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CBCS SCHEME

USN

17ELE15

First Semester B.E. Degree Examination, Dec.2017/Jan.2018
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 100

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

1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. State Ohm's law. Mention its limitations. **(05 Marks)**

b. State and explain Kirchoff's laws as applied to D.C circuits. **(08 Marks)**

c. A coil of 150 turns is linked with a flux of 0.01 weber when carrying a current of 10 A. Calculate the inductance of the coil. If the current is uniformly reversed in 0.01 sec, calculate the induced electromotive force. **(07 Marks)**

OR

2 a. Define dynamically induced e.m.f and statically induced e.m.f with examples. **(06 Marks)**

b. Two resistors connected in parallel across 100V D.C supply. The total current from the supply source is 10 A. The power dissipated in one resistor is 600 W. What is the current drawn when they are connected in series across the same supply. **(08 Marks)**

c. Define the co-efficient of coupling and find its relation with L_1, L_2 and M. **(06 Marks)**

Module-2

3 a. With a neat sketch, explain the construction of the various parts of a D.C generator. **(08 Marks)**

b. What is the significance of back EMF in a D.C motor? **(06 Marks)**

c. With a neat figure, explain the construction and working principle of a dynamometer type wattmeter. **(06 Marks)**

OR

4 a. Derive the EMF equation of D.C generator. **(06 Marks)**

b. Find the useful flux per pole of a 250V, 6 pole shunt motor (D.C) having a two circuit connected armature winding with 220 conductors. At normal working temperature, the overall armature resistance including brushes is 0.2 Ω. The armature current is 13.3 A at the no-load speed of 908 rpm. **(08 Marks)**

c. Describe with a neat sketch, the constructional details and operation of a single phase induction type energy meter. **(06 Marks)**

Module-3

5 a. Derive an expression for power in pure capacitor circuit and draw voltage, current and power waveforms. **(07 Marks)**

b. A series circuit with a resistor of 100 Ω, capacitor of 25 μF and inductance of 0.15 H is connected across 220 V, 50 Hz supply. Calculate impedance, current, power and power factor of the circuit. **(08 Marks)**

c. With a neat sketch, explain 3-way control of Lamp. **(05 Marks)**

OR

6 a. Define earthing. Explain any one type of earthing with a neat diagram. **(06 Marks)**

b. Two impedances $(150 - 157j)\Omega$ and $(100 + 110j)\Omega$ are connected in parallel across 200 V, 50 Hz supply. Find branch currents, total current and total power consumed in the circuit. Draw the phasor diagram. **(08 Marks)**

c. Define power factor and mention its practical importance. **(06 Marks)**

Module-4

7 a. In a three phase star connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power. **(06 Marks)**

b. Show that the two wattmeters are sufficient to measure three phase power. Also derive an expression for the power factor in terms of wattmeter readings. **(06 Marks)**

c. A 6 pole, 3 phase, stars connected alternator has an armature with 90 slots and 12 conductors per slot. If revolves at 1000 rpm, the flux per pole being 0.5 web. 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. **(08 Marks)**

OR

8 a. Mention the advantages of three phase system over single phase system. **(06 Marks)**

b. With neat sketches, explain the construction of salient pole alternator. **(07 Marks)**

c. A three phase load of three equal impedances connected in delta across a balanced 400 V supply takes a line current of 10 A, at a power factor of 0.7 lagging. Calculate
(i) The phase current, (ii) Total power, (iii) The total reactive volt Amperes. **(07 Marks)**

Module-5

9 a. Derive EMF equation of transformer. **(06 Marks)**

b. The maximum efficiency at full load and upf of a single phase 25 kVA, 500/1000 V, 50 Hz transformer is 98%. Determine the efficiency at (i) 75% load 0.9 p.f (ii) 50% load 0.8 p.f (iii) 25% load 0.6 p.f. **(07 Marks)**

c. A three phase 6 pole 50 Hz 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 stand still (v) Frequency of rotor of rotor current at full load. **(07 Marks)**

OR

10 a. Derive the condition for which the efficiency of a transformer is maximum. **(06 Marks)**

b. Define slip. Derive an expression for frequency of Rotor current. **(06 Marks)**

c. A single phase, 20 kVA transformer has 1000 primary turns and 2500 secondary turns. The net cross-sectional area of the core is 100 cm^2. When the primary winding is connected to 550 V, 50 Hz supply. Calculate (i) The maximum value of the flux density in the core (ii) the voltage induced in the secondary winding and (iii) The primary and secondary full load currents. **(08 Marks)**

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CBCS Scheme

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15ELE15

First Semester B.E. Degree Examination, Dec.2015/Jan.2016
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 80

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator, will be treated as malpractice.

