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.*

1 a. State and explain the following terms:
        i)   Self Inductance
        ii) Mutual Inductance.   **(06 Marks)**
    b. Two 1000 turn air cored coils 10 cm long having a cross sectional area of 8 cm² are kept
        side by side. The mutual inductance between them is 0.006 H. Find self inductance of each
        coil and also the coefficient of coupling.   **(06 Marks)**
    c. What is power factor in an a.c. circuit? Distinguish between lagging power factor and
        leading power factor. Which of the following devices work at, unity power factor lagging
        power factor and leading power factor?
        i)   Electric iron
        ii) Fluorescent lamp
        iii) Incandescent lamp
        iv) Condenser bank to improve power factor
        v)   Induction motor.   **(08 Marks)**

2 a. Show that the current leads the voltage in series R-C circuit, draw the waveforms.
                                                                         (06 Marks)
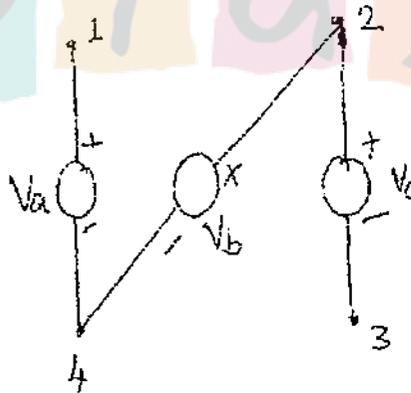   b. The three voltages are connected as shown in Fig.Q2(b)   **(06 Marks)**

Fig.Q2(b)

$V_a = 20 \angle 60^0$; $V_b = 30 \angle 75^0$; $V_c = 15 \angle -30^0$.
Find: i) V_{12}, ii) V_{31}, iii) V_{34}.

    c. Two impedances $Z_1 = (6 - j8)$ ohm and $Z_2 = (10 + j12)$ ohm are connected in parallel. If
        the total current of the combination is $(20 + j10)$ find the branch currents and power
        dissipated in each branch.   **(08 Marks)**

3 a. Write a note on advantages of three phase systems.   **(05 Marks)**
    b. Derive an expression for power in a 3-phase balanced circuit.   **(05 Marks)**
    c. Two wattmeters connected to measure the input to a balanced three-phase circuit indicate
        2500 watts and 500 watts respectively. Find the power and power factor of the circuit:
        i)   when both readings are positive.
        ii) when the latter reading is obtained after reversing the connections to the current coil.
                                                                         (10 Marks)

4   a. What are the different errors possible in the energy motor? How they are minimized?
                                                                                    (05 Marks)
    b. With schematic diagram, explain the working of a dynamometer wattmeter.   (05 Marks)
    c. What is earthing? Explain the purpose of earthing with neat sketches explain plate earthing.
                                                                                    (10 Marks)

5   a. Draw a neat sketch representing the cut section view of a d.c. machine. Explain the important features of different parts involved there on.
                                                                                    (08 Marks)
    b. Derive the expression for the armature torque developed in a d.c. motor.   (06 Marks)
    c. A 120 V d.c. shunt motor has an armature resistance of 0.2 Ω and shunt field resistance of 60 Ω. It runs at 1800 rpm, when it takes full load current of 40 A. Find the speed of the motor while it is operating at half the full load.
                                                                                    (06 Marks)

6   a. With usual notations, derive an expression for the emf induced in a d.c. generator.
                                                                                    (07 Marks)
    b. What are salient and non-salient synchronous machines? Mention any two characteristic features of each of them.
                                                                                    (06 Marks)
    c. A 3-phase, 16-pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 Wb, sine distributed, and the speed is 375 rpm. Find the frequency and the phase and line voltages. Take winding factor as 0.96.
                                                                                    (07 Marks)

7   a. Derive the emf equation of a single-phase transformer.   (06 Marks)
    b. Define the transformation ratio and regulation of a transformer.   (04 Marks)
    c. A 40 kVA transformer has a core loss of 450 W and a full load copper loss of 850 W. If the load power factor is 0.8, calculate:
        i)   Efficiency at full load
        ii) Load at which copper loss is equal to iron loss
        iii) Efficiency at this load.
                                                                                    (10 Marks)

8   a. Define slip of an induction motor. Explain why slip is never zero in an induction motor.
                                                                                    (07 Marks)
    b. Explain how torque is produced in a three-phase induction motor.   (07 Marks)
    c. The frequency of voltage applied to 4-pole induction motor is 50 Hz and that of rotor induced emf is 1.5 Hz. Find the slip and speed of the motor.
                                                                                    (06 Marks)

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