Registration No: | | | | | | | | | | |

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B.TECH
PCME4307

6th Semester Regular Examination – 2015
ADVANCED MECHANICS OF SOLIDS
BRANCH(S): MECH

Time: 3 Hours
Max Marks: 70
Q.CODE: J287

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: (2 x 10)

a) Describe the fictitious load method to find deflection at a point.
b) A thick cylinder is subjected to an external pressure. What will be the nature of circumferential stress and where will it be maximum?
c) Write differential equations of equilibrium..
d) Describe briefly the maximum shear stress theory.
e) Explain briefly a deviatoric state stress system with example.
f) What is meant by an octahedral plane?
g) Write the name of modes of fracture failure.
h) State Castigliano's theorem.
i) Define flexural axis.
j) Define endurance limit of a material.

Q2 a) For the following stress matrix, determine the normal and shear stress on a plane with normal having direction cosines as $n_x=0.6$, $n_y=0$, $n_z=0.8$ (5)

$$\begin{vmatrix} 3 & 2 & 3 \\ 2 & 5 & 0 \\ 3 & 0 & 4 \end{vmatrix}$$

b) Determine the normal and shear stress on octahedral plane for the state of stress given in Q2(a) (5)

Q3 a) The displacement field for a body is given by (5)

$$u = (x^2 + 2y)i + (3 + 2z)j + (2x^2 + y)k .$$

Two points P and Q in the un-deformed body have coordinates (1, 0, 1) and (2, 1, – 1) respectively. Determine the distance between P and Q after deformation.

b) Determine the strain in a direction having direction cosines as $n_x=0.6$, $n_y=0$, $n_z=0.8$ at point (1,1,2) for the displacement field given in Q3(a) (5)

Q4 A Simply supported beam of length 2m and constant flexural rigidity EI is loaded by a concentrated load 10 kN acting at the mid span. Determine by energy method the deflection of a point at 0.8m from left end of the beam considering only flexure. (10)

Q5 Determine the stress at point A and B of the ring having inner and outer diameters as 12 and 16cm respectively as shown in Fig. 5. The cross-section of the ring is circular and Young's modulus for the material of the beam is 2.1×10^5 N/mm^2. (10)

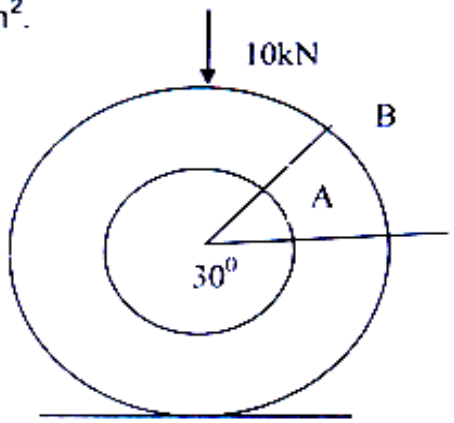

Fig. 5

Q6 A thick-walled cylinder is subjected to an internal pressure 3000kg/cm^2. Its internal diameter 20cm and external diameter is 30cm. Determine the circumferential stress at inner and outer surface of the cylinder. Also determine the radial and tangential strain at inner surface if Young's modulus and poisson's ratio for material of cylinder is 2.1GPa and 0.3 respectively (10)

Q7 a) What do you mean by the endurance limit of a material ? Describe about the different factors that affect the endurance limit. (5)

b) Describe notch sensitivety. (5)

Q8 Write Short Notes (5 x 2)

a) Stress invariants.

b) Micromechanics of composite materials