FACULTY OF ENGINEERING AND TECHNOLOGY

QUESTION BANK OF

BASIC ELECTRICAL ENGINEERING

19KBELE15/25

For B.E I & II Semester

Common to All branches

MODULE-1

DC CIRCUIT FUNDAMENTALS

REVIEW OF ELECTROMAGNETIC INDUCTION

2 marks questions

Q1. Define active and passive elements?

Q2. Define electromagnetic induction?

Q3. Define coefficient of coupling?

4 marks questions

Q1. State and explain faradays laws of electromagnetic induction.

Q2. Differentiate between dynamically and statically induced EMF.

6 marks questions

Q1. State and explain ohms law? Mention the advantages and limitation of ohms law.

Q2. State and explain Kirchhoff's law?

Q3. Explain the analogy between electric and magnetic circuits

Q4. Explain the following

a. Lenz law
b. Flemings right hand rule
c. Flemings left hand rule

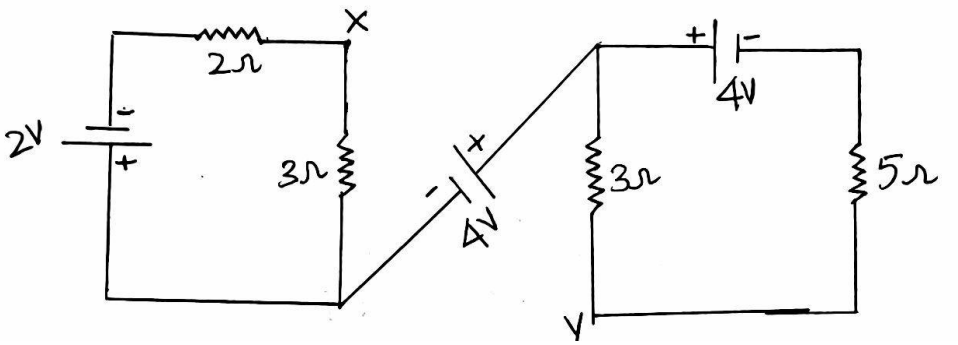
Q5 Derive an expression for coefficient of coupling between two magnetically coupled coils

Q6 . Two coils connected in parallel across 100 V DC supply, takes 10A current from the supply power dissipated in one coil is 600W. What is the resistance of each coil.

Q7 Three resistances of 10 ohms, 20 ohms & 30 ohms are connected once in series and then in

parallel. Find the series & parallel equivalent resistances, power dissipated and the energy consumed in 2 hrs in each case, if the applied voltage is 230v.

Q8. Find the potential difference between points X & Y in the network shown in the figure.



Q9. A coil consists of 600 turns and a current of 10A in the coil gives rise to a magnetic flux of 1 miliweber. Calculate

i. The self inductance
ii. The energy stored
iii. The EMF induced when the current is reversed in 0.01 second

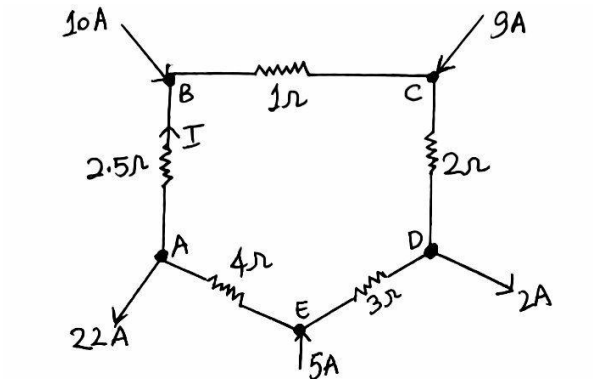
8 marks questions

Q1. Two resistors of 15 Ω and 20 Ω are connected in parallel. A resistance of 12 Ω is connected in series with the combination. A voltage of 120v is applied across the entire circuit. Find the current in each resistance, total current, voltage across 12 Ω & power consumed in all the resistance.

Q2. A circuit consists of two parallel resistors having resistances of 20Ω and 30Ω respectively. If the current through 15Ω resistor is 3Amp. Find

i. Current in 20Ω and 30Ω resistors
ii. The voltage across the whole circuit
iii. The total power and power consumed in all the resistances.

