

Student ID: - 1802396

Student Name: - Lloyd John

Module Title: - Engineering science two

Module Code: - M4X00386

Date: - 06/05/2020

Starting Time of the Exam: - 13:00

Q1

(i) ~~Pth~~

$$V = IR$$

$$\frac{1}{R_T} = \frac{1}{2} + \frac{1}{2}$$

$$V = 1V$$

~~Wattage~~

$$I = 1A$$

$$R = 1\Omega$$

$$V = 1 \times 1$$

(ii) $V = \mathcal{E} - Ir$

$$V = IR$$

$$6 \times 1 = 6$$

$$9 - 1 - 6$$

$$\frac{3 - V}{I} = r$$

$$\frac{9 - 7}{1} = 2$$

$$r = 2\Omega$$

$$V = 6 + 1 = 7V$$

$$I = 1A$$

$$\mathcal{E} = 9V$$

$$r = ?$$

(iii)

$$P = IV$$

$$I = 1$$

$$V =$$

$$P = 1 \times 9$$

$$P = ?$$

$$P = 9W$$

$$W = J/s$$

$$J = S \times W$$

$$J = 9 \times 300$$

$$J = 2700J$$

Q1

10

(iv) Low internal ^{resistance} ↓ Allows the system to have a great current and less voltage loss.

$$\frac{1}{R} + \frac{1}{R} = \frac{1}{R}$$

$$V = V$$

$$V = I + R = V$$

$$I = I$$

$$V = 3$$

$$P = 1$$

$$VI - 3 = V \quad (ii)$$

$$VI = IR$$

$$0 = 1 \times 3$$

$$2 - 1 = P$$

$$r = \frac{V - E}{I}$$

$$0 = \frac{V - P}{I}$$

$$R = 1$$

$$I = I$$

$$= V$$

$$P = 9$$

$$VI - 9$$

$$P \times I = 9$$

Q2

a) Produces the same heating effect as dc equivalent.

b) $V_0 = V_{rms} \times \sqrt{2}$

$$V_0 = 230 \times \sqrt{2}$$

$$V_0 = 325.27V$$

c)

$$I_{rms} = 0.26A$$

$$V_{rms} = 230V$$

$$P = V_{rms} \times I_{rms}$$

$$P = 230 \times 0.26$$

$$P = 59.8W$$

d) $F = \frac{1}{T}$

$$T = \frac{1}{F}$$

$$T = \frac{1}{50}$$

$$T = 0.02s$$

e) (i)

1 Wave Form = 4 squares

~~$$F = \frac{1}{4 \times 10^{-3}}$$~~

$$F = \frac{1}{4 \times 10^{-3}}$$

$$F = 250Hz$$

Q2

(ii)

$$V_{rms} = \frac{V_0}{\sqrt{2}}$$

$$V_{rms} = \frac{45}{\sqrt{2}}$$

$$V_{rms} = 31.82V$$

(iii)

$$V_0 = 45V$$

(iv)

$$45 \times 2$$

$$\text{peak to peak} = 90V$$

(v)

The line would just go up and down in a single line.

(vi)

in 10ms there's 2.5

$$10ms = 2.5 \times 4 = 10$$

there would be 4 times the amount of complete cycles

Q3

a) ~~the capability system to hold charge~~ The ability of a system to hold charge.

b)

$$(i) E = \frac{1}{2} CV^2$$

$$E = 0.5 \times 330 \times 10^{-6} \times 9^2$$

$$E = 0.013$$

(ii)

$$\tau = RC$$

$$\tau = 470 \times 10^3 \times 330 \times 10^{-6}$$

$$\tau = 155.1s$$

(iii)

$$V_0 e^{-\frac{t}{RC}}$$

$$V_0 e^{-\frac{60}{155.1}}$$

$$V = 6.11V$$

Q4

~~Derive~~ $\Delta U = Q - W$

$$P = 100 \text{ kPa}$$

$$W_e = \Delta I \Delta T$$

$$\alpha = 0.35721$$

$$\therefore V =$$

$$m = 5 \text{ kg}$$

$$V_{fg} = V_g - V_f$$

$$T_1 = 99.61^\circ\text{C}$$

$$V_{fg} = 1.6941 - 0.001043$$

$$V_1 = V_2$$

$$= 1.6931$$

$$T_2 =$$

$$V = 1.6931 \times 5 = 8.46 \text{ m}^3$$

$$P_2 = ?$$

$$V = 8.46 \text{ m}^3$$

P_2 is

$$H = U + P \cdot V$$

Q 5

$Q = 10\%$ of $\dot{w}_{in}$

$$P_1 = 120 \text{ kPa}$$

$$\dot{w}_{in} = 4 \text{ kW}$$

$$T_1 = 20^\circ\text{C}$$

$$P_2 = 1000 \text{ kPa}$$

$$T_2 = 300^\circ\text{C}$$

$$\dot{Q} = 0.1 \times 4000 = -400 \text{ W/s}$$

$$\sum \dot{m}_{in} = \sum \dot{m}_{out} \text{ (kg/s)}$$

$$\dot{m}_1 = \dot{m}_2$$

$$-400 + 400 = \sum \dot{m}_{out} h_2 = \sum \dot{m}_{in} h_1$$

$$\dot{Q} + \dot{W} = \sum \dot{m}_{out} h_2 - \sum \dot{m}_{in} h_1$$

$$\dot{Q} - \dot{W} = \dot{m} (h_2 - h_1)$$

$$\dot{Q} - \dot{W} = \dot{m} \times c_p (T_2 - T_1)$$

$$\frac{\dot{Q} - \dot{W}}{c_p (T_2 - T_1)} = \dot{m}$$

$$\frac{(-400) - (-4000)}{1.005 \times (300 - 20)} = \dot{m}$$

$$\dot{m} = 12.79 \text{ kg/s}$$

Q 5

(ii)

$$P \cdot V = R \cdot T$$

$$\frac{R T_1}{P_1} = V_1$$

$$\frac{0.2870 \times (20 + 273)}{120}$$

$$= 0.7007 \text{ m}^3/\text{kg}$$

$$\dot{V}_1 = V_1 \times \dot{m} = 0.7 \times 12.79$$

$$\dot{V}_1 = 8.953 \text{ m}^3/\text{s}$$

$$\dot{V}_1 = 8953 \text{ L/s}$$

$$\frac{R T_2}{P_2} = V_2$$

$$\frac{0.2870 \times (300 + 273)}{1000}$$

$$= 0.1644 \text{ m}^3/\text{kg}$$

$$\dot{V}_2 = V_2 \times \dot{m} = 0.1644 \times 12.79$$

$$\dot{V}_2 = 2.103 \text{ m}^3/\text{s}$$

$$\dot{V}_2 = 2103 \text{ L/s}$$

Q6

$$m_i - m_e = m_2 - m_1$$

$$Q - W = \sum_{\text{out}} m h - \sum_{\text{in}} m h + (m_2 u_2 - m_1 u_1)$$