

Th foundation #

ws-7

Task

(1)

Upper fixed point = U.F.P = 95°C ; Lower fixed point = L.F.P = 5°C

$\theta_1 = 59^{\circ}\text{C}$

We know that
$$\frac{\theta_1 - \text{L.F.P.}}{\text{U.F.P.} - \text{L.F.P.}} = \frac{\theta_2 - \text{L.F.P.}}{\text{U.F.P.} - \text{L.F.P.}}$$

$$\Rightarrow \frac{59-5}{95-5} = \frac{C-0}{100-0}$$

$$\Rightarrow \frac{546}{94} = \frac{C}{100} \Rightarrow \frac{6}{10} = \frac{C}{100}$$

$$\Rightarrow C = 60^{\circ}\text{C}$$

(2)

L.F.P = 10° ; U.F.P = ? $\theta_2 = 50^{\circ}$; $\theta_1 = 60^{\circ}$

We know that
$$\frac{\theta_1 - \text{L.F.P.}}{\text{U.F.P.} - \text{L.F.P.}} = \frac{\theta_2 - \text{L.F.P.}}{\text{U.F.P.} - \text{L.F.P.}}$$

$$\Rightarrow \frac{60-10}{\text{U.F.P.}-10} = \frac{50-0}{100-0}$$

$$\Rightarrow \frac{50}{\text{U.F.P.}-10} = \frac{50}{100}$$

$$\Rightarrow 50 \times 2 = \text{U.F.P.} - 10$$

$$\Rightarrow \text{U.F.P.} = 110^{\circ}\text{C}$$

(3)

Given

$$F = 30^\circ\text{C}$$

we know $C = \frac{5}{9} (F - 32)$

$$\Rightarrow \frac{F}{3} = \frac{5}{9} (F - 32)$$

$$\Rightarrow 3F = 5F - 160$$

$$\Rightarrow 2F = 160 \Rightarrow F = 80^\circ\text{F}$$

(4)

$$C = \frac{1}{10} F$$

we know $C = \frac{5}{9} (F - 32)$

$$\Rightarrow \frac{F}{10} = \frac{5}{9} (F - 32)$$

$$\Rightarrow 9F = 50F - 1600$$

$$\Rightarrow 41F = 1600 \Rightarrow F = \frac{1600}{41} = 39.1^\circ\text{F}$$

$$\Rightarrow 9F = 50(F - 32) \Rightarrow 9F = 50F - 1600$$

$$\Rightarrow 41F = 1600 \Rightarrow F = \frac{1600}{41} = 39.1^\circ\text{F}$$

$$C = \frac{1}{10} 39 = 3.9^\circ\text{C}$$

(5)

$$C = 60^\circ\text{C} ; F = 141^\circ\text{F}$$

we know that $C = \frac{5}{9} (F - 32) ; F = 140^\circ\text{F}$

$$\Rightarrow \frac{12}{60} = \frac{5}{9} (F - 32) \quad \text{So error is}$$

$$= 141 - 140$$

$$= 1^\circ\text{F}$$

$$\Rightarrow 12 \times 9 = F - 32$$

$$\Rightarrow 108 = F - 32$$

(6)

$$k = 2010$$

we know $k = 273 + C$

$$\Rightarrow C = k - 273 = 20 - 273 = -253^\circ C$$

we know

$$C = \frac{5}{9} (F - 32)$$

$$\Rightarrow -253 = \frac{5}{9} (F - 32)$$

$$\Rightarrow -253 \times \frac{9}{5} = F - 32$$

$$\Rightarrow 12 = -423.4 F$$

$$\Rightarrow -455.4 = F - 32$$

(7)

$$L \cdot F \cdot P = 3^\circ ; U \cdot F \cdot P = 102^\circ ; \theta_c = 80$$

we know that

$$\frac{\theta_c - L \cdot F \cdot P}{U \cdot F \cdot P - L \cdot F \cdot P} = \frac{C - L \cdot F \cdot P}{U \cdot F \cdot P - L \cdot F \cdot P}$$

