Total No. of Questions : 7]

P4586

SEAT No. :

[Total No. of Pages : 2

[4860] - 1066
M.E. (Mechanical) (Design Engineering)
ADVANCED STRESS ANALYSIS
(2013 Credit Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions out of 7.***
2) ***All the questions should be solved in one answer book and attach extra supplements if required.***
3) ***Draw Diagrams wherever necessary.***
4) ***Use of scientific calculator is allowed.***
5) ***Assume suitable data where ever necessary.***

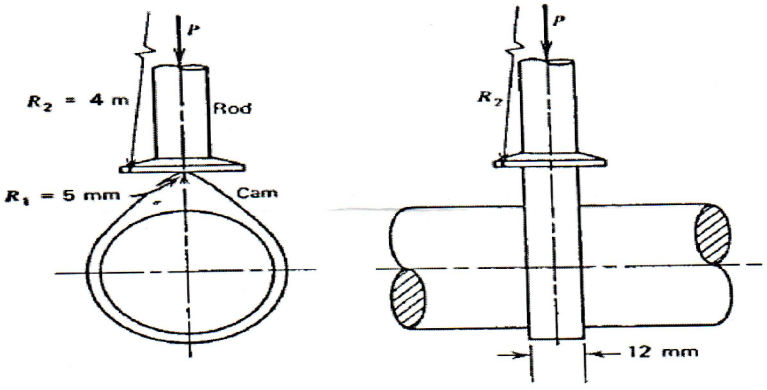
Q1) A problem is represented by the function. **[10]**

$$\phi = \frac{3W}{4h}\left[xy - \frac{2Ry^3}{3h^2}\right] + \frac{P}{2}y^2$$

Where, h is half depth of the beam, and W as the concentrated load. Investigate the stress function and determine the stress components.

Q2) Derive the following expression for uniformly loaded circular plate with clamped **[10]** edges. $W = \frac{q}{64D}(a^2 - x^2)^2$

Q3) A cast iron push rod as shown in figure below (E = 117 GPa, v = 0.20) in a valve assembly is operated by a steel cam (E= 200 GPa, v = 0.29). The cam is cylindrical in shape and has a radius of curvature of 5 mm at its tip. The surface of the push rod that contacts the cam is spherical in shape with a radius of curvature 4 m so that the rod and cam are in point contact. If allowable maximum principal stress for cast iron is - 1400MPa, determine the maximum load P that may act on the rod. **[10]**



P.T.O.

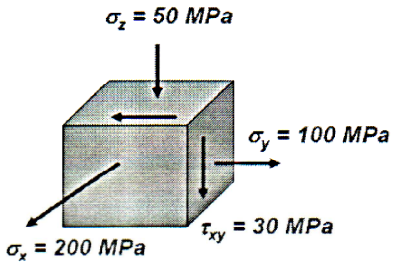
Q4) Following strains were obtained on a delta rosette ε_a = 190 μm/m (at 0°), ε_b = 200 μm/m (at 60°), and ε_c = – 300 μm/m (at 120°). Calculate maximum principal strain direction, the principal stresses and the maximum shear stress. Take E = 200 GPa, v = 0.285 **[10]**

Q5) Write a short note on **[10]**

a) Sliding Friction Consideration in Contact Stress Analysis

b) Rectangular Strain Gauge Rossette.

Q6) Stress analysis of a spacecraft structural member gives the state of stress shown below. If the part is made from 7075-T6 aluminium alloy with yield strength of 500 MPa, will it exhibit yielding? If not, what is the safety factor?**[10]**



Q7) Explain typical failure modes of engineering plastics. **[10]**