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Module-1

1 a. State ohm's law. Mention its limitations. **(05 Marks)**

b. A coil consists of 600 turns and a current of 10 A in the coil gives rise to a magnetic flux of 1 mWb. Calculate: (i) self inductance, (ii) The emf induced, (iii) The energy stored when a current s reversed in 0.01 sec. **(05 Marks)**

c. A circuit of two parallel resistors having resistance of 20Ω and 30Ω respectively, connected in series with 15Ω. If the current through 15 Ω resistor is 3A, find (i) current in 20Ω and 30Ω resistors, (ii) voltage across the whole circuit, (iii) The total power and power consumed in all resistors. **(06 Marks)**

OR

2 a. Define dynamically induced emf and statically induced emf with examples. **(05 Marks)**

b. State and explain Kirchoff's current law and Kirchoff's voltage law. **(06 Marks)**

c. In the network shown in Fig.Q2(c), determine current flow in the ammeter 'A' having resistance of 10 Ω.

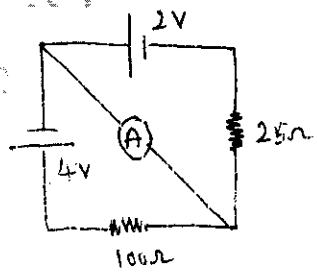

Fig.Q2(c) **(05 Marks)**

Module-2

3 a. Sketch torque versus armature current and speed versus armature current characteristics of a D.C. shunt motor and mention its applications. **(06 Marks)**

b. With the help of neat diagram, explain the construction and working principle of electrodynamometer type wattmeter. **(06 Marks)**

c. An 8 pole D.C. generator has 500 armature conductors and has useful flux per pole of 0.065 Wb. What will be emf generated if it is lap connected and runs at 1000 rpm? What must be the speed at which it is to be driven to produce the same emf if it is wave connected? **(04 Marks)**

OR

4 a. Derive EMF equation of DC generator. **(04 Marks)**

b. With a neat diagram, explain the construction and working of a induction type energy meter. **(06 Marks)**

c. A 200V, 4 pole, lap wound DC shunt motor has 800 conductors on its armature. The resistance of the armature winding is 0.5 Ω and that of the shunt field winding is 200 Ω. The motor takes 21A and flux/pole is 30 mWb. Find speed and gross torque developed in the motor. **(06 Marks)**

Module-3

5 a. Explain two way control of lamps with truth table and connection diagram. **(05 Marks)**

b. An alternating voltage (80+j60)V is applied to a circuit and the current flowing is (-4+j10)A. Find: (i) the impedance of the circuit, (ii) the phase angle, (iii) power consumed. **(05 Marks)**

c. Two impedances $z_1 = (10 + j15)\Omega$ and $z_2 = (6 - j8)\Omega$ are connected in parallel. If the total current supplied is 15A, what is power taken by each branch? **(06 Marks)**

OR

6 a. Show that power consumed in an AC circuit is P = VI cos ϕ, where V is RMS value of the applied voltage, I is the RMS value of current and ϕ is the angle between voltage V and current I. **(05 Marks)**

b. What is earthing? Explain any one type of earthing with neat figure. **(06 Marks)**

c. A coil of power factor 0.6 is in series with 100 μF capacitor. When connected to a 50 Hz supply, the potential difference across the coil is equal to potential difference across the capacitor. Find the resistance and inductance of the coil. **(05 Marks)**

Module-4

7 a. Mention the advantages of three phase system over single phase system. **(05 Marks)**

b. Three similar coils each having resistance of 10Ω and reactance of 8Ω are connected in star, across 400 V, 3 phase supply. Determine (i) line current, (ii) total power, (iii) reading of each of two wattmeter connected to measure power. **(06 Marks)**

c. A 2 pole 3phase alternator running at 3000 rpm has 42 slots with 2 conductors per slot. Calculate the flux per pole, required to generate a line voltage of 2300 V. Assume $K_d = 0.952$ and $K_p = 0.956$. The armature is star connected. **(05 Marks)**

