BIRLA INSTITUTE OF TECHONOLOGY AND SCIENCE, PILANI

First Semester (2016-2017), Comprehensive Examination

Course: Advanced Structural Mechanics and Stability(CE G552)

Date: 1st Dec. 2016(Room:2204) Max. Marks: 70 Duration: 2:00PM-5:00PM

Q.1. In an undeformed body point O' lies in the neighbourhood of O. The direction cosines of OO' is l,m and n with respect to the given axis system(x-y-z). This body is now subjected to some loads and the deformation in the body has taken place. Find out the strain developed in the segment of OO'. Calculate the direction cosines of deformed OO'. [10]

Q.2. Describe the torsional behaviour of rectangular cross-section. [15]

Q.3. Derive the governing differential equation of stability of the beam-column shown in **Fig.1** using equilibrium approach. Solve the differential equation and find the expression for P_{cr}. [15]

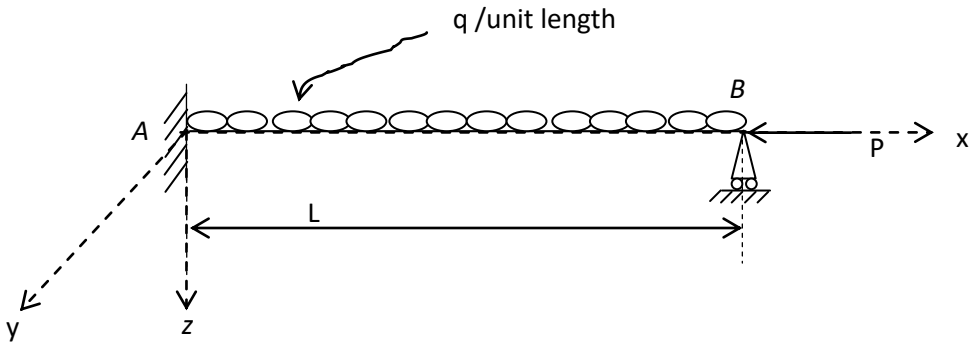

Fig. 1. Beam-column

Q.4. The plate(a×b×h) shown in **Fig.2** is simply supported on all four sides. This plate is subjected to uniformly distributed load q, In-plane loads(N_x and N_y) and shear load(N_{xy} and N_{yx}) along the edges the loads are all in positive sense. Derive the differential equation of the equilibrium to be used for the stability analysis as a 1st part of the question. In the second part of the question take $q = 10 \sin\frac{m\pi x}{a} \sin\frac{n\pi y}{b}$ kN/m^2 , a=b=1m, h=0.01m, v=0.3, E=200GPa, N_x =0.00001kN/m and other loads as zero. Find w at the centre of the plate using Navier's method. [20]

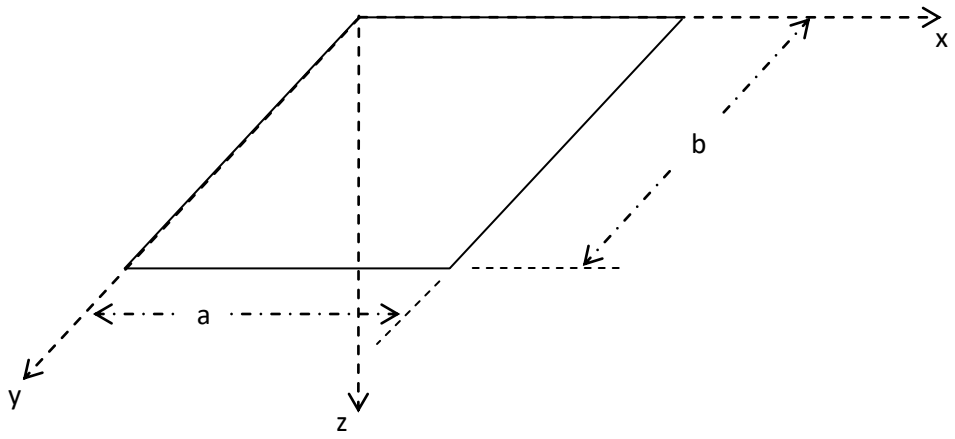

Fig.2 Simply supported plate with thickness=h.

Q.5. A pipe made up of steel has a tensile elastic limit of 400 N/mm^2 and E=200 GPa. The pipe has a internal diameter of 10cm and is subjected to an internal pressure of 150 N/mm^2. Determine the thickness of the pipe required using the different failure theories taking the factor of safety as 1.2. [10]