

Bihar Engineering University, Patna
B.Tech. 2nd Semester Examination, 2023

Course: B.Tech.

Code: 100201

Subject: Basic Electrical Engineering

Time: 03 Hours

Full Marks: 70

Instructions:-

- (i) The marks are indicated in the right-hand margin.
- (ii) There are NINE questions in this paper.
- (iii) Attempt FIVE questions in all.
- (iv) Question No. 1 is compulsory.

Q.1 Answer any seven questions of the following:

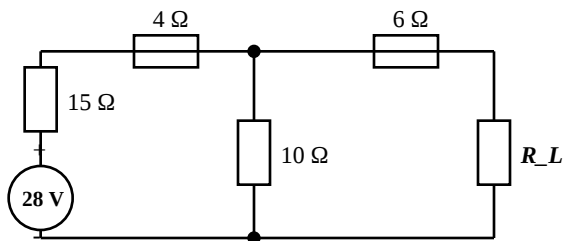
[2 x 7 = 14]

- (a) If 20, 30 and 50 ohms are connected in delta connection, then what are its equivalent values (in ohms) in star connections?
 - (i) 6, 10, 10
 - (ii) 6, 10, 5
 - (iii) 15, 15, 10
 - (iv) 6, 15, 15
- (b) The time constant of RC circuit is?
 - (i) $1/RC$
 - (ii) R/C
 - (iii) $1/(RC)^2$
 - (iv) RC
- (c) The maximum power will be transferred from a voltage source to load when
 - (i) the source impedance is half of the load impedance
 - (ii) the source impedance is equal to the load impedance
 - (iii) the source impedance is twice that of the load impedance
 - (iv) the source impedance and load impedance both must be zero
- (d) Draw the V-I characteristics of ideal and practical current source and voltage source.
- (e) Define form factor and peak factor.
- (f) Write the statement of KVL and KCL.
- (g) How do hysteresis and eddy current loss depend on frequency?
- (h) Explain generation of rotating magnetic field in electrical machine.
- (i) Differentiate among neutral, grounding and earthing.
- (j) Relate flux, reluctance and permeability.

Q.2

- (a) Explain maximum power transfer theorem. Find the value of R_L at which maximum power is transferred to the load in the following circuit. Also find the maximum power transferred.

[7]



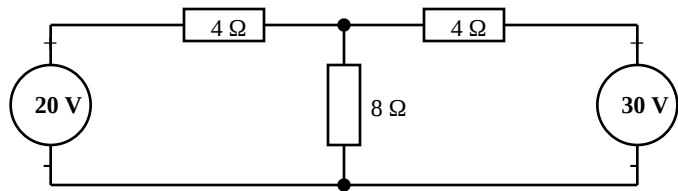
- (b) Explain and discuss the difference between ideal and practical voltage and current source. Also explain unilateral and bilateral elements with suitable examples.

[7]

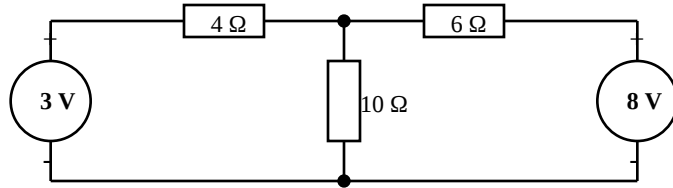
Q.3

- (a) Compute the current in the 8Ω resistor as shown in figure using Superposition Theorem.

[4]



- (b) State and explain Thevenin's Theorem. [5]
- (c) Using Thevenin's equivalent circuit, find the current through 6 ohm resistor. [5]



Q.4

- (a) A series R-L-C circuit having a resistance of 50 Ω, an inductance of 500 mH and a capacitance of 400 μF, is energized from a 50 Hz, 230 V, AC supply. Find the- [6]
- (i) resonant frequency of the circuit;
- (ii) peak current drawn by the circuit at 50 Hz;
- (iii) peak current drawn by the circuit at resonant frequency.
- (b) A coil of power factor 0.8 is connected in series with a 110 μF capacitor. The supply frequency is 50 Hz. The potential drop across the coil is found to be equal to the potential drop across the capacitor. Calculate the resistance and inductance of the coil. [8]

Q.5

- (a) Compare electric and magnetic circuits, clearly stating similarities and dissimilarities between them. State five applications of magnetic circuit in engineering field. [7]
- (b) Derive the relationship between line voltage and phase voltage, line current and phase current for a 3-phase delta-connected system. [7]

Q.6

- (a) What is eddy-current loss? What are the undesirable effects of eddy currents? How can they be minimized? Mention some applications of eddy-currents. [6]
- (b) An iron ring of cross-sectional area 5 cm² is wound with a wire of 120 turns and has a cut of 3 mm. Calculate the magnetizing current required to produce a flux of 0.3 mWb, if mean length of magnetic path is 25 cm and relative permeability of iron is 650. [8]

Q.7

- (a) Define voltage regulation of a transformer and derive conditions for (i) zero regulation and (ii) maximum regulation. Also draw the curve of variation of voltage regulation with power factor. [6]
- (b) Derive an expression for the induced e.m.f of a transformer. A 3000/200 V, 50 Hz, single-phase transformer is built on a core having an effective cross-sectional area of 150 cm² and has 80 turns in the low-voltage winding. Calculate- [8]
- (i) the value of the maximum flux density in the core;
- (ii) the number of turns in the high-voltage winding.

- Q.8** Describe with neat sketches the construction of a 3-phase induction motor. Explain the principle of operation of a 3-phase induction motor. What is meant by slip in an induction motor? [14]

- Q.9** Write short notes on any two of the following:- [7x2=14]

- (a) Components of LT switch gear.
- (b) Necessity and Types of Earthing.
- (c) Working of MCB & ELCB.
- (d) Speed control of DC motor.