

Roll No.

Y – 3176(A)
M.A./M.Sc. (Second Semester) (SPECIAL) EXAMINATION, August 2021
(SECOND CHANCE)
MATHEMATICS
Paper–202
(Differential Equation)

Time : Three Hours

Maximum Marks : 85

Minimum Pass Marks : 29

Note : Attempt *all* questions.

1. Prove that if g is continuous on D , then the successive approximation $\{u_n(t)\}$ defined by Picard method exist as continuous function on J and $(t, u_n(t)) \in D$ for $t \in J$. 17
2. Let $v, w \in C[J_1, R]$ and satisfy the inequalities : 17
 $D_-v(t) \leq g(t, v(t))$ and
 $D_-w(t) > g(t, w(t))$ with
 $(t, v(t)), (t, w(t)) \in \Omega$ for $t \in J_1$ then prove that :
 $v(t_0) < w(t_0)$ implies $v(t) < w(t), t \in J_1$.
3. Show that the system of equations $\frac{dx}{dt} = -2x + 3y + xy, \frac{dy}{dt} = -x + y - 2xy^2$ is almost linear and discuss the type of stability of critical point $(0, 0)$. 17
4. Discuss the stability of critical point of the following two-dimensional system and draw the phase diagram : 17
$$x'_1 = -x_1 + 2x_2, x'_2 = -2x_1 - 5x_2.$$
5. Show that in the vector field : 17
$$\dot{x} = f(x, \mu) = \mu x - x^3, x \in R', \mu \in R'$$
the supercritical pitchfork bifurcation occurs.

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