BIRLA INSTITUTE OF TECHONOLOGY AND SCIENCE, PILANI

First Semester (2016-2017), Mid-Semester Examination

Course: Finite Element Analysis (CE G619)

Date: 4th Oct. 2016 (Room:6105) Max. Marks: 50 Duration: 9:00AM-10:30AM

Q.1. Find the approximate solution of the differential equation given below by (i) Collocation method with x=0.0 and x=0.75, (ii) Galerkin method, (iii) Ritz method.

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

Approximate the solution by taking, $u=c_1\phi_1+c_2\phi_2+\phi_0$, with $\phi_1=x(1-x^2)$, $\phi_2=x^2(1-x^2)$ and $\phi_0=(x-1)$. [15]

Q.2. The bar shown in **Fig.1** is subjected to a body force *f(x)*. Derive the governing differential equation of the system. Find the weak form of the derived equation using Modified Galerkin approach. Take this weak form equation and formulate the Finite Element equation considering the whole bar as one quadratic element. Solve this derived FE equation by taking, *f(x)*=20kN/m, A=0.004 m^2 , L=2m and E=200GPa. [20]

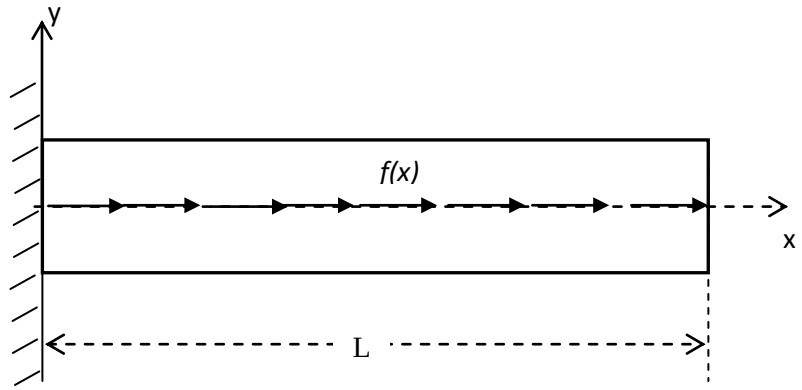

Fig.1 Bar subjected to body force

Q.3. Find the deformations, member forces and reaction forces in the plane truss shown in **Fig.2**. Length and C/S area of all members are same. [15]

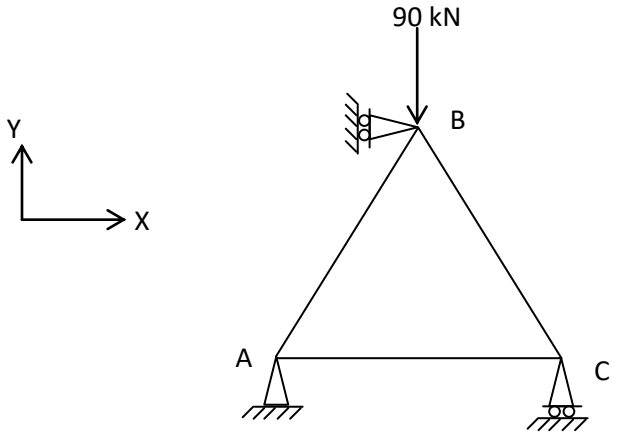

Fig.2