ENGINEERING SCIENCE - CSEE 2002

Solutions from: Maktaba by TETEA

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i	ii	iii	iv	v	vi	vii	viii	ix	x
A	A	E	A	A	B	B	D	E	B

2. (a) Pressure = force/area

= (1 x 9.81)/0.1 = 98.1N/m^2

(b)Pressure = density x height x g

= 76 x 10^{-2} x 9.81 x 13600 = 101396.16 N/m^2

3.-u = 108km/h = 30m/s, v = 0m/s, time = 15s

From, v = u + at, a =-30/15

Acceleration = -2m/s^2

4. Density is the ratio between mass of a substance and its volume, while relative density is the ratio of density of a substance to density of water.

5. Power = force x distance/time

= 500 x 3.75/5 = 375 W

6. Resistivity is the ability of the material to resist the flow of current while temperature coefficient of resistance of a substance is the rise in resistance of a substance when temperature increases by 1K.

7. For parallel connections, the total resistance is given by,

R_T= 1/R_1 + 1/R_2 + 1/R_3 = ½ + 1/3 + 1/4 = 13/12

R_T = 0.92Ω

8. Given, 100rev/min = 10.5 rad/radius = 25cm

Velocity = angular velocity x radius

= 10.5 x 0.25

= 2.62 m/s

9.-u= -20cm, f = -12cm…….. (Apply real is positive convention

1/f = 1/u + 1/v so, 1/-12 = 1/v + 1/-20, v= -30 cm

Hence, nature is virtue since it is formed in front the mirror, position is 30 cm in front the mirror.

10. At STP, p = 101325 N/m^2, volume =? Temperature = 273K.

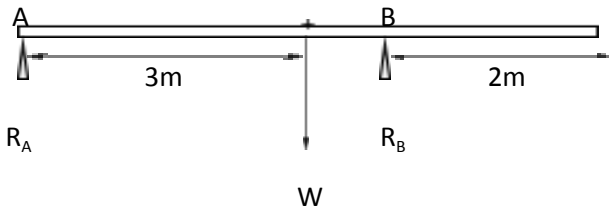
Apply general gas equation, PV/T = constant

So V = (490000 x 400 x 273)/ (303 x 101325) = 1743 ml

11. Q = MCT, mass = 80000 / (390 x 45) = 4.6

Requid mass = 4.6 kg.

12. Consider the figure below.



-Taking moments about A,

(20 x 9.81 x 3) = ($4R_B$), R_B = 147.15N, R_B = 49.05 N

13.-Total resistance = (1/50 + 1/30) + 62

= 80.75Ω

(a)total current, I = V/R = 230/80.75 = 2.85 A

Then, V = 62 x 2.85 = 176.6 v

Also, Pd between 50 Ω and 30 Ω = 230v – 176.6v = 53.41V

Then,A_2 = 53.41/50 = 1.07 A.

V = 176.6V, A_1 =2.85 A, A_2 = 1.07 A

(b)-Current in coil 30Ω = 2.85A-1.07A = 1.78A

Then, power = I^2R = $(1.78)^2$ x 30

Power = 95.25W

14. (a) v = u + at

= 0 + 0.2(16)

Velocity = 3.2m/s

(b) 13.89 = 0 + 0.2t

Time = 69.45 s

(c) s = ut + ½ at^2

$= 0 + ½ (0.2) (69.45)^2$

$= 482.3$ m

(d) $v = u + at$, $t = (v-u)/a$

$= ((50 – 30)/0.2) \times 36/10$

Time = 27.8s

$S = 0 + ½ (0.2) (27.8)^2$

Distance = 77.16m.

15. (a) Velocity ratio = radius/pitch

$= 250/8$

$= 31.25$

(b)Mechanical advantage = load/effort

$= (200 \times 9.81)/36$

$= 54.5$

(c)Efficiency = M.A/VR x 100%

$= 31.25/54.5 \times 100\%$

$= 57.3\%$

16. Let temperature be t.

-Latent heat of ice = 2kg x 335J/kg = 670J

- Sensible heat of ice = 2 x 4200 x (t) = 8400t J

-Sensible heat of water = 5 x 4200 x (38-t) = 21000(38-t) J

- Sensible heat of vessel = 0.2 x 4200 x (38 –t) J

Heat lost = heat gained

(21000(38-t) + 840(38-t) = (670 + 8400t)

$t = 27.4^0C$

Temperature of the water = 27.4^0C

END