b) A capacitor of 79.5 microF is connected in series with a non inductive resistance of 30 Ohms across a 100V, 50Hz supply. Find i) impedance ii) current iii) phase angle iv) equations for instantaneous values of voltage and current.

c) An inductive coil is connected to a supply of 250V, 50Hz and takes a current of 5A. The coil dissipates 750W. Find i) power factor, ii) Coil resistance iii) Coil inductance

4. a) Define following terms: (i) Instantaneous value; (ii) Cycle (iii) frequency (iv) Time period.

b) A resistance of 10 Ohms, inductive reactance of 8 Ohms and a capacitive reactance of 15 Ohms are connected in parallel across a 120V, 50Hz mains. Determine i) total current ii) circuit power factor iii) power.

c) Prove that average power in a single phase AC circuit (with RL Load) is $VI\cos\varphi$. Also show the related vector diagram and waveforms.

Unit – III

5. a) List the advantages of 3 phase systems over single phase systems.

b) The primary winding of a single phase transformer is connected to a 240V, 50Hz supply. The secondary has 1500 turns. If the maximum value of a core flux is 0.00207 wb, determine (a) the number of turns on the primary winding, (b) the secondary induced voltage, and (c) the net area of cross-section, if the flux density has a maximum value of 0.465 wb/m^2.

c) Explain with the help of a neat diagram, the construction and principle of operation of induction type energy meter.

6. a) Two wattmeter method is used to measure the power input to a 3 phase balanced circuit. Find the readings of the each wattmeter if i) $\Phi = 0$ ii) $\Phi = 30^0$ iii) $\Phi = 60^0$ iv) $\Phi = 90^0$

b) Write a note on (i) losses in a transformer (ii) voltage regulation of transformer.

c) With a neat diagram, explain the construction and working of a moving iron attraction type ammeter.

Unit – IV

7. a) A 2-pole, wave wound generator has 51 slots, 24 conductors/slot. If the flux per pole is 0.01Wb, determine the speed at which the armature be driven to give an induced emf of 220V? Now, if the speed is changed to 750rpm, to generate the same emf what should be the flux per pole?

b) Explain the necessity of a starter for a DC shunt motor.

c) What is meant by the voltage regulation of an alternator? Explain.

8. a) With a neat sketch explain the various parts of a DC generator.

b) A 15HP, 4 pole, 250V lap wound DC shunt motor has 48 slots each containing 20 conductors. It draws a current of 80A from the supply. The field and armature resistances are 125Ω and 0.2Ω respectively. The total flux per pole is 100mWb. Calculate the speed and the torque developed by armature.

c) Explain the principle of operation of an alternator.

Unit – V

9. a) Explain the principle of rotating magnetic field.

b) With a neat sketch explain plate earthing.

c) A 6 pole induction motor supplied from a three phase 50 Hz supply has a rotor frequency of 2.3 Hz. Calculate:
i) The percentage slip ii) The speed of the motor

10. a) Explain the need of starter for an induction motor. With a neat diagram explain a star delta starter for a 3 phase induction motor.

b) Explain three way control of lamp.

c) A three phase 10 pole induction motor is supplied by a 6 pole alternator running at 1200rpm. Calculate the speed of the motor for a slip of 3%.

BT* Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester B.E. (Credit System) Degree Examinations

April - May 2016

15EE105 – BASIC ELECTRICAL ENGINEERING

tion: 3 Hours Max. Marks: 100

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

		Marks	BT*
	Unit – I		
a)	Derive an expression for the lifting power of an electromagnet.	06	L*2
b)	Find using mesh current analysis the current through the 8 Ohm resistor in the circuit shown in fig. 1(b)		

