ENGINEERING SCIENCE - CSEE 2006

Solutions from: Maktaba by TETEA

By Yohana Lazaro

1.

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

2. (a) Light energy is the form of energy that is detected by our eyes.

(b) Sound energy is the energy that is produced by vibrations of the material

3.

Fundamental quantity	SI unit
-time	-seconds
-current	-ampere
-temperature	-kelvin

4. Taking moments about R_1,

(90 x 200) = (R_2 x 300),R_2 = 60 N

Also, $R_1 + R_2 = 90$ N, $R_1 = 90$ N – 60 N = 30 N

Hence, reactions are 30 N and 60 N, respectively.

5. If 1 night = 24h, so 10nights = 240h

then, total power = 60W x 240h = 14.4kWh

then cost = 14.4 x 200 = 2880/=

6. Total volume of cork = 20/0.25 = $80cm^2$

-Volume of cork in water = 20/1 = $20cm^3$

Fraction = 20/80

= 1/4

7.-total internal resistance = 1 + 1 + 1 = 3Ω

Resistance of resistor = 5Ω

From, V = I(R + r), I = V/(R + r)

= 1.5/ (5 + 3)

= 0.1875A

8. Given, wavelength = 1.2 cm, frequency = 250 kHz

Recall that, speed, V = λ x f

Speed = 1.2 x 250000

=3000m/s

9. Parallelogram law of forces ''If two forces acting on a point, are represented in both magnitude and direction by two sides of a parallelogram drawn from one of its angular points, their resultant is represented both in magnitude and direction by the diagonal of the parallelogram passing through that angular point.''

Triangle law of forces states that ''if two forces acting on a point, are represented in both magnitude and direction by two sides of a triangle, their resultant is represented both in magnitude and direction by the hypotenuse of the triangle''

10. (a) Elasticity is the ability of the material to regain its original shape when the load is removed from it.

(b)Hook's law states that ''the applied force is directly proportional to extension, provided that the elastic limit is not exceeded.

11. Recall that, F = ma, acceleration, a = F/m = 25/0.5 = 50m/s^2

(a) V = u + at

= 0 + 50 x 20

Final velocity = 1000m/s

(b) $v^2 = u^2 + 2as$

$1000^2 = 2(50)$ (s)

Distance = 10000m

12.-Rate of flow = 600m^3/height = 49m

- From, mass = density x volume = 1000 x 600 = 600000 kg/s

Then, PE = mgh

= 600000 x 9.81 x 49

Hence, potential energy = 288.4 x 10^6 J/s

13.-mass = 20g, velocity, u= 16m/s, final, v = om/s, time = 0.05s

(a)depth = ?

- acceleration a = -16/0.05 = -320m/s^2

S = (16) (0.05) – ½ (320) $(0.05)^2$

Depth = 0.4m

(b)Retarding force = Ma

= 20 x 10^{-3} x (-320)

Retarding force = 6.4N

14.Let resistance of ammeter be G = 0.5Ω,its current be I_g = 0.1 A

(a)A shunt must be connected in parallel with galvanometer, i.e.

(I_g x G) = (I – I_g) x R

R = (I_g x G)/ (I – I_g) = (0.1 x 0.5)/ (2 – 0.1)

Shunt = 0.026Ω

(b)A multiplier must be connected in parallel with galvanometer, i.e.

V = I_g(R + G), 100 = 0.1(R + 0.5), solving for R

Required multiplier = 999.5Ω

15.u = 4cm, f = 5cm

-By using real is positive conversion,

1/f = 1/v + 1/u,1/-5 = 1/v + 1/-4, solving, v = 0.05cm

-nature of image is virtue as is formed behind the mirror because its distance is positive.

- position of image is 0.05cm from pole of the mirror.

-the image is diminished because is formed behind the mirror.

16.(a)From, density = mass /volume

Density of a solid = 100g/40cm^3

Density of a substance is 2.5 g/cm^3

(b)-total volume = 30 + 70 = 100 cm^3

-mass of copper sulphate solution = (30 x 1.2) = 36g

-mass of water = (1 x 70) = 70g

- total mass = 36 + 70 = 106g

From, total density = total mass / total volume

= 106/100

Hence, density of the resulting mixture = 1.06 g/cm^3

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