ENGINEERING SCIENCE - CSEE 2004

Solutions from: Maktaba by TETEA

By Yohana Lazaro

1.

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

2.-U=20cm, f=12cm

Apply the real is positive convection,

1/f = 1/v + 1/u, 1/-12 = 1/v + 1/20, on solving, v = -7.5cm

-Nature of image is inverted

-position of the image is 7.5 cm in front of the mirror.

3.(a)Power is the rate at which a work is done.

(b) power = 100 x 10 x 3/5

= 600W

4.For hydraulic press, velocity ratio is given by,

VR = $\frac{Radius\ of\ large\ piston}{radius\ of\ small\ piston}$ = 80mm/20mm

The velocity ratio = 4

5. Rated 240V-60W

(a) this means that the lamp is to be supplied pd of 240V in order to reach its power of 60W, where it will operate at its normal brightness.

(b)From, power = V I = (I R) I = I^2 R

I = 60/240 = 0.25 A, I^2 = 0.0625

Then, R = P/I^2 = 60/0.0625

Resistance = 960Ω

6.Anomalous expansion of water is the unique tendency of water to expand when its temperature changes from -4^0C to 0^0C.

7.Factors affecting the velocity of sound

-temperature

-humidity

-direction of wind

8.Polarization in leclanche cell is the defect that occurs in simple cells due to the accumulation of hydrogen gas around the positive electrode. It is prevented by holding the mixture of crushed carbon with manganese oxide close to the positive electrode.

9.time used = 8-3 = 5s

U = 0m/s, v =? From velocity = displacement/time

= 18/5

The velocity will be 3.6 m/s

10.The burn by steam is much because the steam contains the heat energy of boiling water along with latent heat of vaporization, on which it releases on contact with the skin, hence penetrates easily.

11.Resistivity is the ability of the body to resist the flow of current while temperature coefficient is the ability of a material to change its resistance when the temperature increases.

12.
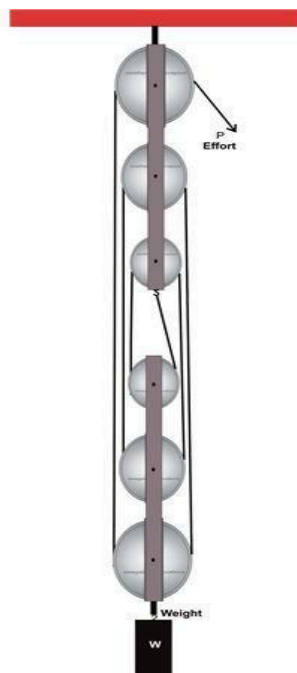
(b)Efficiency = MA/VR x 100%

= (4500/1000) x 100%

= 75%

(ii)-work done by load = 500 x 9.81 x 2 = 9810J

-work done by effort = 1000 x 2 = 2000J

-Energy lost = 2000 – 9810 = -7810J

The negative sign implies that energy was lost.

13.(a)Law of flotation states that '' A floating body displaces its own weight of liquid in which it floats''

   (b) Let volume of brass be V

      -Since total mass of brass and wood = total mass of displaced water

   $(8.5V + 100) = (V + 20)$ x $1g/cm^3$

   Volume = 11 cm^3

14.(a)Coefficient of linear expansion is the fraction increase in length of a material when its temperature raises by 1K
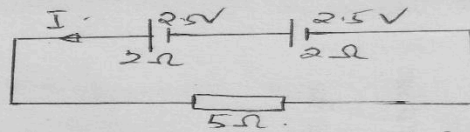
   (b)initial length = 50 cm, new length = 50.35cm

      Extension = 50.35 – 50 = 0.35cm

   Then, $\alpha = 0.35/ (50(t_2 – 15^0)$, $t_2 = 598.3^0C$

Required temperature is 598.3^{0}C

15.(a)Ohm's law states that ''the p.d is directly proportional to the applied current at constant temperature''

(b) (i) Series Connection.

For series connection, Total Resistance,
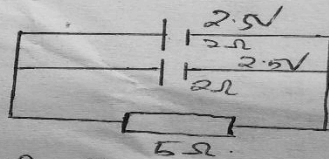$R_T = 2\Omega + 2\Omega + 5\Omega$
$R_T = 9\Omega$
But $I = V/R_T$ ⟹ $V_T = 2.5 + 2.5$
$= 5V.$

Then, $I = \dfrac{5V}{9\Omega}$

∴ Current in series is 0.56A.

(ii) For Parallel Connection

Total Resistance $= \dfrac{1}{2} + \dfrac{1}{2} + \dfrac{1}{5}$
$= 0.83\Omega.$

Total P.d $= 2.5V.$

So, $I = V/R = \dfrac{2.5V}{0.83\Omega}.$

∴ Current is 3 A.

16.(a) law of electromagnetic induction states that ''electromotive force is induced whenever there is change in magnetic flux linking the conductor, and its magnitude is proportional to the rate of changing magnetic fluxes''

(b) Let E_1 = 240 V, E_2 = 6V

from, $N_1/N_2 = E_1/E_2$

$= 240/6$

$= 40$

(ii) AT no loss in transformer, the ratio will be 1, because the input current will be equal to output current.

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