Q3. For the following network shown in the figure, find all the branch currents & potential difference across AD & CE.

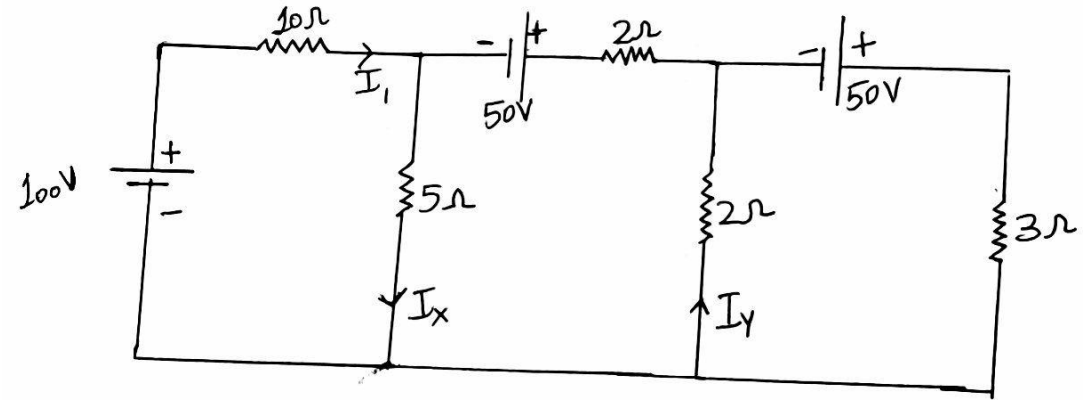


Q4. The number of turns in the two coupled coils is 600 and 1700 respectively. When a current of 6A flows in the second coil the total magnetic flux produced in this coil is 0.8 mwb and the flux that links with the first coil is only 0.5 mwb. Calculate L_1, L_2, K and M

Q5. Two coils having 100 and 150 turns respectively are wound side by side on a closed iron circuit of cross section 125 cm^2 and a mean length of 200 cm. if the relative permeability of iron is 2000, calculate

i. The self inductance of each coil
ii. The mutual inductance between them
iii. The EMF induced in the second coil if the current in the first coil changes from 0 to 5 A in 0.02 sec.

Q6. Using KCL and KVL determine the currents I_X and I_Y in the network shown in the figure.



MODULE-2

AC CIRCUIT FUNDAMENTALS

THREE PHASE CIRCUITS

4 marks questions

Q1. Define the following terms with numerical values.

a. Root mean square value.
b. Average value.
c. Form factor.
d. Peak factor.

Q2. Define the following sinusoidal terms.

a. Instantaneous value
b. Amplitude
c. Time period
d. Frequency

Q3. Define the following and mention their units

a. Real power
b. Reactive power
c. Apparent power
d. Power factor

6 marks questions

Q1. Explain the generation of sinusoidal voltage with necessary figures and explain.

Q2. Explain a pure Resistance (R) circuit with all the relevant figures and necessary equations.

Q3. Explain a pure Inductance (L) circuit with all the relevant figures and necessary equations.

Q4. Explain a pure capacitance (c) circuit with all the relevant figures and necessary equations.

Q5. Explain a series R-L circuit with all the relevant figures and necessary equations.

Q6. Explain a series R-C circuit with all the relevant figures and necessary equations.

Q7. Explain a series R-L-C circuit with all the relevant figures and necessary equations.

Q8. The equation of an AC is given $i=42.42 \sin 628t$. Calculate its.

a. Maximum value.
b. Frequency
c. R.M.S value
d. Average value
e. Form factor

Q9. An alternating current of frequency 60Hz has a maximum value of 12A.

a. Write down the equation for its instantaneous value
b. Find the value of current after 1/360 second.
c. Find the time taken to reach 9.6A for the first time.

Q10. An inductor coil is connected to a supply of 250V at 50Hz and takes a current of 5A. The

coil dissipates 750W. Calculate power factor, Resistance and inductance of the coil.

Q11. A non-inductive resistor of 10 ohms is in series with a capacitor 100μF across a 250 V, 50Hz A.C supply. Determine the current taken by the capacitor and the power factor of the circuit.