OR

8 a. With the help of a circuit diagram and vector diagram, show that two wattmeters are sufficient to measure total power and power factor in a balanced three phase circuit. **(08 Marks)**

b. With neat sketches, explain the construction of salient pole alternator. **(04 Marks)**

c. A three phase load of three equal impedances connected in delta across a balanced 400 V supply, takes a line current of 10 A at a power factor of 0.7 lagging. Calculate:
i) the phase current, ii) the total power, iii) the total reactive volt amperes. **(04 Marks)**

Module-5

9 a. Derive EMF equation of transformer. **(04 Marks)**

b. The maximum efficiency at full load and Upf of a single phase, 25 kVA, 500/1000 V, 50 Hz transformer is 98%. Determine the efficiency at (i) 75% load 0.9 pf, (ii) 50% load 0.8 pf, (iii) 25% load 0.6 pf. **(08 Marks)**

c. If a 6 pole induction motor supplied from a three phase 50 Hz supply has a rotor frequency 2.3 Hz, calculate (i) the percentage slip, (ii) the speed of the motor. **(04 Marks)**

OR

10 a. Derive the condition for which the efficiency of a transformer is maximum. **(06 Marks)**

b. Define slip. Derive an expression for frequency of rotor current. **(05 Marks)**

c. A three phase 6 pole 50 Hz 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 stand still, (v) Frequency of rotor current at full-load. **(05 Marks)**

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15ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 80

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

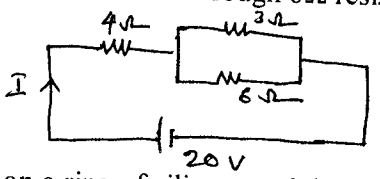
Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define KCL and KVL with an example. **(05 Marks)**

b. From the given below circuit, find the current through 6Ω resistor. [Fig.Q.1(b)]. **(05 Marks)**

Fig.Q.1(b)



c. A coil of 1000 turns is wound on a ring of silicon steel, having mean diameter of 10cm and relative permeability 1200. Its cross sectional area is 12 sq.cm. When a current of 5A flows through the coil, find:
i) Flux in the core
ii) Inductance of the coil
iii) Induced emf if the flux falls to zero in 20m sec. **(06 Marks)**

OR

2 a. Derive an expression for dynamically induced emf with a neat diagram. **(05 Marks)**

b. Two coupled coils of self inductance 0.8H and 0.2H, have a coefficient of coupling 0.9. Find the mutual inductance and turns ratio. **(05 Marks)**

c. A 10Ω resistance is connected in series with a parallel combination of 15Ω and 20Ω resistors. The circuit is applied with V volts. The power taken by the circuit is 150 watts. Find the total current through the circuit and power consumed in all the resistors. **(06 Marks)**

Module-2

3 a. With a neat sketch, explain the construction of various parts of a DC machine. **(05 Marks)**

b. 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. Also find the speed at which it should be driven to produce same emf when wave connected. **(05 Marks)**

c. With a neat figure, explain the construction and working principle of dynamometer type wattmeter. **(06 Marks)**

OR

4 a. Explain the construction and principle of operation of induction type single phase energy meter. **(05 Marks)**

b. 4-pole, 220V, lap connected DC shunt motor has 36 slots, each slot containing 16 conductors. It draws a current of 40A from supply. The field resistance and armature resistances are 110Ω and 0.1Ω respectively. The motor develops an output power of 6kW. The flux per pole in 40m wb. Calculate: i) Speed; ii) Torque developed by armature; iii) Shaft torque. **(05 Marks)**

c. Derive emf equation for DC generator. **(06 Marks)**

Module-3

5 a. Derive an expression for power in pure capacitor circuit and draw voltage, current and power waveforms. **(05 Marks)**

b. A series circuit with a resistor of 100Ω, capacitor of 25μF and inductance of 0.15H is connected across 220V, 50Hz supply. Calculate impedance, current, power and p.f. of circuit. **(05 Marks)**

c. With a neat sketch, explain 3-way control of lamp. **(06 Marks)**

OR

6 a. Define earthing. Explain any one type of earthing with a neat diagram. **(05 Marks)**

