ENGINEERING SCIENCE - CSEE 2001

Solutions from: Maktaba by TETEA

By Yohana Lazaro

1.

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

2.(a)Power is the rate of doing a work.

(b)power = mass x distance ÷ time

= 200 x 6 ÷ 10

= 120 W

3.volume of cork in water = mass÷ density of water = 20÷1 = 20 cm^3

-volume of the cork = 20÷0.25 =80 cm^3

-fraction = 20/80 = 1/4

4.From, linear expansivity = length diff/(orig.length x temp.change)

Temp.change = length diff./(orig.lengh x coeff.)

=(100.6 - 100)/(100 x 2 x 10-5)

= 300°C

New temperature = 300 + 100

= 400°C

5.apply Cartesian conversion, f = +18cm, v= -6cm for convex mirror.

Then, 1/f = 1/v + 1/u. So, 1/18 =1/-6 + 1/u

Position of the object is 4.5cm infront of mirror.

6.(a)Angular motion is the motion of the body about a fixed point.

(b) Acceleration is the rate of changing velocity of the body.

(c)Elastic limit is the point at which abody will not gain it's original shape when it is exceeded.

7. V= 72km/h = 20m/s.At the point A, the initial velocity will be 72 km/h = 20m/s

From, $s = ut + \frac{1}{2}at^2$.So, $50 = 20(2) + \frac{1}{2}(a)(2)$

Acceleration is 10 m/s^2.

8.From, $P = VI^2$, $I = \sqrt{(60/250)} = 0.49A$.

$R = V/I = 250/0.49 = 510.3$ ohms

9.(a)Echo is the reflected sound.

(b) factor s affecting velocity of sound are:-

-temperature

-humidity

-direction of wind

10(a).Neutral point is the point at which the magnetic field is zero.

(b).Repulsion is the only tester for polarity of magnets because it can indicate that the two pokes in contact are the same,rather than using the attraction method.

11.From, Q = I x t. The coulumb s used = 1.10g÷ 0.00033g/c = 3333.33 C.

Then, time = (3333.33)÷ 0.5A

Time = 6666.7seconds

12.(a)-Given Tension used to drive = 1800N - 400N = 1400N

-Angular velocity = 300rev/min = 31.42 rad/s. (Use 1rev = 2π radians)

Then, linear velocity, V = Angular velocity x radius = 31.42 x (0.5/2) = 7.85m/s

Then, power, P = tension x linear velocity

= 1400N x 7.85 m/s

The power is 10995.57 W

(b)For hydraulic press, V.R = (big radius÷small radius)

= 8cm ÷ 2cm

Velocity Ratio = 4

13.Let the specific heat capacity of aluminium be C.

- heat lost by Aluminium = MCt = 40 x C x (200 -21.8) = 7128C J

-heat gained by water = 160 x 4.2 x (21.8-12) = 6585.6J

-heat gained by vessel = 24 x 0.39 x (21.8 - 12) =91.728J

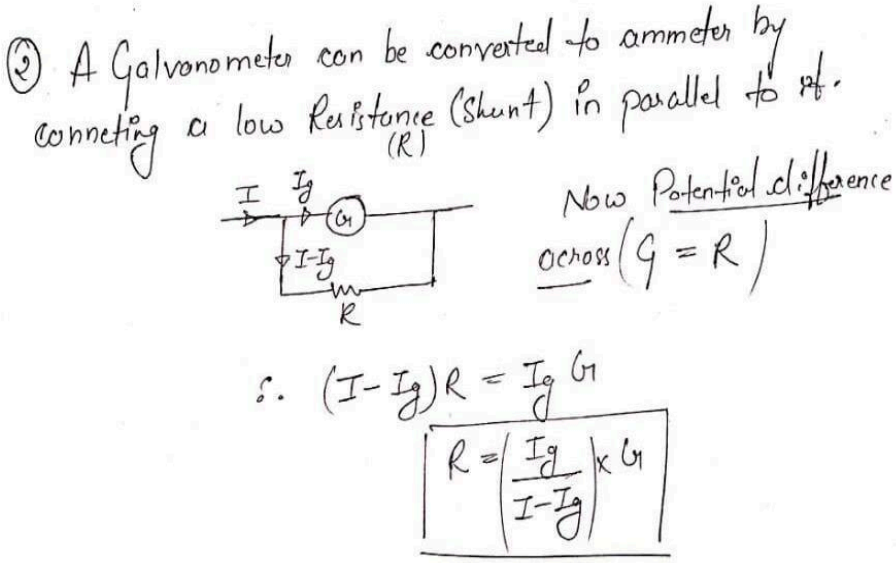
From energy conservation,

Heat gained = heat lost

(6585.6+91.728) = 7128C, on solving for C,

The specific heat capacity of Aluminium,C = 0.9368 J/gK or 936.8 J/kgK

14.Let resistance of galvanometer be G, its current be Ig, required resistance be R, new current be I.



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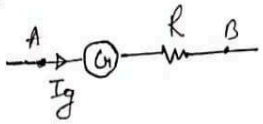
Then, R = (0.015/(1-0.015)) x 5

Required resistance is = 0.076 ohms

(1) Galvanometer can be converted to Voltmeter by connecting a high Resistance (multiplier) (R) in series with it.



Let current Ig shows maximum deflection in (G)

To measure maximum voltage 'V' by Voltmeter

$$V = I_g(R + G)$$

$$R = \frac{V}{I_g} - G$$

Then, R = 10/(0.015) - 5

Required resistance is 4.985 ohms

15.(a)First find the acceleration.

From, $s = ut + \frac{1}{2}at^2$, but u = 0m/s.

$18 = 0 + \frac{1}{2}(a)(8-3)^2$, acceleration is 1.44 m/s^2.

Then, from V= u + at

V = 1.44 x 5

Velocity will be 7.2 m/s.

(b) -Given,w1 = 0rad/s, w2 = ?,time,t 50seconds

From, w2 = w1 + at

= 0 + (2)(50)

Angular velocity attained is 100 rad/s^2.

-Also, Average angular velocity = (w1+w2)/2 = (0+100)/2 = 50 rad/s.

Then, angle turned = 50 rad/s x 50s = 2500 radians.

Then, from 1 rev = 2π radians,so 2500 radians = 398 revolutions.

16.-Area = $\pi(0.03)^2/4 = 0.0007069m^2$

-stress = load÷area = 100000/0.0007069

$=141.47 \times 10^{32}\ N/m^2$

From, E = stress/strain, strain = stress÷ E

Strain = $(141.47 \times 10^{32}) \div (200 \times 10^{33})$

= 0.0007074

Then, strain = extension÷original length

Extension= strain x orig length

= 0.0007074 x 4

Hence, extension is 0.00283 m or 2.83mm

Prepare by:-

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