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B. M. S. College of Engineering, Bengaluru - 560019

Autonomous Institute Affiliated to VTU

December 2023 Supplementary Examinations

Programme: B.E. **Semester: I / II**
Branch: Common to all Branches **Duration: 3 hrs.**
Course Code: 21EE1ESBEE / 21EE2ESBEE **Max Marks: 100**
Course: Basic Electrical Engineering

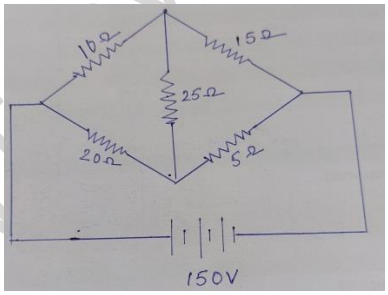
Instructions: 1. Answer any FIVE full questions, choosing one full question from each Module.
2. Missing data, if any, may be suitably assumed.

MODULE-1

1. a) State and Prove Maximum Power Transfer Theorem for a simple DC circuit. **06**

   b) Define and derive the RMS value of a sinusoidal quantity in terms of its peak value. **06**

   c) Determine the current flowing in each branch using Kirchhoff's laws in the network. **08**



MODULE-2

2. a) Demonstrate with phasor diagram that the average power consumed by a series RL circuit is VICosΦ. **06**

   b) Derive the relationship between line and phase currents and voltages in a 3 phase delta connection with vector diagram. **06**

   c) Three coils having resistances of 10Ω and the inductance of 0.02 H are connected in Delta across 440 V, 50 Hz three phase supply. **08**
   Calculate i) Phase voltage ii) Phase current iii) line current iv) active power v) reactive power.

MODULE-3

3. a) What is back EMF? Deduce the equation for armature torque of a DC motor. **08**

   b) In a transformer the iron loss is constant loss and copper loss is variable loss. Justify. How are they minimized? **06**

c) A four pole DC shunt motor takes 22.5 amperes from a 250 V supply. R_a = 0.5 Ω and R_{sh} = 125 Ω. The armature is wave wound with 300 conductors. If the flux per pole is 0.02 Wb, calculate (a) the speed (b) torque developed in the armature (c) power developed. **06**

OR

4. a) Derive the condition for which the efficiency of transformer is maximum. **06**

b) With relevant equations draw N/Ia and Ta/Ia characteristics of DC series motor. **06**

c) A 40 KVA single phase transformer has a core loss of 450 W and full load copper loss of 850 W. If the pf of the load is 0.8, calculate **08**
(i) Full load efficiency
(ii) Load corresponding to maximum efficiency.
(iii) Maximum efficiency at unity pf.

MODULE-4

5. a) Distinguish between squirrel cage rotor and phase wound rotor of Induction motor. **06**

b) Derive an expression for the EMF equation of an alternator. **08**

c) A 12 pole, 3 phase alternator is coupled to an engine running at 500 rpm. It supplies an induction motor, which has full load speed of 1440 rpm. Find the percentage slip and the number of poles of the motor. **06**

OR

6. a) Compare salient and non - salient pole type rotor of an alternator. **06**

b) What is rotating magnetic field? Explain with phasor diagrams. **08**

c) A 6 pole, 3 phase, star connected alternator has an armature with 90 slots and 12 conductors per slot. It revolves at 1000 rpm, the flux per pole being 0.5 Wb. Calculate the EMF generated, if the winding factor is 0.97 and all the conductors in each phase are in series. The coil is full pitched. **06**

MODULE-5

7. a) Distinguish between fuse and miniature circuit breaker. **06**

b) Define earthing. Why earthing is necessary? Explain with the help of a neat diagram about pipe earthing. **08**

c) With a neat diagram discuss about the working of an electric vehicle. **06**

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