Ans:1 i)

$$i_1 = \frac{-5-0}{1-0} = -5 \qquad 0 < t < 1 \qquad \boxed{i = \frac{dq}{dt}}$$
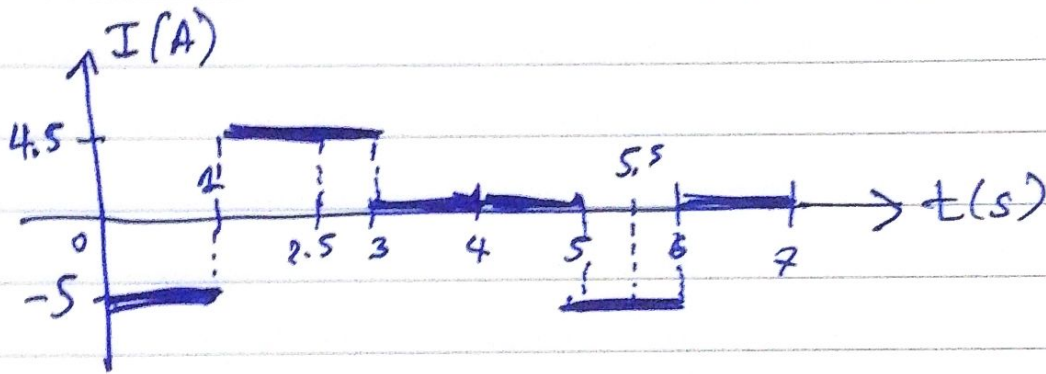
$$i_2 = \frac{4-(-5)}{3-1} = 4.5 \qquad 1 < t < 3$$

$$i_3 = 0 \qquad\qquad 3 < t < 4$$

$$i_4 = 0 \qquad\qquad 4 < t < 5$$

$$i_5 = \frac{-5-0}{6-5} = -5 \qquad 5 < t < 6$$

$$i_6 = 0 \qquad\qquad 6 < t < 7$$

$$t = 2.5, \qquad\qquad t = 5.5,$$
$$i = 4.5A, \qquad\qquad i = -5A$$

Ans:1 ii)

Max Power, $P = I^2 R = (-5)^2 \times 20 = 500 \, W$

Time: $0 < t < 1$, $5 < t < 6$ (when $I = -5A$)

Ans: 2a)

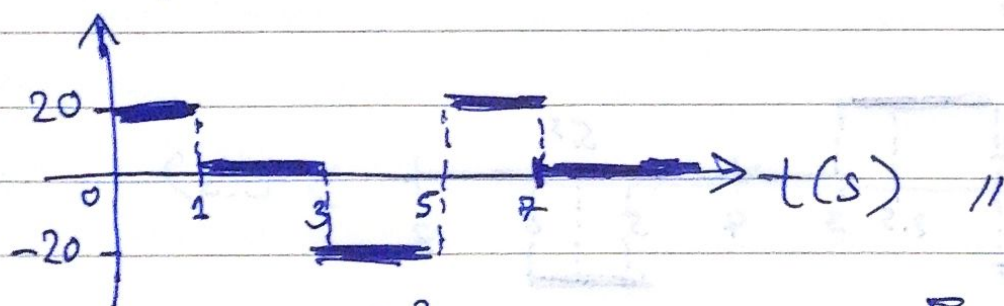$$i_1 = \frac{20 - 0}{1 - 0} = 20 \qquad 0 < t < 1 \qquad \left[i = \frac{dq}{dt} \right]$$

$$i_2 = 0 \qquad\qquad\qquad 1 < t < 3$$

$$i_3 = \frac{-20 - 20}{5 - 3} = -20 \qquad 3 < t < 5$$

$$i_4 = \frac{20 - (-20)}{7 - 5} = 20 \qquad 5 < t < 7$$

$$i_5 = 0 \qquad\qquad\qquad t > 7$$

$$i = \begin{cases} 20 & 0 < t < 1, \; 5 < t < 7 \\ -20 & 3 < t < 5 \\ 0 & 1 < t < 3, \; t > 7 \end{cases} \;//$$

i (mA)

Ans: 2b)

$$W = \int_0^3 P \, dt$$

$$= \int_0^3 I^2 R \, dt$$

$$= 2 \int_0^3 I^2 \, dt$$

$$= 2 \left[\int_0^1 20^2 \, dt + \int_1^3 0^2 \, dt \right]$$

$$= 2 \left[[400t]_0^1 + 0 \right]$$

$$= 2 \times 400 \times 1$$

$$= 800 \; \mu J \; //$$