ENGINEERING SCIENCE - CSEE 2005

Solutions from: Maktaba by TETEA

By Yohana Lazaro

1.

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

2.volume of 50 pins = 50 x 0.1 = 5cm^3

 - new reading = 5 + 20 = 25cm^3

3.(a) seismograph

 (b) hygrometer

 (c)thermometer

 (d)voltmeter

4.(a)mass of liquid displace = volume of wood x density of liquid

$$= 30 \times 1.2 = 36g$$

 (b)mass of the wood = 0.9 x 30 = 27g

  -fraction = 27/36

$$= 3/4$$

5.Anomalous expansion of water is the abnormal tendency of water to expand, instead of contracting when its temperature goes from4^{0}C to 0^{0}C, hence become less dense.

6.At STP, Pressure = 760mmHg, temperature = 273K, volume =?

 Recall that, PV/T = constant so constant = (740 x 300)/ (273 + 30) = 732.67

Then, volume at stp = (273 x 732.67) / 760 = 263.18 cm^2

7.Factors affecting velocity of sound; -

 (a)humidity

 (b)temperature

 (c)direction of wind

8.(a)For parallel connections, $1/R_T = 1/R_1 + 1/R_2 + 1/R_3$

$$= 1/2 + 1/3 + 1/4$$

$R_T = 0.92\Omega$

Hence, the single resistor required = 0.92Ω

9.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.

10.Temperature coefficient of resistance is the measure of change of resistance of a substance per ^0C, WHILE resistivity is the measure of change of resistance of a substance.

11.-work done output = 250 x 25 = 6250 W

 Efficiency = work done output / work done input x 100%

   = 6250/7500 x 100%

   = 83.3%

12.-Area of the punching = 12 x 12 = 144 mm^2

  -shear stress = 350N/mm^2

  -Area of the punch = length x thickness = 12 x 1.6 = 19.2mm^2

 (a)Force = area of the punching die x shear stress

   = 144 x 350

   = 50400N

  (b)Compressive stress = force/ area of the punch

   = 50400/19.2

   =2625N/mm^2

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

  (b)Let volume of brass be V

   -then, since total mass of brass and wood = total mass of displaced water. So,

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

    Volume, V = 11 cm^3

14.(a)Coefficient of linear expansion is the fractional increase in length of a substance when its temperature raises by 1K.

  (b)initial length = 50cm

   - new length = 50.35cm

   - extension = 50.35 – 50 = 0.35cm

From, $\alpha = (l_2 - l_1)/l_1(t_2 - t_1)$, so $0.000012 = (50.35 - 50)/50(t_2 - 15^0C)$, $t_2 = 598.3$

Required temperature = 598.3^0C

15-height of image, h_i = 1cm, height of object, h_o = 2.5mm, u = 5cm

From magnification, $M = h_i/h_o = v/u$

V = (1 x 5)/0.25

Position of image, v = 20 cm.

Again, recall that, $1/f = 1/v + 1/u$, applying real is positive,

1/f = 1/-20 + 1/-5

Focal length = 4cm Infront of the mirror.

16.Let, internal resistance be r,

Emf be E

Then, from E = I (R + r)

E = 0.6(2 + r) -------------(i)

Also, case ii,

E = 0.2(7 + r)---------------(ii)

Solving the two simultaneous equations, E = 1.5, r = 0.5

The emf is 1.5V, and the internal resistance is 0.5Ω

Prepared by; -

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