Total No. of Questions : 7]

SEAT No. :

P4130

[Total No. of Pages :2

[4760] - 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) ***Attempt any five questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of Calculator is allowed.***
5) ***Assume Suitable data, if necessary, if required, but state the assumptions clearly.***

Q1) A stress function is given as under, $\phi = \left[C_1 \cdot r^4 + C_2 \cdot r^2 + C_3 + \frac{C_4}{r^2} \right] \cdot \cos 2\theta$

where r and θ are polar coordinates.

Find out whether this is valid stress function.

Also determine the stresses. **[10]**

Q2) Derive three differential equations of equilibrium in Cartesian Coordinates considering body force components per unit volume with neat diagram. **[10]**

Q3) The radii of curvature of two surfaces of semicircular discs at the point of contact are R_1 = 70mm, R_1' = 150mm, R_2 = 100mm and R_2' = 210mm.The angle between the principal planes of two bodies is 50º. determine the maximum principal stresses and maximum shearing stresses. Also locate the point where each of these stresses occurs. The load applied is 5kN. Take $E_1 = E_2$ = 200 GPa and $y_1 = y_2 = 0.29$. **[10]**

Q4) Derive following expression for circular plate with a circular hole at the center.

$$\frac{dw}{dr} = \frac{a^2 b^2 m_1}{D(1-\mu)(a^2 - b^2)} \left[\frac{1}{r} + \frac{(1-\mu)}{(1+\mu)} \cdot \frac{r}{a^2} \right]$$ **[10]**

P.T.O.

Q5) A steel specimen is mounted with three rectangular rosette strain gauges. The strain gauge readings for particular loading are given as: **[10]**

$\varepsilon_A = 100\times10^{-6}$ $\varepsilon_B = 500\times10^{-6}$ $\varepsilon_C = 600\times10^{-6}$

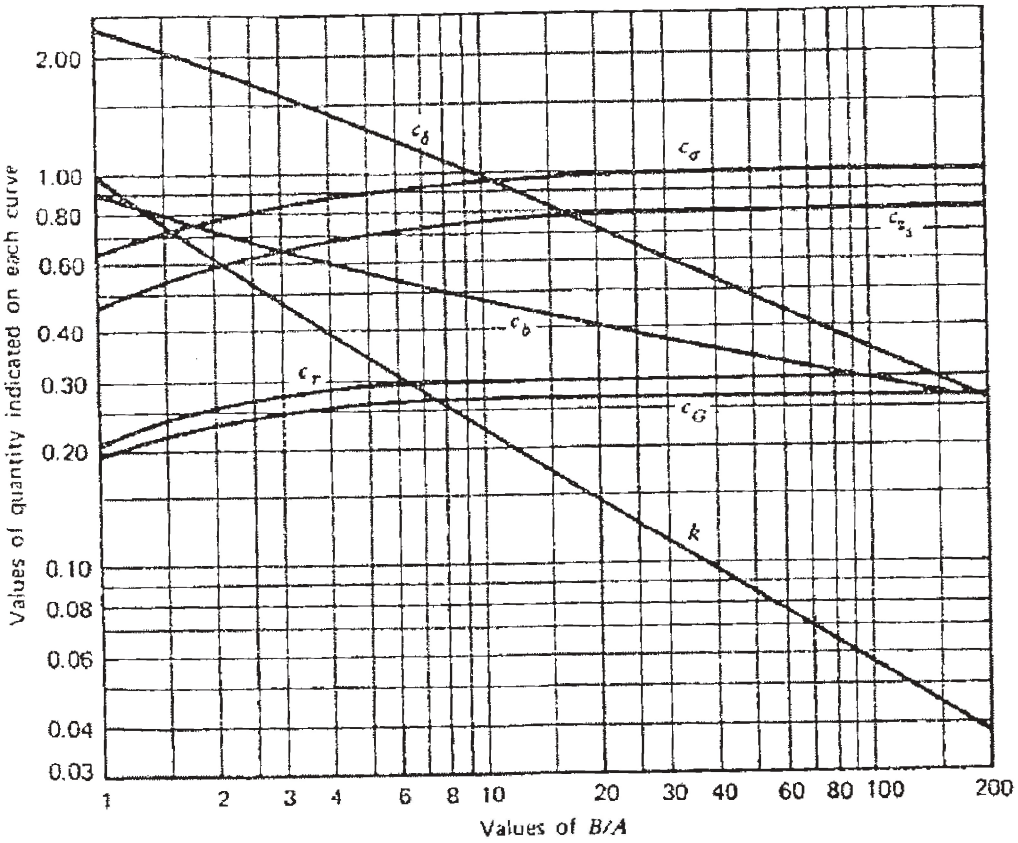
Determine the values and orientation of the principal stresses and maximum shear stress. Take y = 0.285 and E = 200GPa.

Q6) a) Explain the effect of a stressed model in a circular polariscope in a light field arrangement. **[5]**

b) Explain dimensional analysis in experimental technique. **[5]**

Q7) a) Discuss different properties and applications of a composite-Fibre Reinforced Plastic. **[5]**

b) Explain isometric fringe pattern. **[5]**



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