$$\Rightarrow \frac{80 - 3}{102 - 3} = \frac{C - 0}{100 - 0}$$

$$\Rightarrow \frac{77}{99} = \frac{C}{100} \Rightarrow \frac{7}{9} = \frac{C}{100}$$

$$\Rightarrow C = \frac{7}{9} \times 100 = 77.77^\circ C$$

(8)

$$F = 2C$$

$$\text{we know that } C = \frac{5}{9} (F - 32)$$

$$\Rightarrow \frac{F}{2} = \frac{5}{9} (F - 32)$$

$$\Rightarrow 9F = 10(F - 32)$$

$$\Rightarrow 9F = 10F - 320 \Rightarrow F = 320 F$$

(1)

$$L \cdot F \cdot P = 0^\circ C ; U \cdot F \cdot P = 80^\circ C ; C = -39^\circ C$$

$$\text{we know } \frac{R_1 - L \cdot F \cdot P}{U \cdot F \cdot P - L \cdot F \cdot P} = \frac{C - L \cdot F \cdot P}{U \cdot F \cdot P - L \cdot F \cdot P}$$

$$\Rightarrow \frac{R_1 - 0}{80 - 0} = \frac{-39 - 0}{100 - 0}$$

$$\Rightarrow \frac{R_1}{80} = \frac{-39}{100} \Rightarrow R_1 = -\frac{4}{5} \times 39$$

$$\Rightarrow R_1 = -31.2^\circ R$$

(2)

$$k = 200k$$

$$; C = -273 - 200 = 12 - 273 = 200 - 273$$

$$C = -73^\circ C$$

we know

$$C = \frac{5}{9} (F - 32)$$

$$\Rightarrow -73 = \frac{5}{9} (F - 32)$$

$$\Rightarrow F - 32 = \frac{-73 \times 9}{5} = -131.4$$

$$\Rightarrow F = -131.4 + 32 = 99.4^\circ F$$

Advanced level

(2)

$$C = 50^\circ C$$

$$C = \frac{5}{9} (F - 32)$$

$$\text{From } R = \frac{4}{5} C$$

$$\Rightarrow \frac{10}{5} = \frac{5}{9} (F - 32)$$

$$= 273 + 50$$

$$= 323 K$$

$$\Rightarrow 10 = \frac{1}{9} (F - 32)$$

$$\Rightarrow F - 32 = 90$$

$$\Rightarrow F = 122^\circ F$$

$$\Rightarrow R = \frac{4}{5} \times 50$$

$$= 40R$$

(3)

$$k = 200 \text{ k}$$

we know $k = 273 + c$

$$\Rightarrow c = k - 273 = 200 - 273$$

$$= -73^\circ \text{C}$$

(8)

Given $c = 37^\circ \text{C}$

we know $k = 273 + c$

$$= 273 + 37$$

$$= 310 \text{ K}$$

(9)

Given $F = 100^\circ \text{F}$

From $\frac{F - 32}{180} = \frac{R}{360}$

$$\Rightarrow \frac{100 - 32}{180} = \frac{R}{360} \Rightarrow \frac{R}{4} = \frac{68}{9} = 7.555$$

$$\Rightarrow R = 4 \times 7.555 = 30.22^\circ \text{F}$$

(10)

$$c = 100^\circ \text{C}$$

$$k = 273 + c = 273 + 100 = 373 \text{ K}$$

$k = \frac{5}{9}(F - 32)$; From $\frac{R}{4} = \frac{c}{5}$

$$\Rightarrow \frac{20}{100} = \frac{R}{4} \Rightarrow \frac{R}{4} = \frac{100 \times 20}{5}$$

$$\Rightarrow 20 \times 4 = F - 32 \Rightarrow \frac{R}{4} = 20 \Rightarrow R = 80^\circ \text{F}$$

