

(d) Write a BASIC program for solving the differential equation

$$\frac{dy}{dx} = x^2 + y^2, y(0) = 0.1$$

to get $y(x)$, for $0.2 \leq x \leq 5$ at an equal interval of 0.2, by Runge-Kutta fourth order method. 15

Q. 8. (a) Derive the Hamilton equations of motion from the principle of least action and obtain the same for a particle of mass m moving in a force field of potential V .

Write these equations in spherical coordinates (r, θ, ϕ) . 30

(b) The space between two infinitely long coaxial cylinders of radii a and b ($b > a$) respectively is filled by a homogeneous fluid, of density ρ . The inner cylinder is suddenly moved with velocity v perpendicular to this axis, the outer being kept fixed. Show that the resulting impulsive pressure on a length l of inner cylinder is,

$$\pi \rho a^2 l \frac{b^2 + a^2}{b^2} v. \quad 30$$

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