b. Two impedances (150-157j)Ω and (100 + 110j)Ω are connected in parallel across 200V, 50Hz supply. Find branch currents, total current and total power consumed in the circuit. Draw the phasor diagram. **(05 Marks)**

c. Define power factor and mention its practical importance. **(06 Marks)**

Module-4

7 a. Mention the advantages of three phase system over single phase system. **(05 Marks)**

b. Three coils each having resistance of 10Ω and inductance of 0.02H are connected in star across 440V, 50Hz, 3ϕ supply. Calculate the line current and total power consumed. **(05 Marks)**

c. A 6-pole, 3ϕ, star connected alternator has an armature with 90 slots and 12 conductors per slot and rotates at 1000 rpm. The flux per pole is 0.5wb. Calculate emf generated, if the winding factor is 0.97 and full pitched. **(06 Marks)**

OR

8 a. With a neat sketch, explain the constructional details of alternator. **(05 Marks)**

b. A 3ϕ, 16 pole alternator has a star connected winding with 144 slots and 10 conductor per slots. The flux per pole is 30mwb. Find the phase and line voltages, if the speed is 375rpm. **(05 Marks)**

c. A 3ϕ, 400V, motor takes an input of 40kW at 0.45 p.f. lag. Find the reading of each of the two single phase wattmeters connected to measure the input. **(06 Marks)**

Module-5

9 a. Explain the working principle of single phase transformer. **(05 Marks)**

b. Find the efficiency of 150kVA, single phase transformer at i) Full load upf; ii) 50% of full load at 0.8p.f. If the copper loss at full load is 1600 watts and iron loss is 1400 watts. **(05 Marks)**

c. A 3ϕ, 4-pole, 400V, 50Hz induction motor runs with a slip of 4%, find rotor speed and frequency. **(06 Marks)**

OR

10 a. Explain the working principle of an 3ϕ induction motor with a neat sketch. **(05 Marks)**

b. A 10 pole induction motor supplied by a 6 pole alternator, which is driven at 1200 rpm. If the motor runs at slip of 3%, what is its speed? **(05 Marks)**

c. A single phase transformer has 400 primary and 1000 secondary turns. The net cross sectional area of core is 60cm^2. The primary winding is connected to 500V, 50Hz. Find: i) Peak value of core flux density; ii) Emf induced in the secondary winding. **(06 Marks)**

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15ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2017
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 80

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.

Module-1

1 a. State and explain Ohm's Law with an illustration. Also list it's limitations. **(05 Marks)**

b. For the circuit shown in Fig. Q1(b), Obtain voltage between points X and Y. **(06 Marks)**

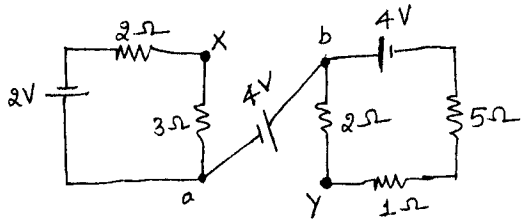

Fig. Q1(b)

c. Obtain relationship between self inductance of two coils, mutual inductance between the coils and co-efficient of coupling. **(05 Marks)**

OR

2 a. State and explain KCL and KVL with illustration for each. **(05 Marks)**

b. Coil A and B in a magnetic circuit have 600 and 500 turns respectively. A current of 8A in coil A produces a flux of 0.04Wb in it. If co-efficient of coupling is 0.2, calculate :
   i) Self inductance of coil A when coil B is open circuited
   ii) emf induced in coil B when flux changes from full value to zero in 0.02s
   iii) Mutual inductance. **(06 Marks)**

c. With illustrations, explain statically and dynamically induced emfs. **(05 Marks)**

Module-2

3 a. Explain the construction and principle of operation of dynamometer type wattmeter. **(05 Marks)**

b. Discuss about various characteristics of a DC series motor with neat diagrams. **(06 Marks)**

c. A 30kW, 300V, DC shunt Generator has armature resistance of 0.05Ω and field resistance of 100Ω. Calculate power developed by the armature when it delivers full output power. **(05 Marks)**