L.Tosk

SAG

(1)

Given $C = 35^\circ\text{C}$

We know $C = \frac{5}{9} (F - 32)$

$$\Rightarrow \frac{5}{35} = \frac{5}{9} (F - 32)$$

$$\Rightarrow 5 = \frac{1}{9} (F - 32) \Rightarrow F - 32 = 9 \times 5$$

$$\Rightarrow F - 32 = 45$$

$$\Rightarrow F = 77^\circ\text{F}$$

(2)

$L.F.P = 4^\circ\text{C}$; $U.F.P = 94^\circ\text{C}$

$$\text{We know } \frac{\theta_1 - L.F.P}{U.F.P - L.F.P} = \frac{\theta_2 - L.F.P}{U.F.P - L.F.P}$$

$$\Rightarrow \frac{C - 4}{94 - 4} = \frac{C - 0}{100 - 0} \Rightarrow \frac{C - 4}{94} = \frac{C}{100}$$

$$\Rightarrow 10(C - 4) = 9C \Rightarrow 10C - 40 = 9C$$

$$\Rightarrow C = 40^\circ\text{C}$$

(3)

$F = 32$

$$\text{We know } \frac{F - 32}{180} = \frac{R}{80}$$

$$\Rightarrow \frac{F - 32}{9} = \frac{1}{4} \cdot \frac{F}{3}$$

$$\Rightarrow 12(F - 32) = 9F$$

$$\Rightarrow 4F - 128 = 3F \Rightarrow F = 128^\circ\text{F}$$

(4)

$$L.F.P = 20^{\circ}C \quad ; \quad U.F.P = 120^{\circ}C \quad ; \quad P = 98.6^{\circ}F$$

$$\text{we know} \quad \frac{\theta_1 - L.F.P}{U.F.P - L.F.P} = \frac{\theta_2 - L.F.P}{U.F.P - L.F.P}$$

$$\Rightarrow \frac{\theta_1 - 20}{120 - 20} = \frac{98.6 - 32}{212 - 32}$$

$$\Rightarrow \frac{\theta_1 - 20}{100} = \frac{66.6}{180}$$

$$\Rightarrow \theta_1 - 20 = \frac{5}{9} \times 66.6 \Rightarrow \theta_1 = \frac{5}{9} \times 66.6 + 20 = 57^{\circ}C$$

(6)

$$L.F.P_1 = 20^{\circ}C \quad ; \quad U.F.P_1 = 150^{\circ}C \quad ; \quad \theta_1 = 60^{\circ}C$$

$$\text{we know that} \quad \frac{\theta_1 - L.F.P_1}{U.F.P_1 - L.F.P_1} = \frac{\theta_2 - L.F.P_2}{U.F.P_2 - L.F.P_2}$$

$$\Rightarrow \frac{60 - 20}{150 - 20} = \frac{40 - 0}{100 - 0} \Rightarrow \frac{40}{130} = \frac{40}{100}$$

$$\Rightarrow \theta_2 = \frac{400}{130} \quad \theta_1 - 20 = \frac{60 - 0}{100 - 0} \Rightarrow \theta_1 - 20 = \frac{3 \times 100}{5}$$

$$\Rightarrow \frac{\theta - 20}{150 - 20} = \frac{60 - 0}{100 - 0} \Rightarrow \frac{\theta - 20}{130} = \frac{60}{100}$$

$$\Rightarrow \frac{\theta - 20}{130} = 0.6 \Rightarrow \theta - 20 = 78 \Rightarrow \theta = 98^{\circ}C$$

(7)

Take Tark ① a solution.

(8)

$$F = 2C$$

we know that $C = \frac{5}{9}(F - 32)$

$$\Rightarrow C = \frac{5}{9}(2C - 32)$$

$$\Rightarrow 9C = 10C - 160$$

$$\Rightarrow C = 160^\circ\text{C}$$