Q12. A current of Average Value 18.019 A is flowing in circuit to which a voltage of peak value 141.42 V is applied. Determine

a. The impedance of the circuit in polar form.
b. The power

Assume that voltage lags the current by 30^0

Q13. What are the advantages of 3-ø system over single phase systems?

Q14. Explain the concept of generation of 3- ø voltage.

Q15. A 3- ø load draws KW and KVA of 12 and 16 respectively. If the two wattmeter's are used to measure the load power. What would be the reading of each of the 2 wattmeter's.

Q16. Two wattmeter are connects to measure the input to a 3- ø, 12 H.P, 50 Hz induction motor which works at a full load efficiency of 85% and a P.F of 0.8 . Find the readings of two wattmeter.

8 marks questions

Q1. Given V = 200sin377t volts and i=($377t-30^0$) amps for an A.C circuit determine:

a. Power factor
b. True power
c. Apparent power
d. Reactive power

Indicate the unit of power calculated

Q2. A circuit consists of a Resistance of 20 Ω and an inductance of 0.05H connected in series. A supply of 230V at 50Hz is applied across the circuit. Find the current power factor & power consumed by the circuit. Draw the vector diagram.

Q3. A circuit consists of a Resistance of 25 Ω and capacitance of 100μ F connected in series. A supply of 200V at 50Hz is applied across the circuit. Find the current power factor & power consumed by the circuit. Draw the vector diagram.

Q4. A circuit consists of a Resistance of 10Ω and an inductance of 16mH and capacitance of 150μ F connected in series. A supply of 100V at 50Hz is applied across the circuit. Find the current power factor & power consumed by the circuit. Also draw the vector diagram.

Q5. Obtain the relationship between line and phase currents and voltage in a 3- ø star connection.

Q6. Obtain the relationship between line & phase currents and voltage in a 3- ø delta connection.

Q7. Show that two wattmeter's are sufficient to measure the total three phase power.
P=$\sqrt{3}.E_L I_L \cos ø$

Q8. Two wattmeter are connects to measure the input to a 3- ø circuit reads 5Kw and 1Kw, the latter reading being read after reversing the potential coil ends. Calculate the power, power factor total volt amperes are reactive volt amperes.

Q9. When 3 balanced impedances are connected in star, across a 3- ø, 415V 50Hz supply. The line current drawn is 20A, at a lagging P.F of 0.4. Determine the parameters of the impedance in each phase.

Q10. A balanced delta connected 3- ø load is fed from 3- ø 400v supply. The line current is 20A and the total power absorbed by the load is 10KW. Calculate

a. The impedance in each branch.
b. The power factor.
c. Total power consumed if the same impedances are star connected.

MODULE-3

SINGLE PHASE TRANSFORMER

RESIDENTIAL WIRING & SAFETY MEASURES

2 marks questions

Q1. Define voltage regulation of a transformer.

Q2. Mention the desirable characteristics of a good fuse.

4 marks questions

Q1. Differentiate between fuse & the circuit breaker.

Q2. Differentiate between core type and shell type transformer.

Q3. What is a fuse? Explain its working principle.

Q4. With reference with the fuse explain the following terms

a. Rated current
b. Fusing current
c. Fusing factor

6 marks questions

Q1. Explain two way control of lamp (staircase wiring)?

Q2. Explain three way control of lamp (verandah wiring)?

Q3. What is earthing? Explain the necessity of earthing.

Q4. What is an electric shock? Mention the precautions that need to be taken to avoid electric shock.

Q5. With a neat figure explain plate earthing.

Q6. With a neat figure explain pipe earthing.

Q7. Derive the E.M.F equation of a transformer.

Q8. Define efficiency of a transformer and derive the condition for its maximum efficiency.

Q9. Explain the principle of operation of a single phase transformer.

Q10. Explain the construction of a single phase transformer.

Q11. The design requirements of a 6000/450V 50Hz core type transformer are : approximate EMF / turn = 15 V
Maximum flux density Bm= 1wb/m2
Calculate suitable number of primary and secondary turns and the net cross sectional area of core.

Q12. A 50KVA transformer has N1 : N2 = 300 : 20. The primary winding is connected to a 2200 V, 50 Hz supply. Calculate.

a. Secondary voltage on no load.
b. Approximate values of primary and secondary currents on full load
c. The maximum value of flux.

