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| **Question Number** | **Mark** |
| **Question I** |  |
| **Question II** |  |
| **Question III** |  |
| **Question IV** |  |
| **Question V** |  |
| **Total** |  |

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| **Question I:**  **A. Choose the correct answer.**  **(1) The differential equation is**  **(a) of order 3 and nonlinear (b) of order 3 and linear**  **(c) of order 2 and linear (d) None of the previous**  **(2) The singular points of the differential equation are**  **(a) (b**  **(c) (d) None of the previous** |
| **(3) The minimum value of the radius of convergence of a power series solution centered at zero of the differential equation is**  **(a) (b (c) (d) None of the previous**  **(4) The operator that annihilates is**  **(a) (b)**  **(c) (d) None of the previous**  **(5) The auxiliary equation of is**  **(a) (b) (c) (d) None of the previous** |
| **(6) If the auxiliary equation of a homogeneous Cauchy- Euler differential equation is then**  **(a) (b)**  **(c) (d) None of the previous** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **(7)**  **(a) (b) (c) (d) None of the previous**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **(8) If the roots of a characteristic equation of a second order homogenous linear differential equation with constant coefficients are : then the differential equation is**  **(a) (b) (c) (d) None of the previous**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **(9)**  **(a) (b)**  **(c) (d) None of the previous**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**   1. **Without solving classify the differential equations below as separable, linear, exact, homogeneous and/or Bernoulli:** 3. **.**   **Question II :**   1. **Determine the region of the xy-plane for which the differential equation has a unique solution** 2. **Write the function in terms of unit step function, then find the Laplace transform of the given function.**   **Question III:**   1. **Solve the initial value problem** 2. **Find the orthogonal trajectories of the family**   **Question IV:**  **Solve the system of differential equations**  **Question V:**  **A. Find two linearly independent power series solutions about the ordinary point ,** |
| **B. Use the Laplace transform to solve the initial value problem**    **Good Luck☺** |