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Code No: A0403

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech I Semester Examinations, March/April-2011

STRESS ANALYSIS AND VIBRATION

(CAD/CAM)

Time: 3hours **Max. Marks: 60**

Answer any five questions

All questions carry equal marks

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1.a) What is meant by Airy's function and Biharmonic equation?

b) Find the ratio of thickness to the internal diameter of a tube subjected to internal pressure when the pressure 75% of the value of the maximum permissible circumferential stress. Find the increases in internal diameter of such a tube, 20cm internal diameter when the internal pressure is 42MPa. E = 200 GPa γ =0.28. [4+8]

2.a) What do you understand by displacement field?

b) A flat steel of disk of 80cm outside diameter with a 20cm hole is shrunk around a solid steel shaft. The shrink allowance is 1 in 1000 parts.
i) At what rpm will the shrink fit loosen up as a result of rotation?
ii) What are the maximum stresses when spinning at the speed calculate in part (i)
iii) What are the stresses at stand still?
iv) What are the stresses at half the speed calculate in part (i) ρ, E, ν are 7800kg/m^3, 200GPa and 0.3. [12]

3.a) What are the various formulation and solution methods for elasticity problems?

b) Derive expressions for maximum deflection and stress in a thin circular plate simply supported around the edge and subjected to uniformly distributed load. [8+8]

4.a) Discuss the significance of contact stresses.

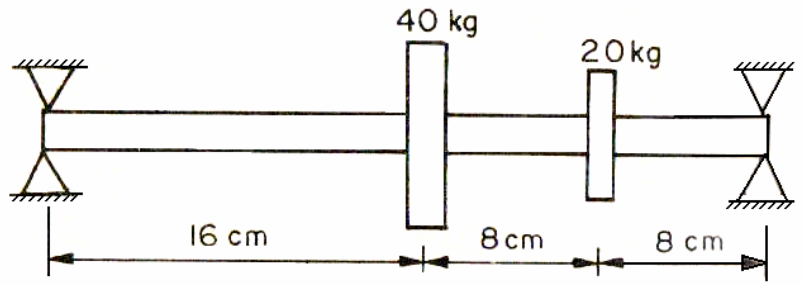
b) Derive an expression foe maximum shear stress induced in a rectangular bar under torsion. [12]

5.a) Find the time period of vibration of a compound pendulum.

b) Calculate the natural frequency of vibration of a torsional pendulum of fig. with the following dimensions. Length of the rod = 1m, diameter of the rod d = 5mm, diameter of the rotor D = 0.2m and the mass of the rotor M = 2kg. The modulus of rigidity for the material of the rod may be assumed to be 0.83x10^{11}N/m^2. [12]

Contd……2

6. Estimate the lowest natural frequency of transverse vibrations for the system shown in figure by Stodola's method.
Take E= 2.0 x 1011 N/m^2, I= 10^{-6} m^4 and g = 10m/s^2 [12]



7. Derive the frequency equation for a beam with both ends fixed and having transverse vibration. [12]

8. A bar is free at both ends and is initially stretched by static force P acting at the ends. The forces are released instantaneously. Derive the frequency equation expression for natural frequencies, normal function and general series for free vibration. [12]

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