

by Charpit's method.

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Q. 7. (a) If Q is a polynomial with simple roots $\alpha_1, \alpha_2, \dots, \alpha_n$ and if P is a polynomial of degree $< n$, show that

$$\frac{P(x)}{Q(x)} = \sum_{k=1}^n \frac{P(\alpha_k)}{Q'(\alpha_k)(x - \alpha_k)}$$

Hence prove that there exists a unique polynomial of degree $< n$ with given values c_k at the point $\alpha_k, k = 1, 2, \dots, n$. 30

(b) Draw a programme outline and a flow chart and also write a programme in BASIC to enable solving the following system of 3 linear equations in 3 unknowns x_1, x_2 and x_3

$$C * X = D$$

with

$$C = (c_{ij})_{i,j=1}^3, X = (x_j)_{j=1}^3, D = (d_i)_{i=1}^3. \quad 30$$

Q. 8. (a) A particle of mass m is constrained to move on the surface of a cylinder. The particle is subjected to a force directed towards the origin and proportional to the distance of the particle from the origin. Construct the Hamiltonian and Hamilton's equations of motion. 30

(b) Liquid is contained between two parallel planes, the free surface is a circular cylinder of radius a whose axis is perpendicular to the planes. All the liquid within a concentric circular cylinder of radius b is suddenly annihilated; prove that if P be the pressure at the outer surface, the initial pressure at any point on the liquid, distant r from the centre is

$$P \frac{\log r - \log b}{\log a - \log b} \quad 30$$