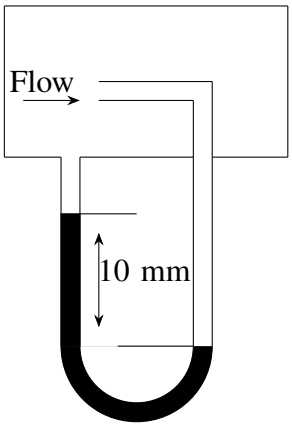
2011-ME-27-39

EE24BTECH11003 - Akshara Sarma Chennubhatla

27) Figure shows the schematic for the measurement of velocity of air $\left(\text{density} = 1.2\text{kg}/m^3\right)$ through a constant area duct using a pitot tube and a water-tube manometer. The differential head of water $\left(\text{density} = 1000\text{kg}/m^3\right)$ in the two columns of the manometer is 10 mm. Take acceleration due to gravity as 9.8 m/s^2. The velocity of air in m/s is



(2011)

a) 6.4
b) 9.0
c) 12.8
d) 25.6

28) The values of enthalpy of steam at the inlet and outlet of a steam turbine in a Rankine cycle are 2800 kJ/kg and 1800 kJ/kg respectively. Neglecting pump work, the specific steam consumption in kg/kW-hour is (2011)

a) 3.6
b) 0.36
c) 0.06
d) 0.01

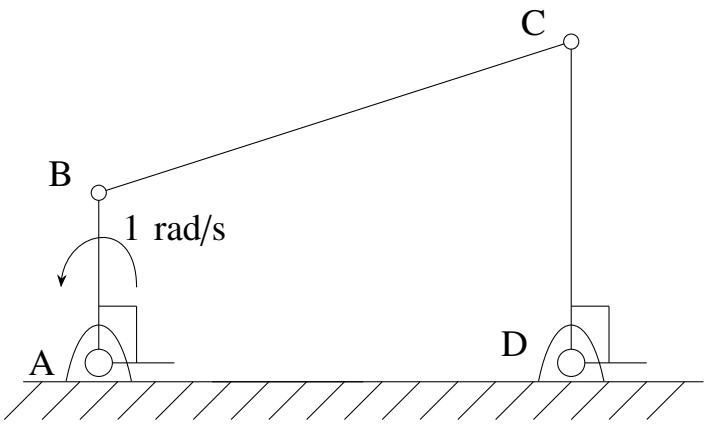
29) The integral $\int_1^3 \frac{1}{x}dx$, when evaluated by using Simpson's $\frac{1}{3}$ rule on two equal subintervals each of length 1, equals (2011)

a) 1.000
b) 1.098
c) 1.111
d) 1.120

30) Two identicals ball bearings P and Q are operating at loads 30 kN and 45 kN respectively. The ratio of the life of bearing P to the life of bearing Q is (2011)

a) $\frac{81}{16}$
b) $\frac{27}{8}$
c) $\frac{9}{4}$
d) $\frac{3}{2}$

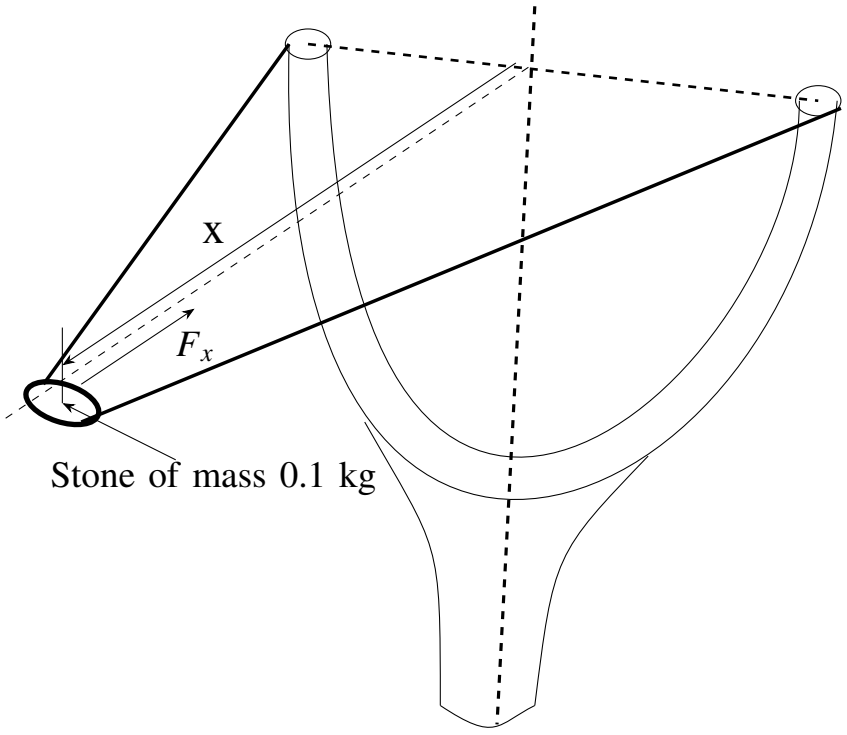
31) For the four-bar linkage shown in the figure, the angular velocity of link AB is 1 rad/s. The length of link CD is 1.5 times the length of link AB. In the configuration shown, the angular velocity of link CD in rad/s is



