BT-2/M-20   **32025**

APPLIED MATHEMATICS-II

Paper–AS-104 N

Opt. (I)

Time : Three Hours]   [Maximum Marks : 75

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT–I

1. (a) Solve $6x^5 - 41x^4 + 97x^3 - 97x^2 + 41x - 6 = 0$.

(b) Solve the equation $x^3 + 6x + 20 = 0$, one root being $1 + 3i$.

2. (a) State and prove the relation between beta and gamma functions.

(b) Using Leibnitz Rule for differentiation, solve

$$\int_0^\infty e^{-x}\, \frac{\sin ax}{x}\, dx.$$

UNIT–II

3. (a) Find the Laplace transform of $e^{2+}\cos^2 t$.

(b) Find $L[t^2 . \sin at]$.

4. (a) Find the inverse transform of $\dfrac{s+2}{s^2+4s+13}$.

(b) Solve, using transform method

$$\frac{d^2y}{dx^2}+4\frac{dy}{dx}+3y=e^{-x},\ y(0)=1,\ y'(0)=1.$$

UNIT–III

5. (a) Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$.

(b) If the temperature of the air is 30°C and the substance cools from 100°C to 70°C in 15 minutes, find when the temperature will be 40°C.

6. (a) Find the solution of DE,

$$\frac{d^3y}{dx^3}+4\frac{dy}{dx}=\sin 2x.$$

(b) Using method variation of parameters solve
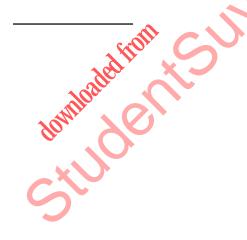
$$\frac{d^2y}{dx^2}+y=\operatorname{cosec} x.$$

UNIT–IV

7. (a) Find the unit vector normal to the surface $xy^2z^3 = 4$ at the point (1, 2, 3).

(b) Give the Physical interpretation of divergence.

8. (a) If $F = 3xy\hat{i} - y^2\hat{j}$, evaluate $\oint_C F \cdot d\,R$, where C is the curve in the *xy*-plane $y = 2x^2$ from (0, 0) to (1, 2).

(b) Evaluate $\oint_C (x^2 - xy)dx + (x^2 - y^2)dy$, using Green's theorem, where C is the square formed by the lines $x = \pm1, y = \pm1$.

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