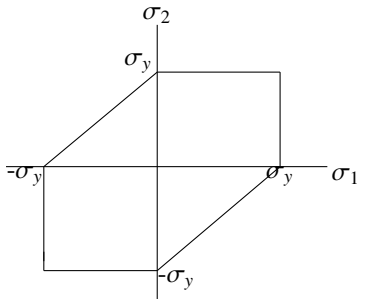
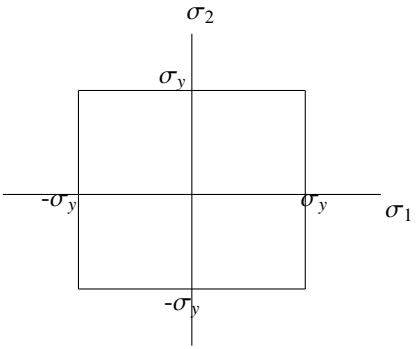
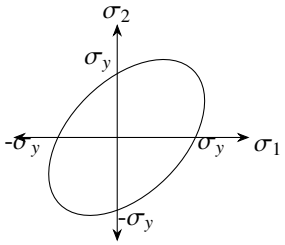
2011-GATE-ME

AI24BTECH11016 - Jakkula Adishesh Balaji

1 14-26

1) Eigenvalues of a real symmetric matrix are always
   a) positive
   b) negative
   c) real
   d) complex
2) A pipe of $25mm$ outer diameter carries steam. The heat transfer coefficient between the cylinder and surroundings is $5W/m^2K$. It is proposed to reduce the heat loss from the pipe by adding insulation having a thermal conductivity of $0.05W/mK$. Which one of the following statements is **TRUE**?
   a) The outer radius of the pipe is equal to the critical radius.
   b) The outer radius of the pipe is less than the critical radius.
   c) Adding the insulation will reduce the heat loss
   d) Adding the insulation will increase the heat loss
3) The contents of a well-insulated tank are heated by a resistor of 23Ω in which $10A$ current is flowing. Consider the tank along with its contents as a thermodynamic system. The work done by the system and the heat transfer to the system are positive. The rates of heat (Q), work (W) and change in internal energy (ΔU) during the process in kW are
   a) $Q = 0,\ W = -2.3,\ \Delta U = +2.3$
   b) $Q = +2.3,\ W = 0,\ \Delta U = +2.3$
   c) $Q = -2.3,\ W = 0,\ \Delta U = -2.3$
   d) $Q = 0,\ W = +2.3,\ \Delta U = -2.3$
4) Match the following criteria of material failure, under biaxial stresses σ_1 and σ_2 and yield stress σ_y, with their corresponding graphic representations:

P. Maximum-normal-stress criterion	
Q. Maximum-distortion-energy criterion	
R. Maximum-shear-stress criterion	

5) The product of two complex numbers $1 + i$ and $2 - 5i$ is
   a) $7 - 3i$
   b) $3 - 4i$
   c) $-3 - 4i$
   d) $7 + 3i$

6) Cars arrive at a service station according to Poisson's distribution with a mean rate of 5 per hour. The service time per car is exponential with a mean of 10 minutes. At steady state, the average waiting time in the queue is
   a) 10 minutes
   b) 20 minutes
   c) 25 minutes
   d) 50 minutes

7) The word **kanban** is most appropriately associated with
   a) economic order quantity

b) just-in-time production
c) capacity planning
d) product design

8) If $f(x)$ is an even function and a is a positive real number, then $\int_{-a}^{a} f(x)\,dx$ equals
a) 0
b) a
c) $2a$
d) $2\int_{0}^{a} f(x)\,dx$

9) The coefficient of restitution of a perfectly plastic impact is
a) 0
b) 1
c) 2
d) inf

10) A thin cylinder of inner radius $500mm$ and thickness $10mm$ is subjected to an internal pressure of $5MPa$. THe average circumferential (hoop) stress in MPa is
a) 100
b) 250
c) 500
d) 1000

11) Which one among the following welding processes uses non-consumable electrode?
a) Gas metal arc welding
b) Submerged arc welding
c) Gas tungsten arc welding
d) Flux coated arc welding

12) The crystal structure of austenite is
a) body centered cubic
b) face centered cubic
c) hexagonal closed packed
d) body centered tetragonal

2 **Q.26 TO Q.55 CARRY TWO MARKS EACH.**

1) A torque T is applied at the free end of a stepped rod of circular cross-sections as shown in the figure. The shear modulus of the material of the rod is G. The expression for d to produce an angular twist θ at the free end is

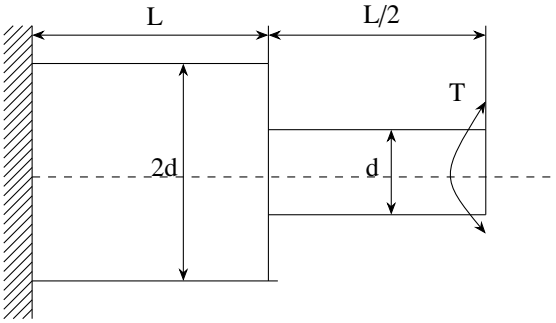


Fig. 1.1

a) $\left(\frac{32TL}{\pi\theta G}\right)^{\frac{1}{4}}$
b) $\left(\frac{18TL}{\pi\theta G}\right)^{\frac{1}{4}}$
c) $\left(\frac{16TL}{\pi\theta G}\right)^{\frac{1}{4}}$
d) $\left(\frac{2TL}{\pi\theta G}\right)^{\frac{1}{4}}$