FE105

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F. E. (Semester-1) (RC 2016-17)
EXAMINATION AUGUST 2020
Fundamentals of Electrical Engineering

[Duration : Two Hours] **[Total Marks : 60]**

Instructions:
1) **Answer THREE full questions with ONE question from each part.**
2) **Assume suitable additional data if necessary.**

PART A

1. a) Draw the typical layout of a coal-fired thermal power plant and explain how it generates electrical energy. (8)

   b) Discuss the analogy between electric and magnetic circuits. (6)

   c) A coil of 120 turns is uniformly wound over a wooden ring. The ring is having a mean circumference of 400mm and a uniform cross-sectional area of 400sq.mm. A current of 5A is passed through the coil. Calculate : (i) Magnetic field strength H (ii) The flux density B (iii) The total flux ϕ (6)

2. a) Explain the following terms related to magnetism: (6)
   (i) Magnetomotive force (ii) Magnetic potential
   (ii) Reluctance (iv) Permeability
   (iv) Flux density (iv) Magnetic field strength

   b) For the network shown in fig.(2b), find the current in each resistance and the voltage across 10Ω resistance. Find also the power consumed in each resistances. (6)

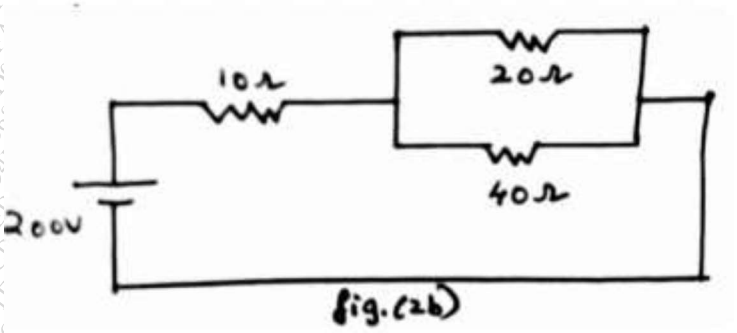

fig.(2b)

c) Using Superposition theorem, calculate the currents in each branch of the network shown in fig.(2c). (8)

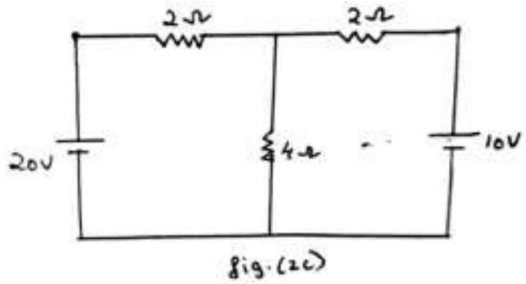

fig.(2c)

3. a) Explain the technology for conversion of wind energy to Electrical energy. (7)

b) State and explain Millman's theorem. (6)

c) Two identical coils P and Q of 900 turns each lie in parallel such that 70% of flux produced by one coil links to the other. A current of 5A flowing in coil P produces a flux of 0.05mwb in it. If the current in coil P changes from 12A to zero in 0.02sec, then calculate: (i) Mutual inductance between the two coils (ii) Self inductances of the two coils. (iii) EMF induced in coil P and coil Q. (7)

PART B

4. a) With a neat sketch explain how an alternating voltage is produced, when a coil is rotated in a magnetic field. Derive the expression for the instantaneous value of alternating sinusoidal emf. (6)

b) In a Delta connected, three phase system, derive the relationship between line voltage and phase voltage, line current and phase current and the expression for total power consumed. (8)

c) A coil dissipates 10W at 0.1 power factor lagging when connected to a 240V, 50Hz ac supply. Calculate the resistance, impedance and inductance of the coil. (6)

5. a) Derive the expression for instantaneous current and instantaneous power in an AC circuit containing Inductance only. Draw neat and labeled waveforms and phasor diagram. (8)

b) Describe the working principle of a single phase transformer. (6)

c) A balanced star connected load of $(8+j6)\Omega$ is connected across three phase, 50Hz, 440V supply system. Calculate the line current, power absorbed and reactive volt-amperes. (6)

6. a) Define phase difference. With neat waveforms explain the concept of leading and lagging phase angle. Also define the term Power factor. (6)

b) Graphically show the representation of a three phase system and explain the concept of phase sequence. (6)

c) Briefly explain the following terms with respect to single phase transformer: (8)
(i) Magnetic leakage (ii) Copper loss

A 200KVA, 3300/240V, 50Hz single phase transformer has 80 turns on the secondary winding. Assuming an ideal transformer, calculate (i) primary and secondary currents on full load (ii) the maximum value of flux (iii) the number of primary turns

PART C

7. a) Draw and explain the Single line representation of a power system indicating generation, transmission and distribution of electrical power. (8)

b) Explain the concept of mutually induced emf and self induced emf. (6)

c) A 60Ωresistor is connected in parallel with an indicative reactance of 80Ω to a 240V, 50Hz supply. Calculate : (i) the current through the resistance and inductive reactance, (ii) the supply current and (iii) the phase angle (6)

8. a) Explain the concept of Current and Voltage sources. (4)

b) Describe the open circuit and short circuit tests on a single phase transformer. (7)

c) Explain the two wattmeter method of power measurement in a 3-phase ac circuit. (9)
A balanced 3-phase, star-connected load draws power from 440V supply. The two wattmeters connected read 5KW and 1.2KW. Calculate power, power factor and current in the circuit.