



**Q.1. Answer the following short questions: (6x5=30)**

- I. Explain the concept of Maximum Principle.**
- II. Find Particular Solution of:  $y^{(4)}(t) + 6y'''(t) + 14y''(t) + 16y'(t) + 8y = 2$**
- III. Find characteristic roots of:  $(r + 4)(r + 4)(r^2 + 2r + 2) = 0$**
- IV. Write complementary function of characteristic equation  $(r + 4)(r + 4)(r^2 + 2r + 2) = 0$ .**
- V. Explain the concept of Primal and Dual.**
- VI. Explain Two Variable Phase Diagrams.**

**Answer the following questions. (3x10=30)**

- Q. 2. Test convergence of the path of  $y_{t+2} - 8y_{t+1} - 2y_t = 10$ , using Schur Theorem.**
- Q. 3. Using Routh Theorem, find dynamic stability of  $y'''(t) + 4y''(t) + 5y'(t) - 2y = -2$**
- Q. 4. Write Kuhn Tucker Conditions for numerical,  $C = (x_1 - 4)^2 + (x_2 - 4)^2$ ,  $2x_1 + 3x_2 \geq 6$ ,  $-3x_1 - 2x_2 \geq -12$ ,  $x_1, x_2 \geq 0$ . Further solution not required.**