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B. E. Second Semester Examination – September/October 2023
Introduction to Electrical Engineering

Time: 3 hrs]

[Maximum Marks: 100

Note: Answer any FIVE full questions, selecting at least ONE full question from each Module.

Module – I

1. a) Discuss about the conventional and non-conventional energy resources in detail. **(10 Marks)**
   b) Draw the neat block schematic diagram and explain in brief the following power generating stations i) Hydro power plant   ii) Nuclear power plant. **(10 Marks)**

2. a) State and explain Faraday's laws of electromagnetic induction. **(06 Marks)**
   b) Define mutually induced emf. Explain with neat diagram , how it is induced in a coil. **(06 Marks)**
   c) Two coils, coil1 and coil2 having 1000 and 2000 turns respectively lie parallel and close to each other such that 80% of the flux produced by coil 1 links coil 2. A current of 10 A in coil 1 produces a flux of 0.1m wb in it, while the same current in coil 2 produces a flux of 0.2 mwb in it. Determine the self inductances of each coil, mutual inductance between them, induced emf in coil 1 and coil 2, if the current in coil 1 is uniformly reverted in 0.01 second. **(08 Marks)**

Module - II

3. a) Define the following A.C terminologies : i) In-phase   ii) Phase difference iii) Form factor iv) Peak factor. **(08 Marks)**
   b) Deduce the relation between voltage and current in a pure capacitor, when it is supplied by an alternating voltage and also derive the expression for power in it. **(08 Marks)**
   c) A pure inductor of 159.2 mH is supplied by a 250V, 50Hz A.C. supply. Determine the inductive reactance, current, equations for instantaneous values of voltage and current. **(04 Marks)**

4. a) Analyse the series R-L circuit, supplied by an A.C voltage and derive the expression for power in it with the aid of phasor diagram and wave forms. **(08 Marks)**
   b) A series circuit consists of R $=10\Omega$ and L $= 31.84$ mH. The circuit is supplied from a 227V, 50 Hz A.C. supply. Determine i) X_L ii) Z iii) I   iv) cos ϕ v) Power vi) V_R and vii) V_L. **(07 Marks)**
   c) List out the advantages of three phase system over single phase system. **(05 Marks)**

Module – III

5. a) Describe the construction of a D.C generator with neat sketch of its cross-section. **(08 Marks)**
   b) Derive the equation for the generated emf in the armature of a D.C generator. **(05 Marks)**
   c) A 4-pole, wave-wound, shunt generator supplies power of 25 kW at a terminal voltage of 500 V. The resistances in armature and shunt filed windings are 0.25Ω and 250Ω respectively. Determine the emf generated if the total brush drop is 2V. Also determine the number of conductors in the armature, when the generator is driven at a speed of 1200 rpm and having flux per pole of 0.02 wb. **(07 Marks)**

6. a) Explain the working principle of a D.C motor.
    b) A 4-pole, 220 V, lap-wound, shunt motor has 540 conductors in the armature. It draws a current of 32 A from the supply mains on full load. The shunt field current is 2A. If the armature resistance is 0.1 Ω and the flux per pole is 30 mwb, determine the speed and the torque developed. (06 Marks)
    c) Describe the construction and operation of a three point starter with neat circuit diagram (08 Marks)

Module - IV

7. a) Explain the types of transformers based on construction with the help of neat sketch. (08 Marks)
    b) Derive the emf equation of a single phase transformer. (06 Marks)
    c) A 50 kVA, single phase transformer has iron loss of 700 W and full-load copper losses of 800W. Determine its efficiency at
       i) Half load , 0.8 p.f ii) $3/4^{th}$ of full load , u.p.f iii) Full-load , 0.9 p.f. (06 Marks)

8. a) Describe the working principle of a three phase induction motor with necessary diagram. (06 Marks)
    b) Discuss the constructional features of the two types of rotor in three phase induction motor. (08 Marks)
    c) A 4-pole , three phase induction motor is supplied from a 50Hz supply system. Determine i) Synchronous speed ii) Rotor speed when the slip is 4% iii) Relative speed and iv) Rotor current frequency with a slip of 10%. (06 Marks)

Module - V

9. a) Explain the casting and capping type of wiring with necessary sketch. (06 Marks)
    b) Discuss the two-way and three-way control of a lamp load with the aid of circuit and truth table for each. (08 Marks)
    c) Define one unit, with respect to electricity energy consumption. Explain the two part tariff with advantages and disadvantages. (06 Marks)

0. a) Discuss about the fuse, fuse element and its working principle. (06 Marks)
    b) What is Electric shock? Mention the precautions to be considered to avoid electric shock. (06 Marks)
    c) What is earthing? Why is it necessary? Explain with neat sketch the pipe earthing. (08 Marks)