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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, B.E. - Semester End Examination; May / June - 2018

Basic Electrical Engineering (Common to All Branches)

Time: 3 hrs

Max. Marks: 100

Note: Answer FIVE full questions, selecting ONE full question from each unit.

UNIT - I

- 1 a. State and explain Kirchoff's law. 6
- b. State and explain Faraday's laws of electromagnetic induction. 6
- c. A circuit consists of two parallel resistors having resistance of 20 Ω and 30 Ω respectively connected in series with 15 Ω . If current through 15 Ω resistor is 3 A. Find the following :
- i) Current in 20 Ω and 30 Ω resistors 8
- ii) The voltage across the whole circuit.
- iii) The total power and power consumed in all resistances.
- 2 a. Define coefficient of coupling and establish the relation between self-inductances, mutual inductances with the coefficient of coupling. 7
- b. A current of 20 A flows through two ammeters A and B in series, the potential difference across A is 0.2 V and across B is 0.3 V. Find how the same current will divide between A and B when they are in parallel. 8
- c. Derive an expression for energy stored in Inductance of 'L' Henry. 5

UNIT - II

- 3 a. Sketch the sinusoidal alternating current wave form and represent as well as define the following terms : 6
- i) Instantaneous value ii) Peak value iii) Cycle and frequency
- b. A series RLC circuit is composed of 100 Ω resistance, 0.1 H Inductance and 5 μF capacitance. A voltage $v(t) = 141.1 \cos 377t$ V is applied to the circuit. Determine the current and voltages across the resistance, Inductance and capacitor. 8
- c. Show that the power consumed by a pure inductance is zero and write the waveforms. 6
- 4 a. Define RMS value and derive an expression for RMS value of sinusoidally varying alternating current. 8
- b. Derive an expression for average power in an RC series circuit, draw the related wave forms and vector diagram. 7
- c. A coil of power factor 0.6 is in series with a 100 μF capacitor, when connected to a 50 Hz supply, the potential difference across the coil is equal to the potential difference across the capacitor. Find the resistance and inductance of the coil. 5

Contd...2

UNIT - III

- 5 a. Obtain a relationship between line voltages and phase voltages in delta (Δ) connected balanced 3- phase system. 6
- b. With a neat sketch, explain the construction and working of induction type single phase energy meter. 8
- c. What is the necessity of earthing? Explain any one type of earthing. 6
- 6 a. Show that the two wattmeters are sufficient to measure three phase power. 6
- b. When three balanced impedances are connected in star, across a 3 phase 415 V, 50 Hz supply. The line current drawn is 20 A, at a lagging power factor of 0.4, Determine the parameter of the impedances in each phase. 8
- c. With neat circuit diagram and switching table, explain three way control of lamp. 6

UNIT - IV

- 7 a. With a neat sketch, explain the cross sectional view of DC machine. 8
- b. Obtain an expression for emf of DC generator. 6
- c. Find the load current of a DC shunt generator, if the shunt field resistance and armature resistances are 15Ω and 0.02Ω respectively, when the induced voltage on open circuit is 127 V and the terminal voltage on load is 120 V. 6
- 8 a. State and explain Flemings left hand rule 6
- b. Derive an expression for torque developed in a DC motor. 6
- c. A shunt D.C. machine connected to 250 V. Supply has an armature resistance of 0.12Ω and the field resistance of 100Ω . Find ratio of the speed if the machine as a generator to the speed of motor. The line current in each case being 80 A. 8

UNIT - V

- 9 a. What is the principle of operation induction motor? 8
- b. Obtain an expression for emf of a transformer from first principles. 6
- c. A 4 pole, 50 Hz Induction motor has a slip of 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. 6
- 10 a. What are the losses occurs in transformers? How they can minimize? 6
- b. Explain the necessity of starter for 3 phase induction motor. 6
- c. A 10 kVA, 400/200 V single phase transformer has maximum efficiency of 98% at 90% full load at 0.8 pF. Find its efficiency at full load and 0.6 pF. 8

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