OR

4 a. Derive emf equation for a DC Generator. **(05 Marks)**

b. Explain the construction and principle of operation of a single phase induction type energy meter. **(06 Marks)**

c. A 4 pole, DC shunt motor takes 22.5A from 250V supply. The armature is wave wound with 300 conductors. The armature resistance is 0.5Ω and field resistance is 125Ω. If useful flux per pole is 0.02Wb ; calculate :
   i) Speed ii) Torque developed iii) Electrical power developed. **(05 Marks)**

Module-3

5 a. With a neat connection diagram and functional table, explain three way control of a lamp. **(05 Marks)**

b. An alternating voltage (80 + j60)V is applied to a circuit and the current flowing through it is (–4 + j10) A. Find the i) impedance of the circuit ii) phase angle iii) pf of the circuit iv) power consumed by the circuit. **(06 Marks)**

c. For the circuit shown Fig. Q5(c), Find ;
i) Current in each branch ii) Power factor of the circuit. **(05 Marks)**

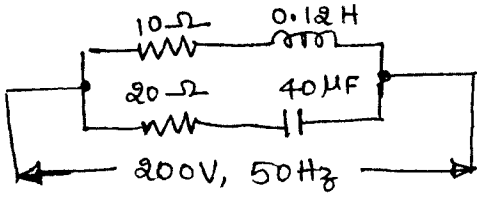

Fig. Q5(c)

OR

6 a. Show that the power consumed by a pure capacitor is zero. Draw the voltage, current and power waveforms. **(05 Marks)**
b. What is earthing? Explain any one type with neat diagram. **(06 Marks)**
c. A series RLC circuit with 100Ω, 25μF and 0.15H is connected across 220V, 50Hz supply calculate : i) impedance ii) current iii) p.f iv) voltage drops across inductor and capacitor. **(05 Marks)**

Module-4

7 a. Mention advantages of 3 phase system over 1 phase system. **(05 Marks)**
b. Three arms of a 3ϕ, delta connected load, each comprise of a coil having 25Ω resistance and 0.15H inductance in series with a capacitor of 120μF across 415V, 50Hz supply. Calculate line current, power factor and power consumed. **(06 Marks)**
c. A 3ϕ. 4 pole, 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. Assume winding factor of 0.96. **(05 Marks)**

OR

8 a. Mention the advantages of stationary armature of an alternator. **(05 Marks)**
b. Establish the relationship between line and phase voltages and currents in a 3ϕ star connected balanced circuit. Shown the vector diagram neatly. **(06 Marks)**
c. Calculate power, power factor and line current in a balanced 3ϕ star connected system drawing power from 440V supply in which two wattmeters connected indicate W_1 = 5kW and W_2 = 1.2kW. **(05 Marks)**

Module-5

9 a. Derive the condition for maximum efficiency of a transformer, **(05 Marks)**
b. Explain with neat vector diagrams, the concept of rotating magnetic field theory. **(06 Marks)**
c. Define slip speed and slip. What is the slip speed, slip and at what speed rotor runs if the frequency of the emf in the stator of a 4 pole, 3ϕ IM is 50Hz and in the rotor is 1.5Hz? **(05 Marks)**

OR

10 a. Derive emf equation of a transformer. **(05 Marks)**
b. With neat diagrams, explain construction of types of rotors of 3ϕ induction motor. **(06 Marks)**
c. A 10KVA, 1ϕ transformer has a primary winding of 300 turns and secondary winding of 750 turns, cross sectional area of core is 64cm^2. If primary voltage is 440V at 50Hz, find maximum flux density in the core, emf induced in secondary of transformer. At 0.8 lag p.f. calculate the efficiency of transformer if full load copper loss is 400W and iron-loss is 200W. **(05 Marks)**

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15ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2017/Jan.2018
Basic Electrical Engineering

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2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. State and explain Kirchhoff's law. **(05 Marks)**

b. Refer Fig Q1(b). Find I_1, I_2 and I_3. **(07 Marks)**

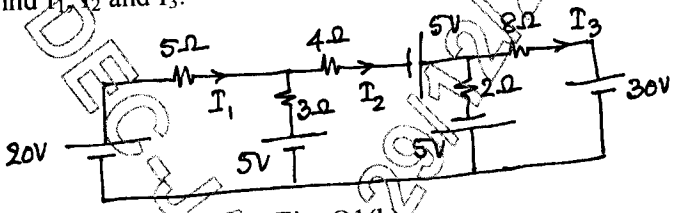

Fig. Q1(b)

c. Coil A of 230 turns and coil B of 240 turns share a magnetic circuit of mean length 0.8m and uniform cross section area 115cm^2. Relative permeability of the core material is 1350. Find the self inductances of the coils. Find the average emf induced in coil A when, in coil B, the current changes from 2A to 6.5A in 0.03s. Assume k = 1.0 between the coils. **(04 Marks)**

