BANKURA UNIVERSITY

B.Sc. 1ᵗʰ Semester (Honours) Examination, March 2021

Subject: *Electronics (H)*

Course ID: 11711   **Course Code: SH/ELC/101/C-1(TH)**

Course Title: *Basic Circuit Theory and Network Analysis*

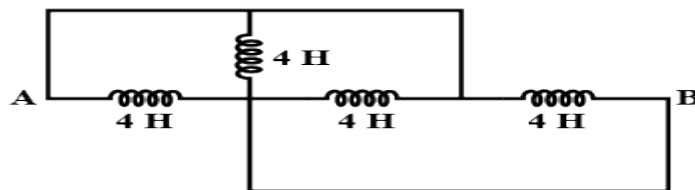**Full Marks: 25**   **Time: 1 Hr 15 Min**

*(The figures in the right hand side margin indicate marks.
Answer all the questions)*

1. Answer *any three* of the following questions   1×3=3
   a) What do you mean by 'Junction and Branch' of an electrical
      network?
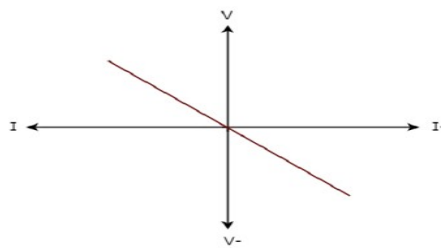   b) Find the equivalent inductance between A and B.

   c) What do you mean by lumped and distributed circuit elements?
   d) What is Impedance?
   e) Draw the equivalent circuit of the following network.
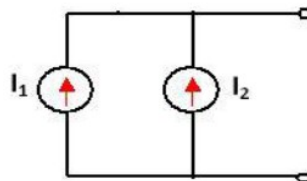

   f) Define charge and power.

2. Answer *any three* of the following questions.   2×3=6

   a) What do you mean by a super-mesh and a super-node?

   b) Prove that Kirchhoff's Voltage Law (KVL) satisfies law of conservation of energy.

   c) Define Form factor and Peak factor of an alternating quantity.

   d) The V-I characteristics of a network element is shown below. Identify whether the network element is linear or non-linear, active or passive, bilateral or unilateral.


   e) What is phasor diagram? Draw the phasor diagram for the ac circuit comprising of a pure inductor.

   f) Find the equivalent resistance between terminals A-B of the circuit shown below.
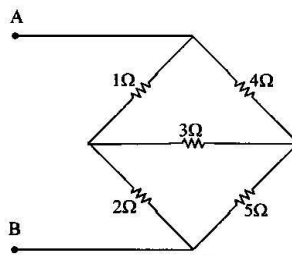
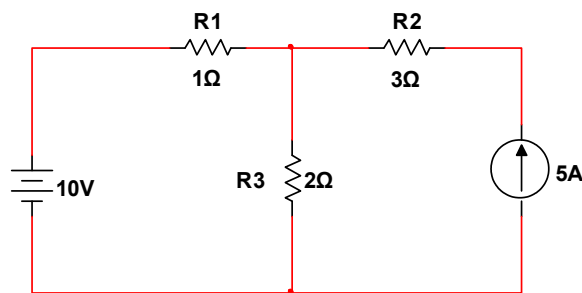
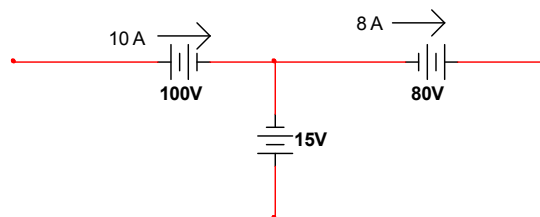3. Answer *any two* of the following questions.   5×2=10

   a) Obtain an expression for star (Y) to delta (Δ) transformation for resistive network. Transform the network shown below, from Δ to Y where A=1μF, B=2μF and C=3μF.   3+2
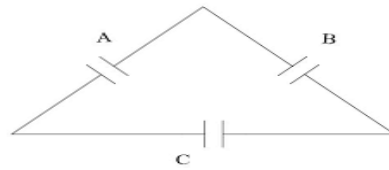
b) State Thevenin's theorem. Find the current through R3 using Thevenin's theorem. 2+3

c) What do you mean by absorbed power and delivered power? The three circuit elements shown in the figure are part of an electric circuit. Find the total power absorbed by the three circuit elements. 2+3

d) Consider the waveform shown below. Find the Average and RMS value of the voltage waveform. 2+3
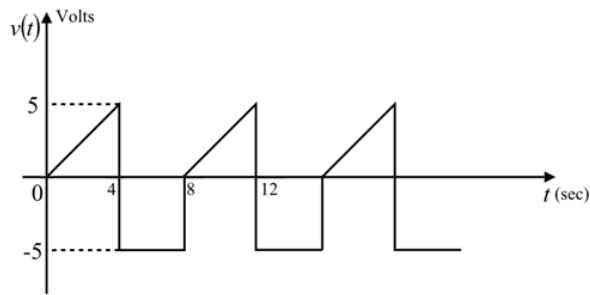
4. Answer *any one* of the following questions.   6×1=6

   a) An element X is connected across an ac source of voltage V=100sin(314t). The current through X is given as I=10 sin(314t+π/2).   2+2+2

   (i) Identify the element X and find its value.

   (ii) Draw the phasor diagram for the element X.

   (iii) How does the reactance of the element X vary with frequency of the ac? Show this variation graphically.

   b) State Maximum power transfer theorem for a dc resistive network. What should be the value of R such that maximum power transfer takes place from the rest of the network. Obtain the amount of this power.   2+2+2=6
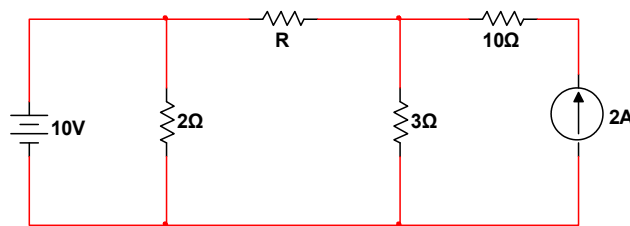
   c) State Kirchhoff's Current and Voltage Law. Find V0 using (i) KCL and (ii) KVL.   2+2+2