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15ELE15/25

First/Second Semester B.E. Degree Examination, July/August 2021 Basic Electrical Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. For the circuit shown in Fig.Q1(a), find V_1 and I_1 .

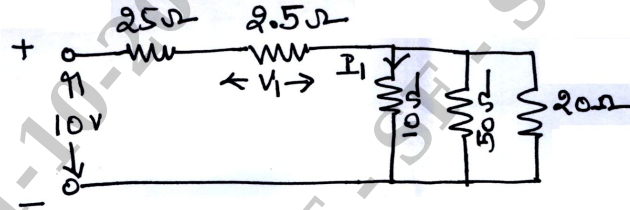


Fig.Q1(a)

(06 Marks)

- b. State and explain Faradays law of Electromagnetic induction. (05 Marks)
- c. Two coils having 1000 turns and 1600 turns respectively are placed close to each other such that, 60% of the flux produced by one coil links the other. If a current of 10A flowing in the first coil produces a flux of 0.5 mWb, find the inductance of the second coil. (05 Marks)

- 2 a. The current in the 6Ω resistance of the network shown in Fig.Q2(a) is 2A. Determine the currents in all the branches and the applied voltage.

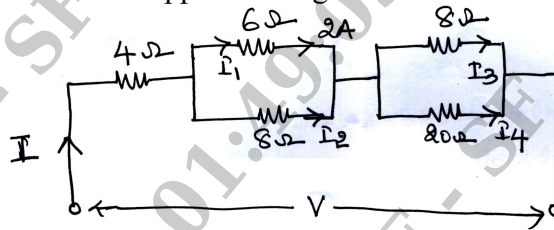


Fig.Q2(a)

(06 Marks)

- b. Derive an expression for energy stored in an inductive coil. (04 Marks)
- c. A coil of 1000 turns is wound on a ring of Silicon steel, having a mean diameter of 10 cm and relative permeability of 1200. Its cross sectional area is 12 sq.cm. When a current of 5A flows through the coil, find: (i) The flux in the core (ii) The inductance of the coil and (iii) The induced emf, if the flux falls to zero in 20 milli seconds. (06 Marks)

- 3 a. A 8 pole wave wound DC shunt generator has 36 slots, 10 conductors in each slot. The flux per pole is 0.01 Wb. It runs at 1200 rpm. The armature and field resistances are 0.1Ω and 100Ω respectively. Calculate the terminal voltage when load current is 120 A. (06 Marks)
- b. Derive an equation for the torque developed in the armature of a D.C. motor. (05 Marks)
- c. With a neat figure, explain the construction and working principle of a dynamometer type Wattmeter. (05 Marks)

- 4 a. Derive the E.M.F. equation of a D.C. Generator. (05 Marks)
- b. A shunt D.C. machine connected to 250 V supply has an armature resistance of 0.12Ω and the field resistance of 100Ω . Find the ratio of the speed of the machine as a generator to the speed as a motor, the line current in each case being 80 A. (06 Marks)
- c. With a neat sketch, explain the construction and working principle of an Induction type single phase energy meter. (05 Marks)

- 5 a. Define effective value of a sinusoidally varying current and find its relation with its maximum value. (05 Marks)
 b. Find the total current, power and power factor of the circuit given in Fig.Q5(b).

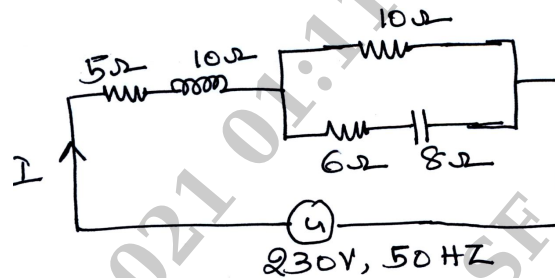


Fig.Q5(b)

- (06 Marks)
- c. With a circuit diagram, explain the working of a two way control of a lamp. (05 Marks)
- 6 a. Draw the triangle of voltages and impedance triangle of series R-C circuit. (05 Marks)
 b. A circuit consists of a resistance of $10\ \Omega$, an inductance of $16\ \text{mH}$ and a capacitance of $150\ \mu\text{F}$ are connected in series. A supply of $100\ \text{V}$ at $50\ \text{Hz}$ is given to the circuit. Find the current, power factor and power consumed by the circuit. (06 Marks)
 c. What is an electric shock? What are the precautions to be taken to prevent shocks occurring? (05 Marks)
- 7 a. Show that the two wattmeters are sufficient to measure three phase power. (05 Marks)
 b. Three $100\ \Omega$ resistance are connected in (i) star and (ii) delta across a $415\ \text{V}$, $50\ \text{Hz}$, 3 phase supply. Calculate the line and phase currents and the power consumed in each case. (06 Marks)
 c. With neat figure, explain the constructional details of an alternator. (05 Marks)
- 8 a. In a three phase delta connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power. (05 Marks)
 b. Two wattmeters are connected to measure the input to a 3 phase, $12\ \text{H.P.}$, $50\ \text{Hz}$, induction motor which works at a full load efficiency of 85% and a power factor of 0.8 . Find the readings of the two wattmeters. (05 Marks)
 c. Derive the EMF equation of alternator. (06 Marks)
- 9 a. Derive an E.M.F. equation of a transformer. (05 Marks)
 b. A $10\ \text{kVA}$, $400/200\ \text{V}$, $50\ \text{Hz}$, single phase transformer has a full load copper loss of $200\ \text{W}$ and has a full load efficiency of 96% at 0.8 power factor lagging. Determine the iron loss. What would be the efficiency at half of the full load and unity power factor? (06 Marks)
 c. A 4 pole, $50\ \text{Hz}$ induction motor has a slip 1% at no load. When operated at full load, the slip is 2.5% . Find the change in speed from no load to full load. (05 Marks)
- 10 a. Explain the different losses occurring in a transformer. (05 Marks)
 b. A single phase, $20\ \text{kVA}$ transformer has 1000 primary turns and 2500 secondary turns. The net cross sectional area of the core is $100\ \text{cm}^2$. When the primary winding is connected to $500\ \text{V}$, $50\ \text{Hz}$ supply, calculate:
 (i) The maximum value of the flux density in the core
 (ii) The voltage induced in the secondary winding
 (iii) The primary and secondary full load currents. (06 Marks)
 c. The frequency of the emf in the stator of a 4 pole induction motor is $50\ \text{Hz}$ and that in the rotor is $1.5\ \text{Hz}$. What is the slip and at what speed the motor is running? (05 Marks)