

**Indian Institute of Engineering Science and Technology, Shibpur**

B. Tech 1st Semester (Gr I/Gr II/Gr III/Gr IV) Mid-Semester Examinations, February 2022

**Basic Electrical Engineering (EE1101)**

Full Marks: 30

Time: 45 minutes

- (i) *Use a single answer-script for all the questions*  
(ii) *All parts of a question MUST be answered together*

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**Part – A**  
*(Answer all the questions)*

1. (a) What is a linear element in an electrical circuit?  
(b) For the circuit shown in Fig. 1, find the voltage across the  $6\Omega$  resistance using mesh analysis.

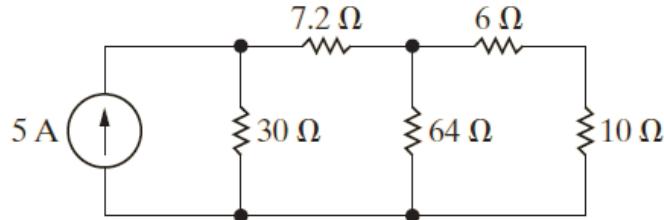


Fig. 1

[1+4]

2. A variable load resistance,  $R_L$  is adjusted for maximum power transfer (Fig 2). Calculate (i) the value of the load resistance, (ii) the maximum power that is delivered to load resistance, (iii) Also, draw the Thevenin's equivalent circuit.

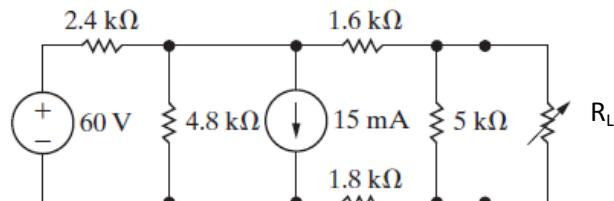


Fig. 2

[2+2+1]

3. (a) Define reluctance of a magnetic circuit.

(b) An iron ring, cross sectional area of  $7 \text{ cm}^2$  and mean length of 100 cm, has an air gap of 2 mm cut in it. Three separate coils having 100, 200 and 300 turns are wound on the ring and carry currents of 1A, 2A and 3A respectively such that they produce additive fluxes in the ring. Relative permeability of the ring material is 1000. Calculate the total flux in the air gap.

[1+4]

**Part – B**  
*(Answer all the questions)*

4. (a) Define the following:

- (i) Waveform, (ii) Instantaneous Value, (iii) Form Factor, (iv) Peak Factor,  
(v) Frequency for AC System.

(b) An alternating current of frequency 50 Hz has a maximum value of 120 A.

- (i) Write down the equation for the instantaneous value.
- (ii) Find the instantaneous value of current after  $1/360$  second.
- (iii) Time taken to reach 96 A for the first time.

[5+2.5]

5. (a) What do you understand by resonance in series R-L-C circuit?

(b) What is Q factor? How it is related to bandwidth and selectivity?

(c) A resistance of  $17.32 \Omega$  is connected in series with a pure inductance of 31.8 mH and the circuit is connected to a 200 V, 50 Hz supply. Calculate (i) the active component and reactive component of current (ii) active power (iii) reactive power

[2+(1+1.5)+3]