Total No. of Questions :7]

SEAT No. :

P4059

[Total No. of Pages : 2

[5255]-557

M.E (Mechanical) (Design Engineering)
ADVANCED STRESS ANALYSIS
(Semester - I) (2013 Credit Pattern) (502203)

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) Derive differential equations of equilibrium in polar Coordinates with neat diagram. **[10]**

Q2) a) Derive the expression for Modulus of elasticity for composite considering iso-stress & iso-strain condition. **[6]**

b) Explain typical failure modes of engineering plastics. **[4]**

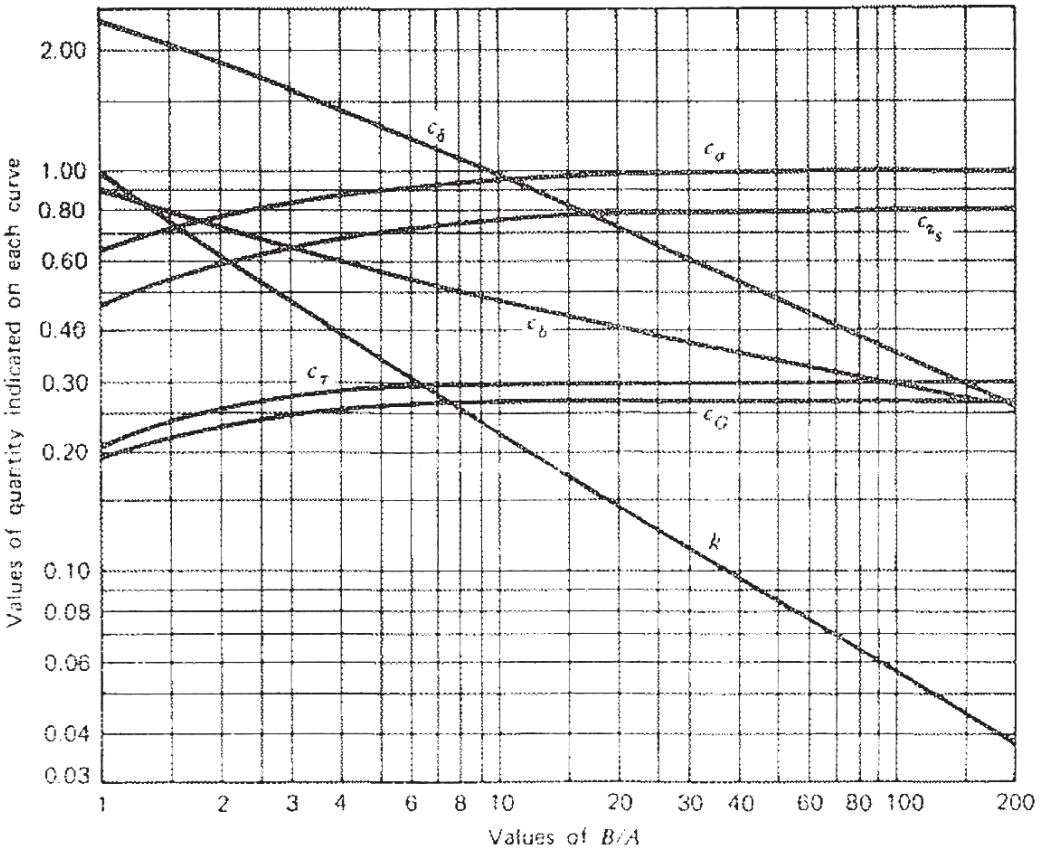
Q3) Explain different criteria of stress analysis for plasticity. **[10]**

Q4) For uniformly loaded 'q N/m' circular plate with clamped edges, derive the following expression.

$$W = \frac{q}{64D}(a^2 - x^2)^2$$ **[10]**

Q5) The two semicircular disks made of steel ($E_1 = E_2 = 200\,GPa$ and $\upsilon_1 = \upsilon_2 = 0.29$). The radii of curvature of the two surfaces at the point of contact are R_1 = 60 mm, R'_1 = 130 mm, R_2 = 80 mm, and R'_2 = 200 mm. The angle a between the planes of minimum curvature is $\pi / 3$ rad. If the load P=4.50 kN, Determine the maximum principal stress, maximum shear stress, and maximum octahedral shear stress in the disks and state the location of the point where each of these stresses occurs. (Refer Graph 1) **[10]**

P.T.O.



Q5) Graph 1: Stress and Deflection coefficient of two bodies in contact of a point

Q6) Investigate validity of the stress function $\phi=\left[\frac{H}{\pi}\right] y \tan^{-1}\left[\frac{x}{y}\right]$ were 'H' is a constant. Also, Determine the stresses. **[10]**

Q7) A rectangular strain gauge rosette records following strain during a test on structural member. **[10]**

$\varepsilon_A = -13\times10^{-6}, \varepsilon_B = 7.5\times10^{-6}, \ \varepsilon_C = 13\times10^{-6}$, meters/m.

Determine

i) Magnitude of principal strains

ii) Orientation of principal strains.