EE101

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M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)

BANGALORE – 560 054

SEMESTER END EXAMINATIONS – DEC 2013 / JAN 2014

Course & Branch	:	**B.E.- Common to all branches**	**Semester**	:	**I**
Subject	:	**Basic Electrical Engineering**	**Max. Marks**	:	**100**
Subject Code	:	**EE101**	**Duration**	:	**3 Hrs**

Instructions to the Candidates:

- Answer one full question from each unit.

UNIT – I

1. a) Explain briefly how the generated electrical energy reaches the customers. (05)

   b) A toroid has a core of cross sectional area 2500mm^2 and a mean diameter of 250mm. The core material has a relative permeability 1000. Calculate the number of turns wound on the core to obtain an inductance of 1H. (06)

   c) Write down three different expressions for coefficient of mutual induction M. Two coils have a mutual inductance of 0.3 H. If the current in one coil is varied from 5A to 2A in 0.4 seconds , calculate i) the average emf induced in the second coil ii) the change of flux linked with the second coil assuming that it is wound with 200 turns. (09)

2 a) Name any two renewable sources of electrical energy. List any two advantages of such a source over the conventional fossil fueled generators. (04)

   b) The self-inductance of a coil of 500 turns is 0.25 H. If 60% of the flux is linked with a second coil of 10000 turns, calculate i) The mutual inductance of the two coils. Ii) EMF induced in the second coil when current in the first coil changes at the rate of 100A/S. (06)

   c) Derive the expression for energy stored in an inductor. Find the inductance of a coil in each of the following cases i) a current of 0.1A yields an energy storage of 0.05 J. ii) a current of 0.1 A increasing at the rate of 0.5A/S represents a power flow of 0.5W. (10)

UNIT – II

3. a) 3 batteries P, Q and R,consisting of 50, 55 and 60 cells in series respectively,are connected in parallel to supply a common load of 100A. Each cell has an emf of 2V and an internal resistance of 0.005 ohm. Determine the current supplied by each battery and the load voltage, using KVL. Also draw the setup indicating the actual current flow. (10)

b) Define active and reactive power and mention their units. An inductance of 0.08H is connected in series with a 15 ohm resistor. The combined circuit is energized from a 240V 50Hz supply. Calculate, i) Reactance of the inductance, ii)Impedance of the circuit, iii)The current in the circuit, iv)Voltage across the resistance, v)Voltage across the inductance, vi)Power absorbed by the circuit and vii)power factor of the circuit. (10)

4. a) i) How many 60W lamps may be safely run on a 230V circuit fitted with a 5A fuse?
ii) Two resistors of 100 ohm and 200 ohm are connected in series across this parallel combination a 4V battery of negligible internal resistance. A voltmeter of 200 ohm resistance is used to measure potential difference across each resistor. What will be the voltage in each case? (10)
iii) A resistance of 10 ohm is connected in series with two resistances each of 15 ohm arranged in parallel. What resistance must be shunted across this parallel combination so that the total current taken shall be 1.5A with 20V applied?

b) Define power factor of an ac circuit. A coil is placed in series with non-inductive resistance which consumes 5000 Watts at 100V. When a voltage of 104V is applied to the circuit, the voltage across the coil is 66V and across the resistor is 50V. Calculate the power absorbed by the coil and its power factor. (10)

UNIT – III

5. a) Three equal star connected inductors take 9 kW at a power factor of 0.8 when connected to 960 V, 3 Phase, 50 Hz supply. Find the per phase load resistance and inductance. (08)

b) A 20 kVA, 440/220 V, single phase, 50Hz transformer has iron loss of 324W. The copper loss is found to be 100W when delivering half full load current. Determine its efficiency when delivering full load current at 0.8 lagging power factor and ii) the percent of full load when the efficiency will be maximum. (08)

c) Derive the relationship between line and phase values of voltage and current in a balanced star connected system. (04)

6. a) With the help of necessary connection diagram and phasor diagram show that total active and reactive power can be measured using 2 wattmeters in a balanced 3 phase star connected load. (08)

b) Derive the emf equation of a transformer. A single phase transformer has 500 turns in the primary and 1200 turns in the secondary. The cross sectional area of the core is 80 cm^2. If the primary winding is connected to a 50 Hz supply at 500V, calculate the peak flux density. (08)

c) Three similar resistors connected in star draw a line current of 5A from a 400 V, 3 phase mains. To what value should the line voltage be changed to (04)

obtain the same line current with the resistors connected in delta?

UNIT – IV

7. a) Derive the equation for the line voltage of a star connected 3 phase alternator. (08)

   b) A 250 V dc shunt motor having an armature resistance of 0.25 ohm carries an armature current of 50 A and runs at 750 rpm. If the flux is reduced by 10%, find the speed. Assume that the torque remains the same. (08)

   c) An 8 pole wave connected dc generator has 900 armature conductors and a flux per pole of 0.04 Wb. At what speed it must be driven to generate 500V. (04)

8. a) Calculate the generated line voltage of a 3 phase, 8 pole, star connected alternator, running at 750 rpm having the following data. Sinusoidally distributed flux per pole = 55 mWb, total number of slots on the armature =72, number of conductors per slot = 10, winding factor = 0.96. (08)

   b) A 250 V shunt motor runs at 1000 rpm at no load and takes 8A. The total armature and shunt field resistances are respectively 0.2 ohm and 250 ohm. Calculate the speed when loaded and taking 50A. Assume the flux to be constant. (08)

   c) Explain the necessity of a starter in case of a dc motor. (04)

UNIT – V

9. a) A 3 phase induction motor has 2 poles and is connected to 400 V, 50 Hz supply. Calculate the actual rotor speed and rotor frequency when the slip is 4%. (08)

   b) It is desired to operate an electric appliance from 3 different places. Also the maximum current through the device is to be limited to 5A. Draw a schematic to meet this requirement and explain. (08)

   c) Explain the braking system of an induction type energy meter (04)

10. a) With circuit diagram explain the operation of Y-Δ starter in a 3-phase induction motor. (08)

    b) An 8 pole alternator running at 750 rpm supplies power to a 6 pole 3-phase, induction motor. The induction motor has a full load slip of 3 percent. Find the full load speed of the induction motor and the frequency of its rotor. (08)

    c) Briefly explain how energy audit will help in reducing the electrical energy wastage. (04)

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