(2011)

a) 3
b) $\frac{3}{2}$
c) 1
d) $\frac{2}{3}$

32) A stone with mass of 0.1 kg is catapulted as shown in the figure. The total force F_x (in N) exerted by the rubber band as a function of distance x (in m) is given by $F_x = 300x^2$. If the stone is displaced by 0.1 m from the un-stretched position ($x = 0$) of the rubber band, the energy stored in the rubber band is



(2011)

a) 0.01 J
b) 0.1 J
c) 1 J

d) 10 J

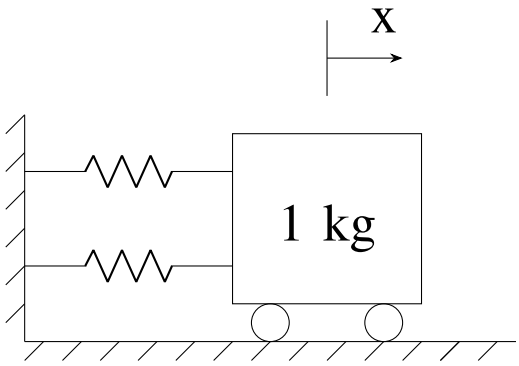
33) Consider the differential equation $\frac{dy}{dx} = \left(1 + y^2\right) x$. The general solution with constant c is (2011)

a) $y = \tan \frac{x^2}{2} + \tan c$
b) $y = \tan^2 \left(\frac{x}{2} + c\right)$
c) $y = \tan^2 \left(\frac{x}{2}\right) + c$
d) $y = \tan \left(\frac{x^2}{2} + c\right)$

34) An unbiased coin is tossed five times. The outcome of each toss is either a head or a tail. The probability of getting at least one head is (2011)

a) $\frac{1}{32}$
b) $\frac{13}{32}$
c) $\frac{16}{32}$
d) $\frac{31}{32}$

35) A mass of 1 kg is attached to two identical springs each with stiffness $k = 20$ kN/m as shown in the figure. Under frictionless condition, the natural frequency of the system in Hz is close to



(2011)

a) 32
b) 23
c) 16
d) 11

36) The shear strength of a sheet metal is 300 MPa. The blanking force required to produce a blank of 100mm diameter from a 1.5 mm thick sheet is close to (2011)

a) 45 kN
b) 70 kN
c) 141 kN
d) 3500 kN

37) The ratios of the laminar hydrodynamic boundary layer thickness to thermal boundary layer thickness of flows of two fluids P and Q on a flat plate are $\frac{1}{2}$ and 2 respectively. The Reynolds number based on the plate length for both the4 flows is 10^4. The Prandtl and Nusselt numbers for P are $\frac{1}{8}$ and 35 respectively. The Prandtl and Nusselt numbers for Q are respectively (2011)

a) 8 and 140
b) 8 and 70
c) 4 and 70

d) 4 and 35

38) The crank radius of a single-cylinder I.C engine is 60 mm and the diameter of the cylinder is 80 mm. The swept volume of the cylinder in cm^3 is (2011)

a) 48
b) 96
c) 302
d) 603

39) A pump handling a liquid raises its pressure from 1 bar to 30 bar. Take the density of the liquid as 990kg/m^3. The isentropic specific work donw by the pump in kJ/kg is (2011)

a) 0.10
b) 0.30
c) 2.50
d) 2.93