BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT: ENGINEERING AND PHYSICS

PROGRAMME BSc HONOURS DEGREE IN COMPUTER SCIENCE

COURSE CODE PH206 (3): ELECTRONICS 1

DURATION: 3 HOURS TOTAL MARKS: 100

INSTRUCTIONS TO CANDIDATES

Answer **question one** in Section A and **any three** questions from Section B. Section A carries 40 marks and each question in Section B carries 20 marks

SECTION A

1 (a) Convert the following from rectangular to polar form: $C = -6 + j\,3$. [4]

(b) Determine the sum of $C_1 = 3 + j\,6$ and $C_2 = -6 + j\,3$. [4]

(c) Find the product of C_1 and C_2 if $C_1 = -2 - j\,3$ and $C_2 = 4 - j\,6$. [4]

(d) Given that $C_1 = 2\angle -40°$ and $C_2 = 7\angle 120°$, calculate the product of C_1 and C_2. [4]

(e) Transform the following sinusoid in time domain to phasor domain: v = - 4sin(30t + 50°) V. [5]

(f) Convert the sinusoid corresponding to the following phasor to time domain: $\mathbf{I} = 12 + j\,5$ A. [5]

(g) The instantaneous current of an ac sinusoidal current is given by $= I_m cos\omega t$. Show that $I_{rms} = \frac{I_m}{\sqrt{2}}$. [6]

(h) Distinguish between ideal and practical sources in electric circuit theory. [2]

(i) Use resistor colour codes to determine the resistances of resistors with the following band colours:

(1) green, brown, blue, silver. [2]
(2) yellow, violet, silver. [2]
(3) grey, red, gold. [2]

SECTION B

2 (a) Using the Wye-Delta transformation, determine the resistance between P and Q of the network shown in Fig. 2.1. [20]

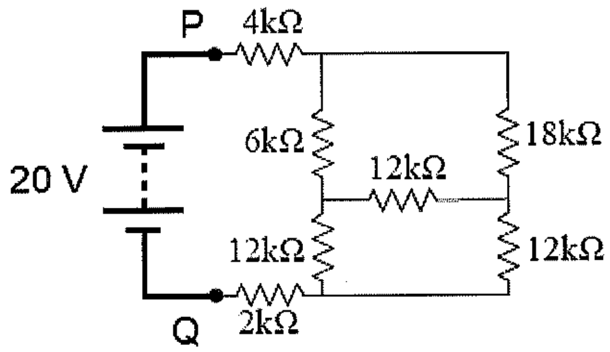

Fig. 2.1

(b) Calculate the source current. [2]

3 (a) Determine the current through the 1 Ω resistor in the circuit in Fig. 3.1 using the Superposition Theorem. [17]

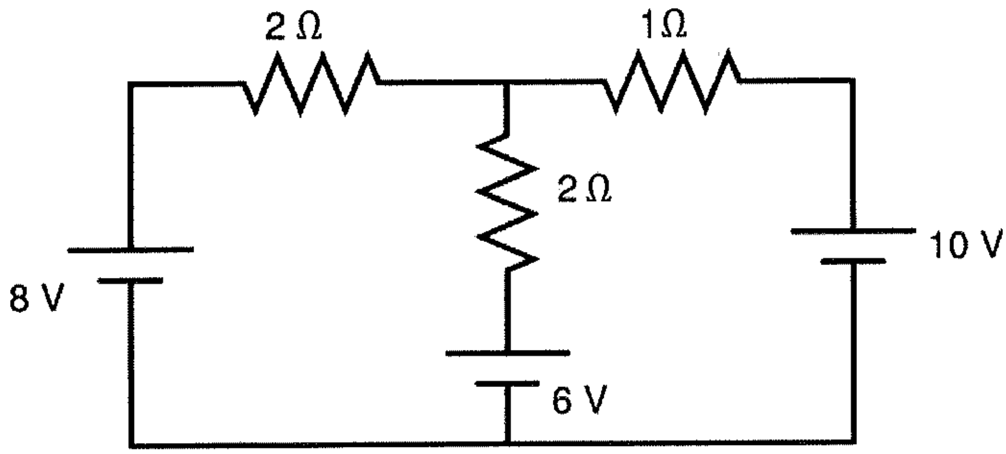

Fig. 3.1

(b) Calculate the amount of heat energy dissipated in the 1 Ω resistor in part (a) over a time interval of 1 hour. [3]

4 In the network of Fig. 4.1, find the Thevenin voltage (V_{TH}), Thevenin resistance (R_{TH}) and the load current I_L flowing through and load voltage (V_L) across the load resistor R_L = 10 Ω using Thevenin's Theorem. [20]

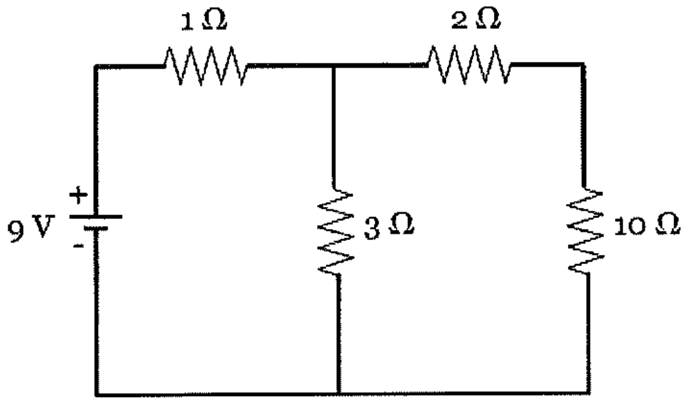

Fig. 4.1

5 In the network of Fig. 5.1, find the Norton current (I_N), Norton resistance (R_N) and the load current I_L flowing through and load voltage (V_L) across the load resistor R_L = 1.5 Ω using Norton's Theorem. [20]

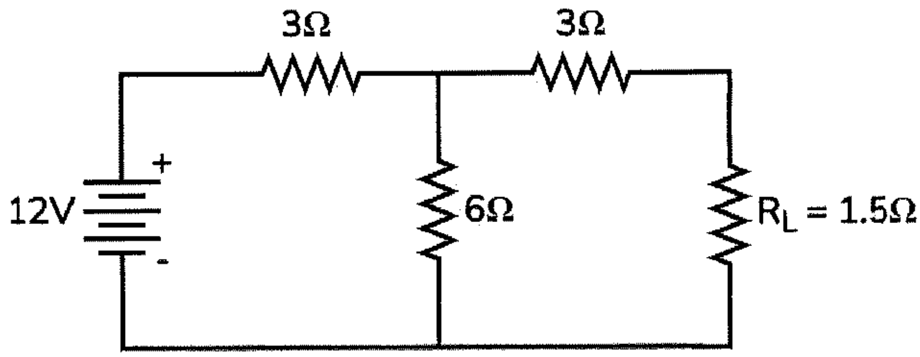

Fig. 5.1

6 (a) A 500 μH inductor, 80 pF capacitor and a 628 Ω resistor are connected to form a series RLC circuit. Calculate

(i) the resonant frequency. [4]

(ii) Q-factor of this circuit at resonance. [4]

(b) Find the instantaneous value of alternating voltage $v = 10 \sin (3\pi\times10^4 t)$ V at

(i) 0 s. [2]

(ii) 50 μs. [2]

(iii) 75 μs. [2]

(c) The current in an inductive circuit is given by $0.3 \sin (200t - 40°)$ A. Obtain the equation for the voltage across it if the inductance is 40 mH. [6]