CBCS SCHEME

21ELE13/23

First/Second Semester B.E. Degree Examination, Jan./Feb. 2023
Basic Electrical Engineering

Time: 3 hrs.   Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a. State and explain Kirchhoff's laws as applied to on electric circuit. **(06 Marks)**
    b. Derive the relation between i) RMS value and maximum value   ii) Average value and maximum value for a purely sinusoidal alternating quantity. **(08 Marks)**
    c. A resistance of 10Ω is connected in series with two resistances each of 15Ω arranged in parallel. What resistance must be shunted across this parallel combination, so that the total current will be 1.5A from 20V supply applied? **(06 Marks)**
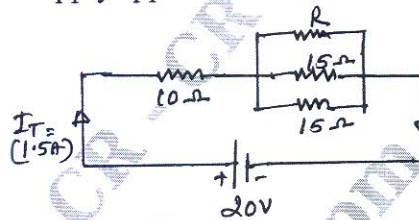

Fig.Q.1(c)

OR

2   a. State and explain maximum power Transfer theorem as applied to the DC series circuit. **(06 Marks)**
    b. Show that power consumed by the pure capacitor is zero. Draw the voltage, current and power waveforms. **(08 Marks)**
    c. The equation of an alternating current is given by i = 42.42 sin 628t. Calculate its
    i) Maximum value   ii) Frequency   iii) RMS value   iv) Average value   v) Form factor
    vi) Peak factor. **(06 Marks)**

Module-2

3   a. Analyze the R-C series circuit and show that current leads the voltage, using phasor diagram. **(07 Marks)**
    b. Deduce the relationship between line and phase value of voltage and current in 3ϕ star connection. Also write 3ϕ power equation. **(06 Marks)**
    c. A circuit consists of a resistance 10Ω, an inductance of 16mH and a capacitor of 150μF connected in series. A supply of 100V, 50Hz is applied to the circuit. Find the current, power factor and power consumed by the circuit. Draw the phasor diagram. **(07 Marks)**

OR

4   a. Show that only two-wattmeters are sufficient to measure the 3ϕ power, using phasor diagram. **(07 Marks)**
    b. Deduce the relationship between line and phase values of current in 3ϕ delta connection. Also write the 3ϕ power equations. **(06 Marks)**
    c. Three similar chocking coils each having resistance of 10Ω and inductive reactance of 10Ω are connected in star across a 440V, 50Hz supply. Find the line current and readings of each of two wattmeters. **(07 Marks)**

Module-3

5 a. With a neat sketch, explain the construction of various parts of DC generator. **(08 Marks)**

    b. Derive the torque equation of DC motor with usual notation. **(06 Marks)**

    c. The primary winding of a transformer is connected to a 240V, 50Hz supply. The secondary winding has 1500 turns. If maximum flux of the core is 0.00207 Wb. Determine: i) The secondary induced emf   ii) No. of turns in the primary   iii) Core area, if the maximum Flux density is given 0.465Wb/m^2. **(06 Marks)**

OR

6 a. Derive the condition for maximum efficiency of a single phase transformer. **(08 Marks)**

    b. With usual notation, derive the EMF equation of a DC generator. **(06 Marks)**

    c. A 4-pole, 500V, dc shunt motor have 720 conductors with wave connected on its armature. If the full load current is 60A and the flux per pole is 0.03Wb. The armature resistance and shunt field resistance are 0.2Ω and 250Ω respectively and the contact drop is 1 volt per brush. Calculate the full load speed of the motor. **(06 Marks)**

Module-4

7 a. Explain the concept of rotating magnetic field of 3ϕ induction motor, with the help of vector diagrams. **(08 Marks)**

    b. With usual notation, derive the EMF equation of 3ϕ synchronous generator. **(06 Marks)**

    c. A 3ϕ, 6 pole, star connected alternator has an armature with 90 slots and 12 conductors per slot. If it rotates at 1000 rpm, the flux per pole is 0.05Wb. Calculate the line value of emf generated. If short pitch factor is 0.97 and distribution factor is 0.96. **(06 Marks)**

OR

8 a. List the difference between salient pole type rotor and non salient pole type rotor construction. **(08 Marks)**

    b. Define slip, derive the expression for frequency of rotor current. **(06 Marks)**

    c. A 6 pole alternator runs at 1000rpm supplies power to a 4 pole Induction motor. The frequency of rotor of induction motor is 2Hz. Determine the slip and speed of the motor. **(06 Marks)**

Module-5

9 a. Draw and explain the single line diagram of a typical transmission and distribution system scheme. **(08 Marks)**

    b. What is earthing? With a neat diagram explain pipe earthing. **(06 Marks)**

    c. Explain the working principle of fuse and MCB. **(06 Marks)**

OR

10 a. What are the desirable characteristics of a tariff and explain two-part tariff. **(08 Marks)**

    b. What is electric shock? What are the safety precautions to be taken while working with electricity to avoid shock? **(06 Marks)**

    c. With the help of block diagram, discuss law voltage distribution system. (400V and 230V) for various consumers. **(06 Marks)**

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