Q13. A single phase 50 Hz transformer has a 30 primary turns and 350 secondary turns the net cross sectional area of core is 250 cm2. If the primary winding is connected to a 230V, 50Hz supply. Calculate the

a. peak value of flux density in the core
b. the voltage induced in the secondary winding.
c. The primary current when the secondary current is 100A

Q14. A 25 KVA transformer has 500 turns on the primary and 40 turns on the secondary winding. The primary winding is connected to a 3 KV, 50 Hz A.C source. Calculate

a. The secondary E.M.F
b. The primary and secondary currents on the full load.
c. The maximum flux in the core.

8 marks questions

Q1. Explain the various losses that occur in a transformer.

Q2. A single phase 25 KVA 1000/2000V 50 Hz transformer has maximum efficiency of 98% at full load UPF. Determine its efficiency at

a. ¾ full load UPF
b. ½ full load 0.8 P.F

c. 1.25 times full load 0.9 P.F

Q3. A 250 KVA transformer has 98.135% efficiency at full load and 0.8 lagging P.F. The efficiency at half load and 0.8 lagging P.F is 97.751%. Calculate the iron loss and full load copper loss.

Q4. A 600 KVA, 1- ø transformer has an efficiency of 92% both at full load and half full load, unity power factor (UPF). Determine its efficiency at 75% full load, 0.9 power factor.

MODULE-4

DC MACHINES

DC GENERATOR & DC MOTOR

4 marks questions

Q1. Mention the applications of various DC motors.

Q2. A 4 pole 1200 rpm DC generator has a lap wound armature having 65 slots and 12 conductors per slot. If the flux per pole is 0.02 wb, determine the EMF induced in the armature.

Q3. A 250V DC shunt motor takes 41A current while running at full load. The resistances of motor armature and of the field winding are 0.1 Ω and 250 Ω respectively. Determine the Back EMF generated in the motor.

6 marks questions

Q1. Derive the EMF equation of DC generator.

Q2. Explain the working principle of DC generator

Q3. Explain the various types of DC generator.

Q4. A 4-pole lap connected DC generator has 600 armature conductors and runs at 1200rpm. If the flux per pole is 0.06 wb, calculate the EMF induced. Find also the speed at which it should be driven to produce same EMF when wave connected.

Q5. A long shunt compound generator delivers a load current of 50 A at 500 V and has armature and series field and shunt field resistance of 0.05Ω, 0.03 Ω & 250 Ω respectively. Allow a 1.0 volt per brush for contact drop.

Q6. A 4 pole generator with wave wound armature has 51 slots, each having 24 conductors. The flux per pole is 0.01wb. At what speed must the armature rotate to give an induced EMF of 220v? What will be the voltage developed, if the winding is lap connected and the armature rotates at the same speed?

Q7. A shunt wound DC generator drives 496A at 440V to a load. The resistance of the shunt field coil is 110 Ω and that of the armature is 0.02 Ω. Calculate the EMF induced in the armature.

Q8. Explain the necessity of starter for a DC motor

Q9. What is Back EMF? Explain its significance in a DC motor.

Q10. Explain the principle of operation of a DC motor?

Q11. Explain the various types of DC motor.

Q12. A 6-pole DC motor takes an Armature current of 110 A at 480V. The armature has 864 lap connected conductors. Calculate

a. The speed
b. The gross torque developed by the armature.

Q13. A 4 pole, 440V DC motor takes an armature current of 50A. The resistance of the armature circuit is 0.28Ω. The armature winding is wave connected with 888 conductors and the useful flux per pole is 23mwb. Calculate the speed of the motor.

8 marks questions

Q1. Explain with a neat figure the construction of a DC generator.

Q2. A 4- pole shunt generator with lap connected armature has armature and field resistance of 0.2 Ω & 50 Ω respectively. It supplies power to 100 lamps, each of 60W, 200 V. calculate the total armature current, the current per path and generated EMF allow a brush drop of 1V at each brush.

Q3. Explain the characteristics of DC shunt motor and DC series motor.

Q4. Derive the torque equation of a DC motor.