OR

2 a. Define 'Self Inductance' of a coil. Derive an expression for the self inductance of a coil in terms of its geometry and material properties. **(05 Marks)**

b. Refer Fig Q2(b) find I_1, I_2 and the power in the 6Ω resistor. **(07 Marks)**

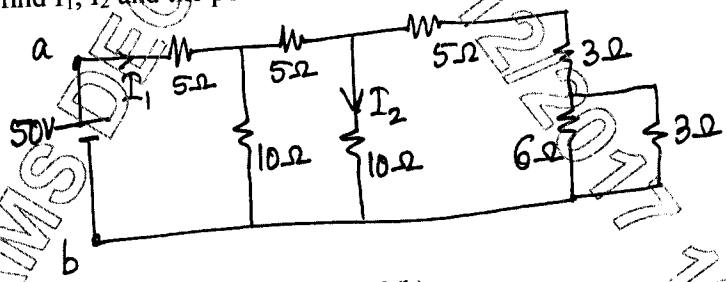

Fig. Q2(b)

c. Coil A of 600 turns and coil B of 500 turns have k = 0.2. A current of 8A in coil A produces 40mWb flux in it. Find : i) Inductance of coil A with coil B open circuited ; ii) the flux linking coil B ; iii) the emf induced in coil B if the flux linking it falls to zero from its full value in 2ms ; and iv) mutual inductance between the coils. **(04 Marks)**

Module-2

3 a. Deduce an expression for the armature torque, T_a, developed in a dc motor and hence show that $T_a \alpha \phi I_a$. **(02 Marks)**

b. A 100V short shunt dc generator supplies 200 lamps of 55W at 110V rating. R_a = 0.06Ω; R_{se} = 0.04Ω ; and R_{sh} = 25Ω. Sketch the circuit diagram and find the emf generated. **(07 Marks)**

c. With a neat sketch, explain the working of a 1ϕ energy meter. **(07 Marks)**

OR

4 a. "A dc series motor should never be run on light or no load". Justify. **(03 Marks)**

b. A shunt dc generator delivers 65kW at 250V and 500rpm. $R_a = 0.015\Omega$ and $R_{sh} = 85\Omega$. Find its speed when running as a motor taking 40kW from 240V supply. BCD = 1V/Brush. Sketch relevant circuit diagrams. **(07 Marks)**

c. With a neat schematic, describe the construction and working of a dynamometer type wattmeter. **(06 Marks)**

Module-3

5 a. Show that a pure inductor is lossless. **(03 Marks)**

b. Refer Fig. Q5 (b). Find the real power, reactive power and the apparent power supplied.

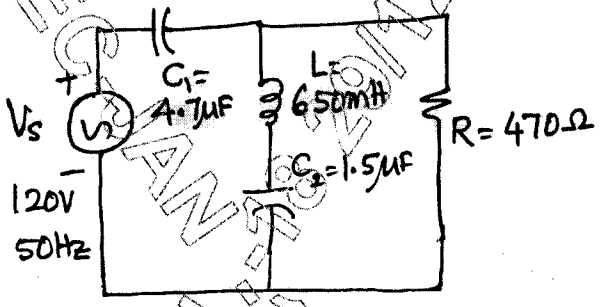

Fig. Q5(b) **(06 Marks)**

c. With a neat circuit diagram and truth table, explain the working of a 3-way control of a device. **(07 Marks)**

OR

6 a. Show that an R-C series circuit takes a leading current. Sketch a phasor diagram indicating the supply emf, the current and the two drops. **(07 Marks)**

b. A resonant series circuit with R = 5Ω, L = 1mH and C = 0.001μF is connected to a 100V supply Find :

i) the drop across L ; and

ii) drop across C. Take the supply as the reference phasor. **(05 Marks)**

c. For a fuse, define i) Rated current, ii) Fusing current ; and iii) Fusing factor. Why is the fusing factor greater than unity? **(04 Marks)**

