70489   -2-

PART – B   **(5×13=65 Marks)**

11. a) Obtain a two-term Galerkin solution for the differential equation given by $\dfrac{d^2y}{dx^2} - 10x^2 = 5$, $0 \le x \le 1$ with the boundary conditions $y(0) = y(1) = 0$.

(OR)

     b) Using Rayleigh-Ritz method, determine the expressions for deflection and bending moments in a simply supported beam subjected to uniformly distributed load over entire span. Find the deflection and moment at midspan.

12. a) Derive shape functions for a 2D rectangular element.

(OR)

     b) Use Gaussian Quadrature to obtain an exact value of the integral

$$I = \int\limits_{-1}^{1} \int\limits_{-1}^{1} \int\limits_{-1}^{1} r^2 \, (s^2 - 1) \, (t^4 - 2) \, dr \, ds \, dt$$

13. a) Calculate the transverse displacement at the free end of the cantilever stepped beam shown in Fig. 1.
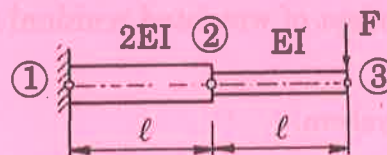

Fig. 1

(OR)

     b) In the element shown in Fig. 2, P is the point (6, 5). On this point the load components in x and y directions are 8 kN and 12 kN respectively. Determine its nodal equivalent forces.
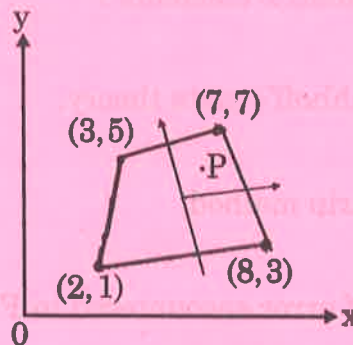

Fig. 2