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PRANVEER SINGH INSTITUTE OF TECHNOLOGY, KANPUR

Even Semester Session 2021-22 Pre-University

B. Tech. Second Semester

Basic Electrical Engineering (KEE-201T)

CO Number	Course Outcome
CO1	To define [L1: Knowledge] basic laws, terminologies and theories pertaining to DC and AC (1-phase and 3-phase) electrical circuits.
CO2	Explain [L2: Comprehension] concepts of electrical circuits, the components of low voltage electrical installations, transformers and electromechanical energy conversion devices and their applications.
CO3	Apply [L3: Application] the concepts of transformers, AC & DC Electric circuits, machines and energy consumption in solving relevant numerical problems.
CO4	Analyze [L4: Analysis] and categorize different types of DC and AC electrical circuits (1-phase and 3-phase).

Time: 3 Hrs. **M. M. 100**

Section A

(2X10 = 20 Marks)

Q1. Attempt all questions:

a) Explain why transformer cannot be operated on DC. **CO2**

b) Define active and passive networks with examples **CO1**

c) Define slip of an induction motor. **CO1**

d) Calculate the form factor and peak factor of a voltage given by $v = 200\sin(100t)$ Volts. **CO3**

e) List the nature of circuit at, before and after resonant frequency in a series RLC circuit. **CO1**

f) Explain the purpose of Earthing in electrical appliances. **CO2**

g) Explain the importance of using laminated Si-steel in induction motors **CO2**

h) A series circuit has R=20Ω, L=0.05H and C=5μF. Compute Bandwidth. **CO3**

i) Explain the advantages of three-phase system over single-phase system. **CO2**

j) A 3-phase, 440V, induction motor is wound for 4 poles and is supplied from 50Hz supply system. Compute the speed of the motor when slip is 5%. **CO3**

Section B

(10X30 = 30 Marks)

Q2. Attempt all questions. Question no 2(a) is compulsory

a) Calculate current in load resistance by thevenin's theorem for the figure shown below. Also calculate norton's parameters from thevenin's circuit as shown in figure 1 **CO4**

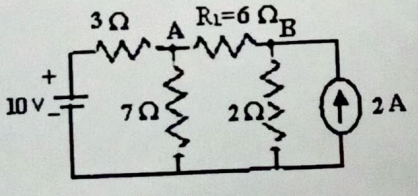

Fig 1

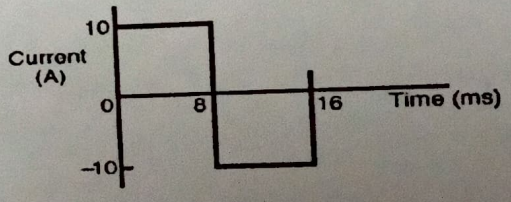

Fig 2

b i) For the periodic waveforms shown calculate as shown in fig 2 **CO3**
(i) frequency (ii) average value over half a cycle
(iii) RMS value (iv) form factor and (v) peak factor.

Or

ii) A transformer is rated at 100 kVA, at full load its copper losses are 1200W and iron losses are 600W. Calculate: (a) The efficiency at full load, unity power factor. (b) The efficiency at half load, unity power factor. (c) load at maximum efficiency **CO3**

c i) With the help of neat sketch, explain the operating principle of the following devices with their applications: (a) Fuse (b) MCB **CO2**

Or

ii) Explain the principle of Synchronous motor. Explain any one of method of starting of Synchronous motor. **CO2**

Section C

Q3. Attempt all questions: **(10X5 = 50 Marks)**

a i) Calculate the equivalent resistance at the terminals A & B using star delta conversion as shown in fig no. 3 **CO4**

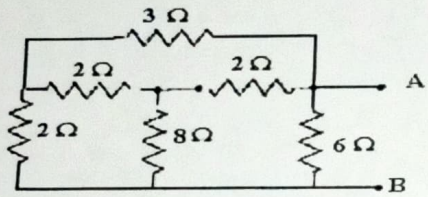

Fig 3

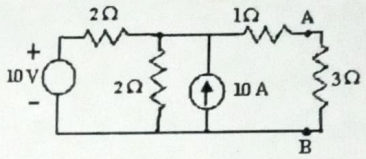

Fig 4

Or

ii) Calculate current flowing through 3Ω resistor by Superposition theorem for the network shown in figure no 4. **CO4**

b i) Derive relationship between line current and phase current in a three-phase delta connected load. Three similar resistance 20Ω each are connected across three phase 400 V supply in delta. calculate the power consumed if all three resistances are present and power consumed if one resistance is open? **CO4**

Or

ii) Derive the expression for quality factor in a R-L-C series circuit. A circuit having a resistance of 4Ω, inductance of 0.5H and variable capacitance in series is connected across a 100 V, 50 Hz supply, calculate the value of capacitance to give resonance. **CO4**

c i) A transformer is rated at 100 kVA, at full load its copper losses are 1200W and iron losses are 600W. Calculate (a) The efficiency at full load, unity power factor. (b) The efficiency at half load, unity power factor. (c) load at maximum efficiency **CO3**

Derive voltage regulation

Or

ii) Illustrate the properties of paramagnetic, diamagnetic, and ferromagnetic material with their examples and applications. **CO3**

d i) A three phase, 50 Hz, Induction motor has a full load speed of 1455 rpm. Calculate no of poles, slip and frequency of rotor induced emf. Also draw torque-slip characteristic of 3-phase induction motor. **CO3**

Or

ii) Calculate the voltage induced in the armature winding of 4 pole, wave wound, DC machine having 728 conductors and running at 1800 rpm. The flux per pole is 35 mWb. Also calculate the torque equation of DC motor with proper explanation. **CO3**

e i) Explain following terms:
a) Primary and Secondary battery
b) Power factor Improvement **CO2**

Or

ii) Through current, voltage and power waveforms and mathematical expressions, explain that average power consumed by a pure inductive circuit during a complete cycle is zero. **CO2**