Q5. A 4-pole, 220V lap connected DC shunt motor has 36 slots each slot containing 16 conductors. It draws a current of 40 A from the supply. The field resistance and armature resistance are 110 Ω & 0.1 Ω respectively. The motor develops an output power of 6 KW. The flux per pole is 40 mwb. Calculate

a. The speed
b. The torque developed by the armature
c. The shaft torque.

Q6. A 500 V shunt motor has 4 poles and wave connected winding with 492 conductors. The flux per pole is 0.05 wb. The full load current is 20A. the armature and shunt field resistances are 0.1 Ω and 250 Ω respectively. Calculate the speed and developed torque.

Q7. The field current in a DC shunt machine is 2A and the line current is 20A and voltage is 200V. Calculate

i. The generated EMF when working as a Generator.
ii. Torque in Nm when running at 1500 rpm as motor.

Take the armature resistance as 0.5 Ω

Q8. The current drawn from the mains by a 220V DC shunt motor is 4A on no load. The resistance of field and armature windings are 110 Ω and 0.2 Ω respectively. If the line current on full load is 40A at speed of 1500 rpm. Find the no load speed.

Q9. A series motor runs at 600 Rpm when taking 110A from a 250V supply. The resistance of

the armature circuit is 0.12 Ω and that of series field winding is 0.03 Ω. The useful flux per pole for 110A is 0.024 wb and that for 50A is 0.0155 wb. Calculate the speed when current is fallen to 50A.

Q10. A 4 pole lap connected DC generator runs at 900 rpm and has 40 slots, each slot containing 10 conductors.

a. Find the useful flux per pole if the generated EMF is 300V.
b. What is the average value of the EMF induced in a field coil having 1000 turns, when the field coil is opened flux becomes zero in 005 sec.

MODULE-5

AC MACHINES

THREE PHASE INDUCTION MOTOR

ALTERNATOR

4 marks questions

Q1. Define pitch factor and distribution factor with reference to an Alternator.

Q2. A three phase (3-Φ), 50 Hz, 6 pole Induction motor has a full load percentage slip of 3%. Find

i. Synchronous speed
ii. Actual speed

6 marks questions

Q1. Define slip of an Induction motor and derive an expression for frequency of rotor induced EMF.

Q2. Explain the principle of operation of three phase induction motor.

Q3. A 3 phase Induction motor is wound for 4-poles and is supplied from a 50 Hz supply. Calculate

a. The synchronous speed
b. The speed of rotor when the slip is 4%
c. The motor frequency when the speed of rotor is 600 rpm

Q4. What do you mean by slip of an 3 phase Induction motor? What is the value of slip at the time of starting and when will 'S' be zero.

Q5. Explain the working principle of alternator.

Q6. What are the advantages of rotating field over rotating armature?

Q7. A 3 phase Induction motor with 4-poles and is supplied from an Alternator having 6 poles and running at 1000 rpm. Calculate

a. The synchronous speed of induction motor
b. Its speed when the slip is 0.04
c. The frequency of rotor EMF when the speed is 600 rpm.

Q8. A 6-pole Induction motor is fed from a 50 Hz supply. If the frequency of rotor EMF at full load is 2 Hz. Find the full load slip & speed.
Q9. A 4 pole, 50Hz induction motor has a slip of 1% at no load. When operated at full load, the slip is 2.5%. find the change in speed from no load to full load.
Q10. A 12 pole 50 Hz induction motor runs at 485 rpm. What is the frequency of rotor current.

8 marks questions

Q1. Explain the concept of production of rotating magnetic field in a three phase induction motor.
Q2. Explain the important features of squirrel cage and phase wound rotor construction in an Induction motor.
Q3. With a neat figure explain star delta starter of a three phase induction motor.

Q4. Discuss the different types of rotors used in the alternators. Mention the characteristic features and applications.
Q5. Derive the EMF equation of an alternator.

Q6. A 3-ø, 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux / pole is 0.03 wb and the speed is 375 rpm. Find the frequency and the phase and the line EMF. Assume pitch factor as unity and distribution factor as 0.96.
Q7. A 2 pole,3 phase Alternator running at 3000 rpm has 42 armature slots with 2 conductors in each slot. Calculate the flux per pole required to generate a line voltage of 2300 V. Distribution factor is 0.952 and pitch factor is 0.956

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