Module-4

7 a. Sketch a 4-wire STAR supply and identify the phase and line voltages. With balanced supply taking $E_R = E_P \angle 0^\circ$, obtain the relationship between the phase and line voltages. Hence, sketch a phasor diagram indicting all phase and line voltages. **(08 Marks)**

b. 2 wattmeters connected to measures 3ϕ power of a balanced Δ load read 2.5 kW and 0.5kW. Find the load pf if i) both readings are positive; and ii) the latter reading is obtained after reversing the connections of the potential coil. **(04 Marks)**

c. In a 3ϕ alternator, why is it advantageous to have the armature on the stator and the excitation on the rotor? **(04 Marks)**

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OR

8 a. With a neat circuit diagram, show how 3ϕ power can be measured using two Wattmeters. State the NECESSARY CONDITION clearly. **(07 Marks)**

b. A balanced Δ load of (8+j6) Ω/phase is connected to a 400V supply. Find i) the phase current ii) the line current. If the same impedances are connected in STAR, what is the reactive power consumed and at what pf? **(04 Marks)**

c. A 4-pole, 3ϕ alternator driven at 1800rpm has 42 slots with 4 conductors/slot. Average flux/pole is 0.36 Wb, sinusoidally distributed. $K_p = 0.956$ and $K_d = 0.952$. Find the line voltage on no-load if connected in i) Δ ; and ii) STAR. **(05 Marks)**

Module-5

9 a. Starting from expression for the efficiency of a transformer derive the condition for maximum efficiency and the expression for maximum efficiency. **(05 Marks)**

b. A 135 kVA, 1ϕ transformer has primary of 2kV, 50Hz. Primary and secondary number of turns are 162 and 48 respectively. Neglecting losses, find i) no-load secondary emf ; ii) full load primary and secondary currents, and iii) maximum core flux. **(04 Marks)**

c. With a neat sketch, explain the working of a STAR - Δ starter, for a 3ϕ induction motor. Show that the starting inrush current is reduced by 66.7%. **(07 Marks)**

OR

10 a. "A 3ϕ induction motor can never run at N_s". Justify. **(04 Marks)**

b. A single phase transformer has a maximum efficiency of 98% at 75% load, upf. The copper loss at maximum efficiency is 314W. Find its efficiency at 50% load, 0.9 pf. **(04 Marks)**

c. A 6-pole, 3ϕ alternator running at 1200rpm feeds a 4-pole, 3ϕinduction motor having slips of 3% at full load and 2.5% at half load. The rotor induced emf/phase at stand still is 160V. At full load and half load, find each of the following: i) the motor speed ; ii) frequency of the rotor induced emf and (iii) the rotor induced emf/phase. **(08 Marks)**

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VTU EXAMS 8th JAN 2017 12:40:04

CBCS Scheme

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15ELE15/25

First/Second Semester B.E. Degree Examination, June/July 2016
Basic Electrical Engineering

Time: 3 hrs. Max. Marks: 80

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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Module-1

1 a. State and explain Kirchoff's laws. **(05 Marks)**

b. Find the currents in the various branches of the given network shown in Fig. Q1 (b). **(06 Marks)**

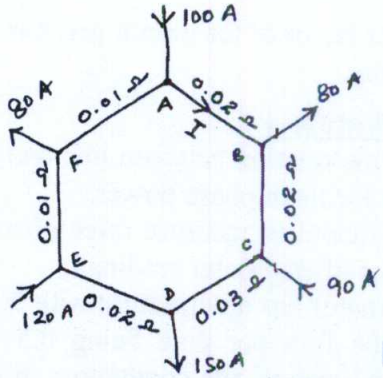

Fig. Q1 (b)

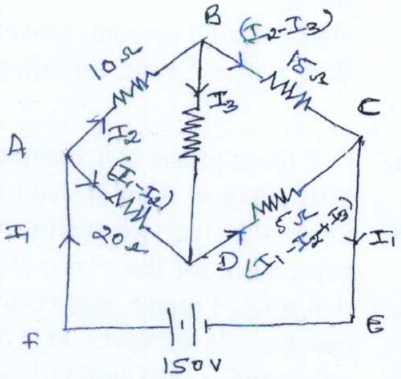

Fig. Q2 (b)

c. Define the co-efficient of coupling and find its relation with L_1, L_2 and M. **(05 Marks)**

