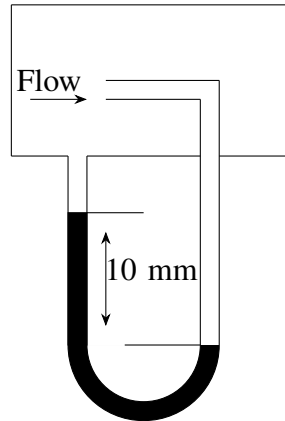


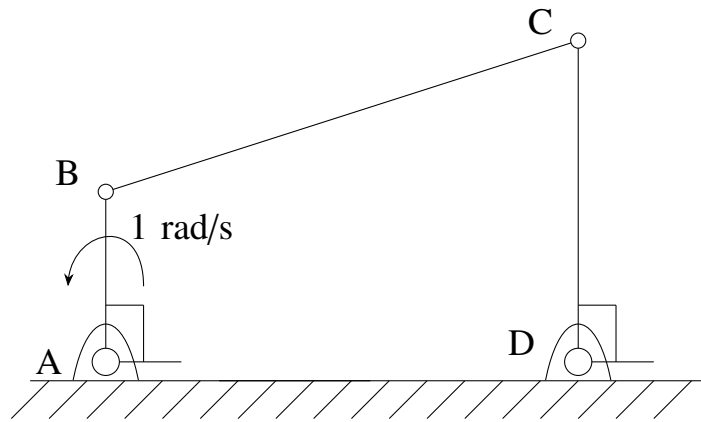
2011-ME-27-39

EE24BTECH11003 - Akshara Sarma Chennubhatla

- 1) Figure shows the schematic for the measurement of velocity of air (density = 1.2 kg/m^3) through a constant area duct using a pitot tube and a water-tube manometer. The differential head of water (density = 1000 kg/m^3) 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

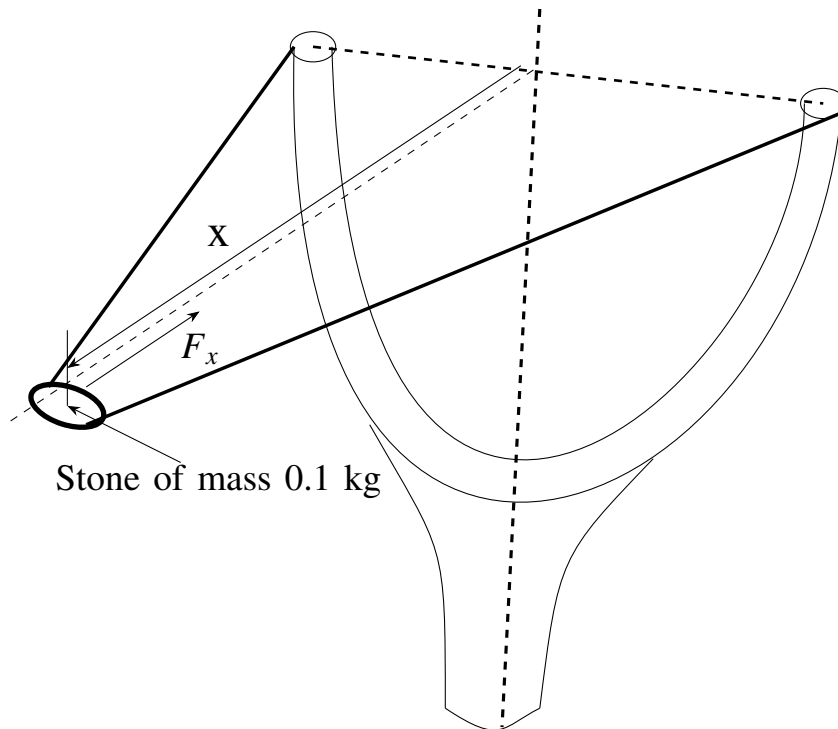


- a) 6.4
b) 9.0
c) 12.8
d) 25.6
- 2) The values of enthalpy of steam at the inlet and outlet of a steam turbine in a Rankine cycle are 2800 kJ/kg and 1800 kJ/kg respectively. Neglecting pump work, the specific steam consumption in kg/kW-hour is
- a) 3.6
b) 0.36
c) 0.06
d) 0.01
- 3) The integral $\int_1^3 \frac{1}{x} dx$, when evaluated by using Simpson's $\frac{1}{3}$ rule on two equal subintervals each of length 1, equals
- a) 1.000
b) 1.098
c) 1.111
d) 1.120
- 4) Two identical 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
- a) $\frac{81}{16}$
b) $\frac{27}{8}$
c) $\frac{9}{4}$
d) $\frac{3}{2}$
- 5) 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



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

- 6) 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



- a) 0.01 J
- b) 0.1 J
- c) 1 J
- d) 10 J

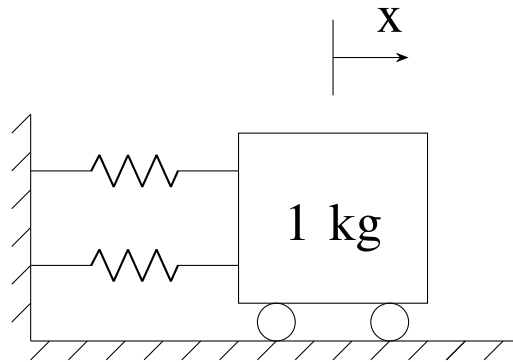
- 7) Consider the differential equation $\frac{dy}{dx} = (1 + y^2)x$. The general solution with constant c is

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

8) 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

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

9) 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



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

10) 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

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

11) 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 the 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

- a) 8 and 140
- b) 8 and 70
- c) 4 and 70
- d) 4 and 35

12) 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

- a) 48
 - b) 96
 - c) 302
 - d) 603
- 13) A pump handling a liquid raises its pressure from 1 bar to 30 bar. Take the density of the liquid as $990\text{kg}/\text{m}^3$. The isentropic specific work done by the pump in kJ/kg is
- a) 0.10
 - b) 0.30
 - c) 2.50
 - d) 2.93