}) = f(t). \end{cases}$$

6 a. Find the Inverse Laplace transform of the following :

$$\frac{5s+3}{(s-1)(s^2+2s+5)}$$

b. Find
$$L^{-1}\left\{\frac{s}{\left(s^{2}+1\right)\left(s^{2}+4\right)}\right\}$$
 by using convolution theorem. 7

c. Solve:
$$y'' + 4y' + 4y = e^{-t}$$
 $y(0) = y'(0) = 0$ by Laplace transform method.
UNIT - IV

7 a. Find the possible percentage error in computing the resistance 'r' from the formula, $\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2}, if r_1, r_2 \text{ are both in error by 2\%.}$

- b. Expand $e^{ax} \cos by$ in Taylor Series upto second degree terms about the origin. 7
- c. Find the stationary value of $x^2 y^3 z^4$ subject to the condition x + y + z = 5. 7

⁸ a. If
$$F = (5xy - 6x^2)\hat{i} + (2y - 4x)\hat{j}$$
, Evaluate $\int_c F.dr$ along the curve C in the
xy - plane, $y = x^3$ from the point (1,1) to (2,8).

- b. Apply Green theorem to evaluate $\int_{c} (2x^2 y^2) dx + (x^2 + y^2) dy$ where C is the boundary of the area enclosed by *x*-axis and the upper-half of the circle $x^2 + y^2 = a^2$.
- c. Evaluate by using Gauss Divergence theorem $\iint_{s} (yz\hat{i} + zx\hat{j} + xy\hat{k}) \cdot \hat{n}ds$ where *s* is the surface of the sphere $x^2 + y^2 + z^2 = a^2$ in the first Octant.

UNIT - V

9 a. Evaluate:
$$\int_{0}^{a} \int_{0}^{x + y} e^{x + y + z} dx dy dz.$$

b. Evaluate:
$$\iint_{R} xy(x + y) dx dy \text{ over the area between } y = x^{2} and y = x.$$

c. Evaluate:
$$\int_{0}^{\infty} \int_{0}^{x} xe^{-x^{2}/y} dxdy$$
 by change the order of integration. 7

10 a. Find the area of the circle $x^2 + y^2 = a^2$ by double integration.

- b. Find the volume of the tetrahedron bounded by the planes x = 0, y = 0, z = 0 and x + y + z = 1. 7
- c. Using Beta and Gamma function Show that,

$$\int_{0}^{\frac{\pi}{2}} \sqrt{\cot\theta} \, d\theta = \frac{\pi}{2}$$

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