Total No. of Questions : 7]

SEAT No. :

P5069

[Total No. of Pages : 3

[5060]-583

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) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data if necessary, but state the assumptions clearly.***

Q1) Investigate stress function $\phi = \frac{\cos^3\theta}{r}$, is it permissible Airy's stress function. Determine the stress components. **[10]**

Q2) A mild steel plate (E=200GPa, $\upsilon = 0.29$, Yield stress = 315 MPa) has a thickness h = 10 mm and covers a circular opening having a diameter of 200 mm. The plate is fixed at the edges and is subjected to a uniform pressure p. **[10]**

Determine the magnitude of the yield pressure p_y and maximum deflection w_{max} at the centre of the plate when this pressure is applied.

Derive the equation for maximum deflection you use.

Q3) Derive an expression for Equivalent modulus of Elasticity for composite rod subjected to Longitudinal loading and Transverse loading, to the direction of fibre. State clearly the assumptions made. **[10]**

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Q4) A model scaled to ten times the size of a prototype is tested under a loading of 5 times greater than the actual prototype loading. The model material has a modulus of elasticity which is 10 percent less than that for the prototype material. The maximum stress and deflection of the model were found to be 8 MPa and 0.65 mm respectively. Determine the expected values for the prototype. **[10]**

Q5) A feed roll consists of two circular cylindrical steel rollers, each 200 mm in diameter and arranged so that their longitudinal axes are parallel. A cylindrical steel shaft of 60 mm diameter is fed between the rollers in such a manner that its longitudinal axis is perpendicular to that of the rollers. The total load between the shaft and rollers is 4.5 kN. Determine maximum principal stress and maximum shear stress in the shaft. Also determine the distance from the plane contact to the point of maximum shear stress. **[10]**

Take Young's modulus E=200GPa and Poisson's ratio $\upsilon = 0.29$.

Q6) a) Stress function $\phi=(A/2)\,x^2 + Bxy + (C/2)\,y^2$ provides stress distribution on a rectangular plate, Evaluate the stress field and sketch the stress distribution on plate. **[5]**

b) Explain Isochromatic and Isoclinic Fringes. **[5]**

Q7) State of stress at a point is defined as shown in figure 1, for a part made from steel with yield strength of 350 MPa. Will it exibits yielding? If not, Determine the factor of safety using **[10]**

a) Von Mises criterion and

b) Tresca's criterion.

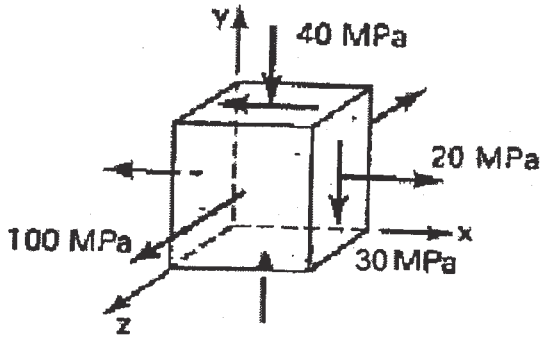
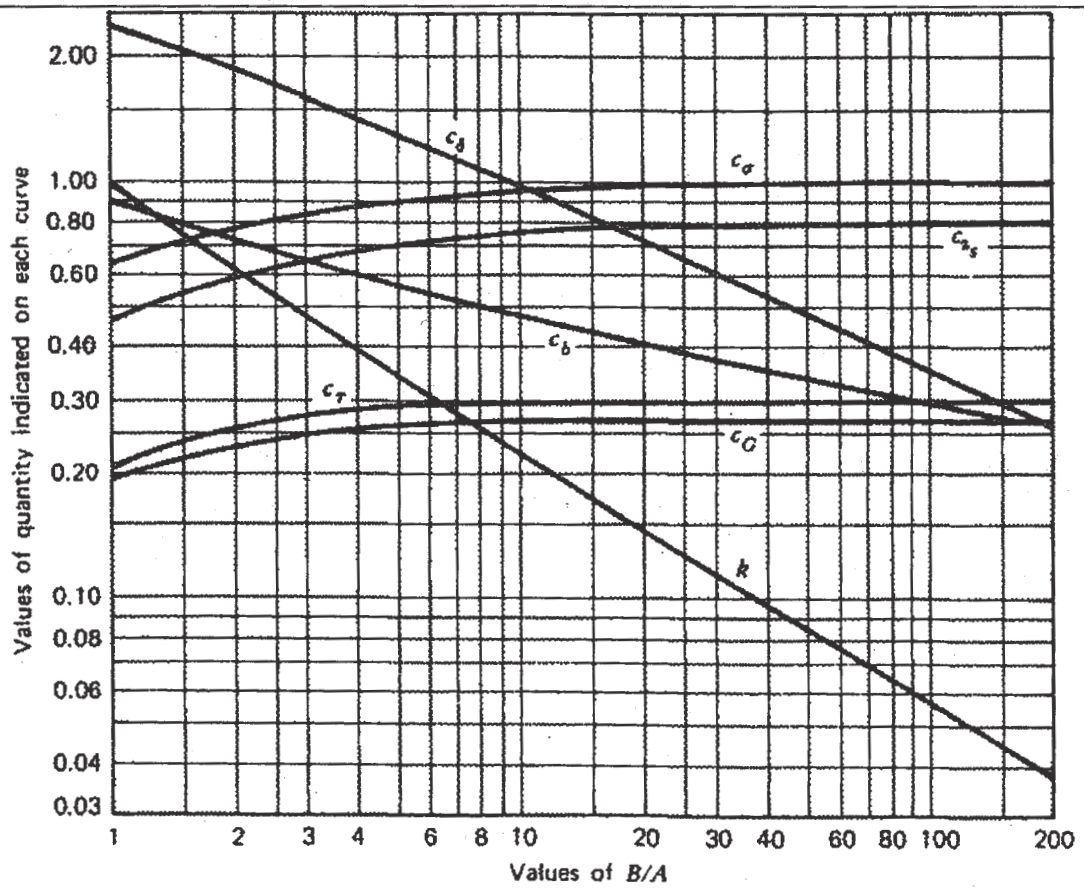


Fig. 1: State of stress at a point



Stress and Deflection coefficient of two bodies in contact of a point

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