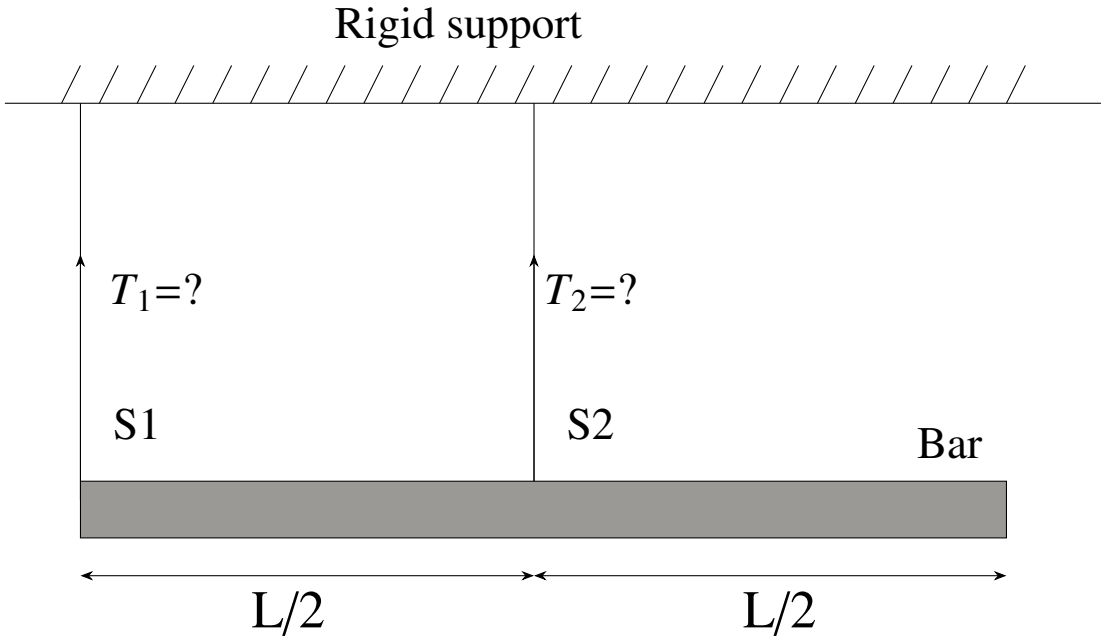
GATE 2018 ME

EE24BTECH11032- John Bobby

1) $F(z)$ is a function of the complex variable $z = x + iy$ given by $F(z) = iz + kRe(z) + iIm(z)$.For what value of k will $F(z)$ satisfy the Cauchy-Rienmann equations?
   a) 0
   b) 1
   c) -1
   d) y
2) A bar of uniform cross section and weighing 100N is held horizontally using two massless and inextensible strings S1 and S2 as shown in the figure.



   a) $T_1 = 100N$ and $T_2 = 0N$
   b) $T_1 = 0N$ and $T_2 = 100N$
   c) $T_1 = 75N$ and $T_2 = 25N$
   d) $T_1 = 25N$ and $T_2 = 75N$
3) If σ_1 and σ_2 are the algebraically largest and smallest principal stresses respectively, the value of the maximum shear stress is
   a) $\frac{\sigma_1+\sigma_3}{2}$
   b) $\frac{\sigma_1-\sigma_3}{2}$
   c) $\sqrt{\frac{\sigma_1+\sigma_3}{2}}$
   d) $\sqrt{\frac{\sigma_1-\sigma_3}{2}}$
4) The equation of motion for a spring-mass system excited by a harmonic force is $M\ddot{x} + Kx = F\cos\omega t$, where the M is the mass, K is the spring stiffness, F is the force amplitude and ω is the angular frequency of excitation. Resonance occurs when ω is equal to
   a) $\sqrt{\frac{M}{K}}$

b) $\frac{1}{2\pi}\sqrt{\frac{K}{M}}$

c) $2\pi\sqrt{\frac{K}{M}}$

d) $\sqrt{\frac{K}{M}}$

5) For an Oldham coupling used between two shafts, which among the following statements are correct?
   A. Torsional load is transferred along the shaft axis.
   B. A velocity ratio of 1 : 2 between shafts is obtained without using gears
   C. Bending load is transferred transverse to shaft axis.
   D. Rotation is transferred along the shaft axis.

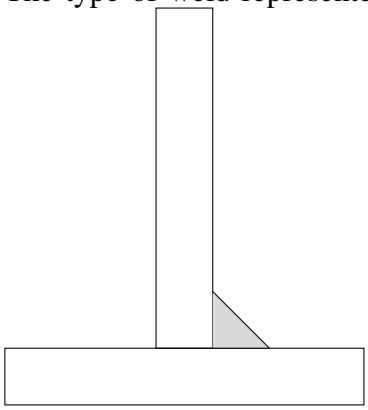
   a) A and C
   b) A and D
   c) B and C
   d) B and D

6) For a two dimensional incompressible flow field given by $\mathbf{u} = A\left(x\hat{i} - y\hat{j}\right)$, where $A > 0$, which one of the following statements is FALSE?
   a) It satisfies continuity equation.
   b) It is unidirectional when $x \to 0$ and $y \to \infty$.
   c) Its streamlines are given by $x = y$.
   d) It is irrotational.

7) Which one of the following statements is correct for superheated vapour?
   a) Its pressure is less than the saturation pressure at a given temperature.
   b) Its temperature is less than the saturation temperature at a given pressure.
   c) Its volume is less than the volume of the saturated vapour at a given temperature.
   d) Its enthalpy is less than the enthalpy of the saturated vapour at a given pressure.

8) In a linearly hardening plastic material, the true stress beyond initial yielding
   a) increases linearly with the true strain
   b) decreases linearly with the true strain
   c) first increases linearly and then decreases linearly with the true strain
   d) remains constant

9) The type of weld represented by the shaded region in the figure is



   a) groove
   b) spot
   c) fillet
   d) plug

10) Using the Taylor's tool life equation with exponent $n = 0.5$, if the cutting speed is reduced by 50, the ratio of new tool life to original tool life to original tool life is

a) 4
b) 2
c) 1
d) 0.5

11) A grinding ratio of 200 implies that the
a) grinding wheel wears 200 times the volume of the material removed
b) grinding wheel wears 0.005 times the volume of the material removed
c) aspect ratio of abrasive particles used in the grinding wheel is 200
d) ratio of volume of abrasive particle to that of grinding wheel is 200

12) Interpolator in a CNC machine
a) controls spindle speed
b) coordinates axes movements
c) operates tool changer
d) commands canned cycle

13) The time series forecasting method that gives equal weightage to each of the m most recent observations is
a) Moving average method
b) Exponential smoothing with linear trend
c) Triple Exponential smoothing
d) Kalman Filter