BIRLA INSTITUTE OF TECHONOLOGY AND SCIENCE, PILANI

First Semester (2022-2023), Mid-Semester Examination

Course: Finite Element Analysis (CE G619)

Date: 2nd Nov 2022 | Total Marks: 50 | Duration: 4:00PM-5:30PM

Q.1. Find the approximate solution of the differential equation given below by (i) Least square method (ii) Galerkin method, (iii) Ritz method (Variational) and (iv) Ritz method (Integral). Find one parameter solution. [30]

$$\frac{d^2u}{dx^2}+\frac{du}{dx}-u=x^3 \ , \quad 0<x<1, \quad u(0)=0.0 \ \text{ and } \ u(1)=1.0$$

Q.2. Derive the governing differential equation of the system shown below (Tapered bar subjected to a body force *f(x)* per unit volume and a concentrated end load). Find the weak form of the derived differential equation using Modified Galerkin approach. Taking this weak form equation formulate the Finite Element equation considering the whole bar as one quadratic element. Solve this derived FE equation by taking, *f(x)*=$10x^2$kN/m^3, A=0.003 m^2, L=2m and E=200GPa. Find the displacement, strain and stress at the center of the bar. [20]