

CBCS SCHEME

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17ELE15/25

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

- State and explain the KVL and KCL. (06 Marks)
 - Explain difference between parallel connection and series connection Advantage of parallel over series connection. (06 Marks)
 - Two identical coils of 1000 turns each A and B lie in parallel planes such that 60% of the flux produced by one coil links the other. A current of 5A in A produces in it a flux of 0.05 mWb. If the current in A changes from 6A to -6A in 10 msec. What is the emf induced in coil B. Determine L_A , L_B and M. (08 Marks)

OR

- For the circuit shown in Fig.Q2(a). Obtain voltage between points X and Y. (08 Marks)

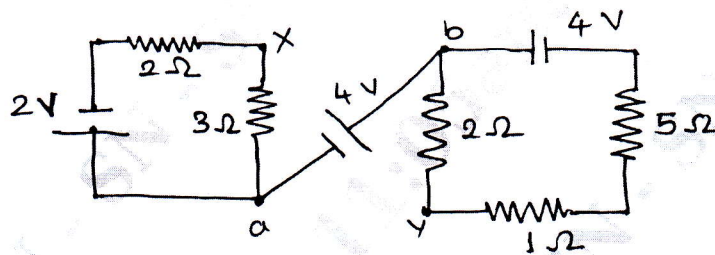


Fig.Q2(a)

- Derive an expression for energy stored in an inductor. (04 Marks)
- Define self inductance and mutual inductance of coil. Derive an expression for self inductance mutual inductance. Obtain the relationship between self inductances mutual inductance and coefficient of coupling. (08 Marks)

Module-2

- With the help of neat diagram, explain the construction of DC machine. (08 Marks)
 - Derive an equation of EMF induced in DC generation. (06 Marks)
 - With a help of diagram, explain the construction and working principle of a dynamometer type wattmeter. (06 Marks)

OR

- A 4 pole, 220V lap connected DC shunt motor has 36 slots, each slot containing 16 conductors. It draws a current of 40A from the supply. The field resistance and armature resistance are 110Ω , 0.1Ω respectively. The flux per pole is 40 mwb. Calculate :
i) Speed ii) Torque developed. (07 Marks)
 - A 4 pole generator with wave wound armature has 51 slots, each having 24 conductors. The flux per pole is 0.01 weber. At what speed must the armature rotate to give an induced emf of 220V? What will be the voltage developed if the voltage developed if the winding is lap and the armature rotates at the same speed? (05 Marks)
 - With the help of neat diagram, explain the working and construction of single phase induction type energy meter. (08 Marks)

Module-3

- 5 a. Show that the power consumed in an R-C series circuit is $VI \cos \phi$. Draw the waveform for voltage, current and power draw the phasor diagram. (08 Marks)
- b. Draw and explain the wiring diagram for 2 – way control of lamp. (06 Marks)
- c. Two impedances ($150 - j157$ ohms and $(100 + j110)$ ohms) are connected in parallel across 200V, 50Hz supply. Find branch currents, total currents and total power consumed in the circuit Pr. (06 Marks)

OR

- 6 a. A circuit consists of a resistance of 10Ω , an inductance of 16mH and a capacitance of $150\mu\text{F}$ connected in series. A supply of 100V at 50Hz is given to the circuit. Find the current, pf and power consumed by the circuit. Draw the vector diagram. (06 Marks)
- b. Define RMS value of a sinusoidally varying current. Derive an expression of RMS value of alternating current. (06 Marks)
- c. With a neat figure, explain the plate earthing what is necessity of earthing. (08 Marks)

Module-4

- 7 a. Three similar coils each having resistance of 10Ω and reactance of 8Ω are connected in star, across 400V, 3-phase supply. Determine :
 i) Line current
 ii) Total power
 iii) Phase voltage
 iv) Line voltage
 v) Phase current. (06 Marks)
- b. Define the following terms :
 i) Line voltage
 ii) Phase current
 iii) Line current
 iv) Phase voltage
 v) Star connection
 vi) Delta connection in three phase system. (08 Marks)
- c. Derive an emf equation of an alternator. (06 Marks)

OR

- 8 a. A balanced three phase star connected load draws power from 440V supply. The two wattmeter meter connected indicate $w_1 = 5\text{KW}$, $w_2 = 1.2\text{KW}$. Calculate power, power factor and line current in the circuit. (06 Marks)
- b. A 3ϕ , 4pole, 50Hz star connected alternator has 36 slots with 30 conductors per slot. The useful flux per pole is 0.05Wb. Find synchronous speed and line voltage on no-load. ($k_d = 0.96$). (04 Marks)
- c. Explain the construction details of three phase synchronous generator with the help of neat diagram. (10 Marks)

Module-5

- 9 a. Explain the working and construction of single phase transformer. (07 Marks)
b. A 20KVA single phase transformer has 200 turns on primary and 40 turns on secondary. The primary is connected to 1000V, 50Hz supply. Find the secondary voltage, rated current flowing through two windings and the maximum value of flux. (05 Marks)
c. Explain with neat vector diagram, the concept of rotating magnetic field theory. (08 Marks)

OR

- 10 a. Define slip, derive an expression for frequency of rotor current. (06 Marks)
b. A single phase 25KVA, 1000/2000V, 50Hz transformer has a maximum efficiency of 98% at full load unity power factor.
Determine at :
i) $\frac{3}{4}$ F.L and unity power factor
ii) $\frac{1}{2}$ F.L and 0.8pf. (08 Marks)
c. A three phase 6 pole, 50Hz induction motor has a slip of 1% at no load and 3% at full load.
Determine :
i) Synchronous speed
ii) No load speed
iii) Full load speed
iv) Frequency of rotor current at standstill. (06 Marks)