OR

2 a. State ohm's law and mention its limitations. **(05 Marks)**

b. In the network shown in Fig. Q2 (b), find the currents flowing in each branch using Kirchoff's laws. **(06 Marks)**

c. Define mutual inductance and explain with respect to two coils placed very close to each other. **(05 Marks)**

Module-2

3 a. With a neat sketch, explain the construction of the various parts of a D.C. generator. **(05 Marks)**

b. What is the significance of back EMF in a D.C. motor? **(05 Marks)**

c. With a neat figure, explain the construction and working principle of a dynamometer type wattmeter. **(06 Marks)**

OR

4 a. Derive the EMF equation of a D.C. generator. **(05 Marks)**

b. Derive an equation for the torque developed in the armature of a D.C. motor. **(05 Marks)**

c. With a neat figure, explain the construction and working principle of an induction type single phase energy meter. **(06 Marks)**

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Module-3

5 a. Derive an expression for average value of an alternating quantity. **(05 Marks)**

b. A circuit consists of a resistance of 10 Ω, an inductance of 16 mH and a capacitance of 150 μF connected in series. A supply of 100 V at 50 Hz is given to the circuit. Find the current, pf and power consumed by the circuit. Draw the vector diagram. **(06 Marks)**

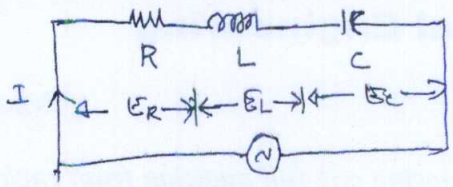

Fig. Q5 (b)

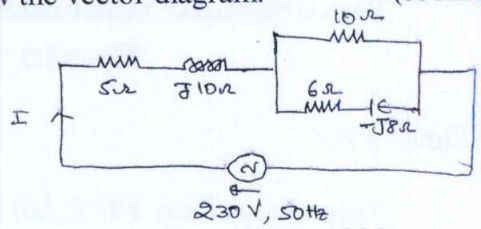

Fig. Q6 (b)

c. With a circuit diagram, explain the working of a three way control of lamp. **(05 Marks)**

OR

6 a. Define RMS value of a sinusoidally varying current and find its relation with its maximum value. **(05 Marks)**

b. Find the total current, power and power factor of the circuit given in Fig. Q6 (b). **(05 Marks)**

c. With a neat figure, explain plate earthing. **(06 Marks)**

Module-4

7 a. In a three phase star connection, find the relation between line and phase values of currents and voltages. Also derive the equation for three phase power. **(05 Marks)**

b. Show that the two wattmeters are sufficient to measure three phase power. Also derive an expression for the power factor in terms of wattmeter readings. **(06 Marks)**

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 web. 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. **(05 Marks)**

OR

8 a. In a 3 phase delta connection, find the relation between line and phase values of currents and voltages. Also derive an equation for three phase power. **(05 Marks)**

b. Explain the effect of power factor on the two wattmeter readings connected to measure three phase power. **(06 Marks)**

c. A 6 pole, 3 phase, 50 Hz alternator has 12 slots per pole and 4 conductors per slot. The winding is 5/6 full pitched. A flux of 25 mWb is sinusoidally distributed along the air gap. Determine the line emf, if the alternator is star connected. **(05 Marks)**

Module-5

9 a. Derive the EMF equation of a transformer. **(05 Marks)**

b. Find the number of turns on the primary and secondary side of a 440/230 V, 50 Hz single phase transformer, if the net area of cross section of the core is 30 cm^2 and the flux density is 1 Wb/m^2. **(06 Marks)**

c. Define the slip of an induction motor and derive the relation between the supply frequency and rotor current frequency. **(05 Marks)**

OR

10 a. Explain the different losses occurring in a transformer. **(05 Marks)**

b. A single phase, 20 KVA transformer has 1000 primary turns and 2500 secondary turns. The net cross sectional area of the core is 100 cm^2. When the primary winding is connected to 550 V, 50 Hz supply, calculate (i) the maximum value of the flux density in the core, (ii) The voltage induced in the secondary winding and (iii) the primary and secondary full load currents. **(06 Marks)**

c. With a circuit diagram, explain the working of a star-delta starter for a three phase induction motor. **(05 Marks)**

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