MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : ES-101

BASIC ELECTRICAL AND ELECTRONIC ENGINEERING-I

Time Allotted: 3 Hours

Full Marks

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

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Part I

Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternative for *any five* of the following: 1×

    (i) The form factor of a current waveform is 1, its shape is

    (a) sinusoidal   (b) triangular

    (c) square   (d) sawtooth

    (ii) A series circuit consists of two elements, has the current and applied voltage as

    $i = 4 \sin (2000\,t + 11.32°)$ A

    $v = 200 \sin (2000\,t + 50°)$ r.

    The circuit elements are

    (a) Resistance and Capacitance   (b) Capacitance and Inductance

    (c) Inductance and Resistance   (d) Both Resistances

    (iii) The reluctance of a magnetic circuit is given by   http://www.makaut.com

    (a) $1/\mu_0 \mu_r$ (b) ϕ/NI

    (c) $1/\mu_0 A$ (d) $1/\mu_r A$

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(iv) In a parallel ac circuit, if the supply frequency is greater than the resonant frequency, then the circuit is http://www.makaut.com

(a) inductive

(b) resistive

(c) capacitive

(d) either inductive or capacitive

(v) Thevenin's theorem can not be applied to networks that contain elements which are

(a) linear

(b) non-linear

(c) active

(d) passive

(vi) The area of hysteresis loop is a measure of

(a) retentivity

(b) coercivity

(c) flux density

(d) energy loss

(vii) The power factor of a purely resistive circuit is http://www.makaut.com

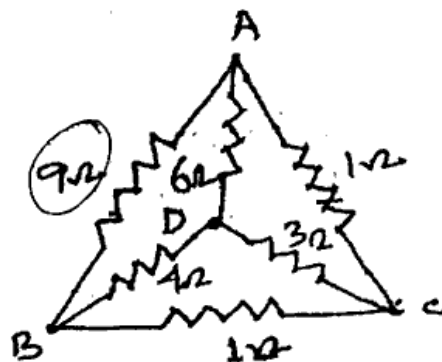(a) zero

(b) one

(c) infinity

(d) 0.5

Group – B

(Short Answer Type Questions)

Answer *any two* of the following.

5×2=10

2.) A network of resistances is formed as shown in figure. Find the resistance between the points A and B.

3. Derive an expression for rms and average value of a sinusoidal voltage $v = v_m \sin wt$.

4. Two coils have self inductances L_1 and L_2 and mutual inductance between them is M. Derive an expression for co-efficient of coupling k for these coils. http://www.makaut.com

5. An iron ring of mean length of 140 cm and cross section 12 sq cm is wound with 500 turns of wire. The permeability of the iron is 300, when a current of 0.5A flows through the coil. Find the flux in the coil.
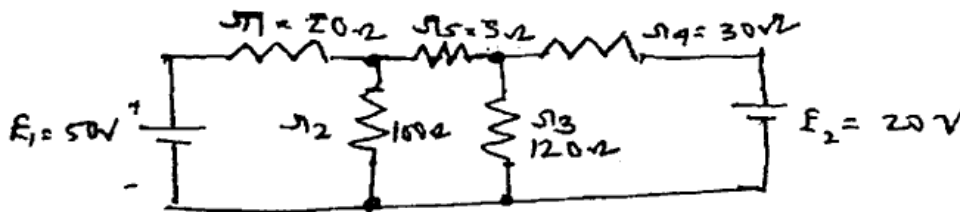
Group – C
(Long Answer Type Questions)

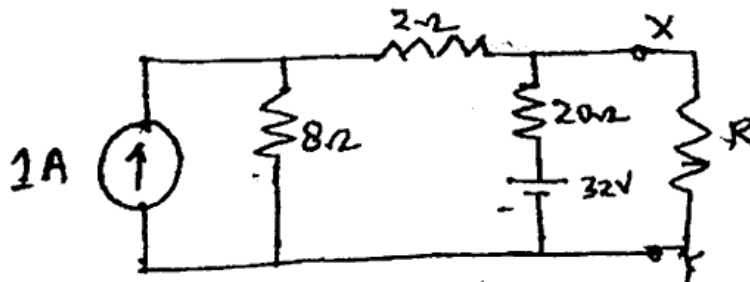**Answer *any two* of the following.**   10×2=20

6. (a) Using nodal analysis, find the current through r_5 for the circuit shown.

(b) Find the Thevenin's equivalent of the circuit shown at terminal XY.   5+5=10

7. A resistance of 100 Ω is connected with an inductance of 1.2 H and capacitance of 10μF in series. The combination is connected across 100V, 50Hz supply. http://www.makaut.com

Find:

   (i) Current in the resistor

   (ii) Voltage across the capacitor

   (iii) Voltage across the inductor

   (iv) Power consumed   10

Draw the complete phasor diagram.

3

8. (a) Deduce the expression for lifting power of electromagnet.

    (b) A mild steel having a cross sectional area of 10 cm^2 and a mean circumference of 60 cm has of 300 turns wound around it. http://www.makaut.com

    Determine:

    (i) Reluctance of the steel ring

    (ii) Current required to produce a flux of 1m wb in the ring. Relative permeability of the steel is 400.

    (iii) If a steel of 1mm is cut in the ring, what will be the new value of the current. Assum leakage and fringing effect.   3+7

9. (a) A circuit receives 50 A current at a power factor of 0.8 lag from a source of 250 V, 50 Hz, 1-Ph supply. Calculate the capacitance of the capacitor which is required to be connected across circuit to make the power factor of the circuit unity. http://www.makaut.com

    (b) What is meant by the term 'resistance' in an AC circuit?   6+4:

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