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**First / Second Semester B.E. Degree Examination, Dec. 07 / Jan. 08**  
**Basic Electrical Engineering**

Time: 3 hrs.

Max. Marks:100

**Note : Answer any FIVE full questions selecting  
atleast TWO questions from each PART.**

**PART A**

- 1
  - a. Explain Ohm's law and state its limitations. (05 Marks)
  - b. Define coefficient of coupling and establish a relation between self-inductance, mutual inductance with the coefficient of coupling. (07 Marks)
  - c. 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. (08 Marks)
  
- 2
  - a. Sketch the sinusoidal alternating current wave form and denote as well as define the following terms:
    - i) Instantaneous value
    - ii) Peak to peak value
    - iii) Peak amplitude. (05 Marks)
  - b. A series RLC circuit is composed of 100 ohms resistance, 1.0 H inductance and 5  $\mu$ F capacitance. A voltage,  $V(t) = 141.4\cos 377t$  volts is applied to the circuit. Determine the current and voltages  $V_R$ ,  $V_L$  and  $V_C$ . (07 Marks)
  - c. An impedance coil in parallel with a 100  $\mu$ F capacitor is connected across a 200 V, 50 Hz supply. The coil takes a current of 4 A and the power loss in the coil is 600 W. Calculate:
    - i) The resistance of the coil
    - ii) The inductance of the coil
    - iii) The power factor of the entire circuit. (08 Marks)
  
- 3
  - a. What is the necessity and advantages of three phase systems? (05 Marks)
  - b. Show that two wattmeters are sufficient to measure power in 3-phase balanced star connected circuits with the aid of neat circuit diagram and phasor diagrams. (08 Marks)
  - c. A three phase load of three equal impedances connected in delta across a balanced 400 V supply takes a line current of 10 A at a power factor of 0.7 lagging. Calculate from the first principles:
    - i) The phase current
    - ii) The total power
    - iii) The total reactive KVA.
 If the windings are connected in star, what will be the new value of phase current and the total power? (07 Marks)
  
- 4
  - a. Describe the factors affecting the choice of a wiring system. (05 Marks)
  - b. With a neat connection diagram and switching table explain the TWO POINT CONTROL of a lamp. (07 Marks)
  - c. Explain construction and principle of operation of dynamometer type wattmeter with a neat sketch. (08 Marks)

## PART B

- 5 a. Explain the working principle of a DC machine as a generator and motor with suitable diagrams. (06 Marks)
- b. Sketch N-I and T-I characteristics of DC i) Series and ii) Shunt motors. Mention two applications of each motor. (06 Marks)
- c. A series motor runs at 600 rpm when taking 110 A from a 250 V supply. The resistance of the armature circuit is  $0.12 \Omega$ , and that of series winding is  $0.03 \Omega$ . The useful flux per pole for 120 A is 0.024 Wb, and that for 50 A is 0.0155 Wb. Calculate the speed when the current has fallen to 50 A. (08 Marks)
- 6 a. Derive an expression for the electromotive force induced in the secondary winding of a transformer. (05 Marks)
- b. What are the losses in a transformer? On what factors do they depend? How they are minimized? (06 Marks)
- c. A single phase 25 kVA 1000/2000 V, 50 Hz transformer has maximum efficiency of 98% at full load upf. Determine its efficiency at:
- $\frac{3}{4}$  full load upf
  - $\frac{1}{2}$  full load 0.8 pF
  - 1.25 full load 0.9 pF.
- (09 Marks)
- 7 a. Enumerate the advantages of having stationary armature and rotating field system in large capacity synchronous generators. (06 Marks)
- b. Explain the terms pitch factor, distribution factor and winding factor as applied to an alternator. (06 Marks)
- c. A three phase, star connected synchronous generator driven at 900 r/min is required to generate a line voltage of 460 V at 60 Hz on open circuit. The stator has two slots per pole per phase, and 4 conductors per slot. Calculate:
- The number of poles
  - The useful flux per pole.
- (08 Marks)
- 8 a. With neat sketches explain the constructional details of squirrel cage and phase wound induction motors. (08 Marks)
- b. Explain the significance of 'slip' in induction motors. (06 Marks)
- c. If a six pole induction motor supplied from a three phase 50 Hz supply has a rotor frequency of 2.3 Hz. Calculate:
- The percentage slip
  - The speed of the motor.
- (06 Marks)

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