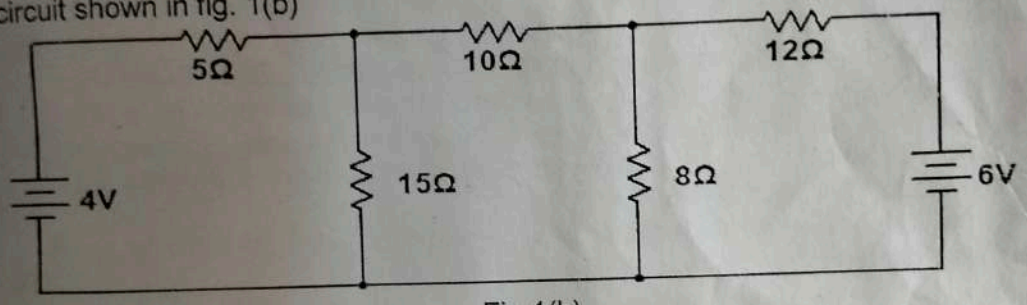

Fig 1(b) 06 L3

c) Using star delta transformation, find the equivalent resistance across AB for the circuit shown in fig 1(c). (All the resistances are measured in ohms).

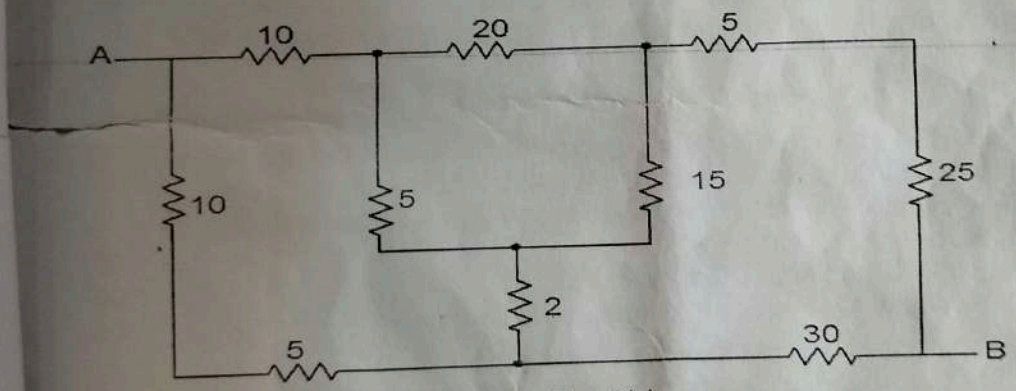

Fig. 1(c) 08 L4

a) Define dynamically induced emf and derive an expression for the same. 06 L1

b) A resistor of 12 Ohm is connected in series with a combination of 15 Ohm and 20 Ohm resistors in parallel. A voltage of 120 V is applied across the whole circuit. Find the current taken from the supply and voltage across the 12 Ohm resistor. 06 L3

c) Two identical coils of 1200 turns each are placed side by side such that 60% of the flux produced by one coil links the other. A current of 10 A in the first coil sets up a flux of 0.12 mWb. If the current in the first coil changes from 10 A to -10A in 20 seconds, find the self inductances of the coils , the self induced emf and mutually induced emf. 08 L2

Unit – II

a) Derive an expression for the average power in a pure resistive circuit energized by sinusoidal voltage. Also show the related diagrams and waveforms. 06 L2

P.T.O.

	c)	With a neat sketch, describe the working principle of DC motor.	6	L2
8				
	a)	Determine the total torque developed in a 250 V, 4 pole dc shunt motor with lap winding, accommodating in 60 slots, each containing 20 conductors. The armature current is 50A and flux per pole is 23m web.	5	L4
6	b)	Starting from the basic principle, develop an expression for the emf induced in an alternator and explain the working principle.	8	L5
	c)	A 3 phase star connected alternator with 12 poles generates 1100 volts on open circuit at a speed of 500 RPM. Assuming 180 turns/phase, a distribution factor of 0.96 and full pitched coils, find the useful flux per pole.	7	L3
6				

Unit – V

	a)	Explain the principle of operation of 3 phase Induction motor.	7	L2
	b)	A 4 pole, 3 phase Induction motor operates from a supply whose frequency is 50Hz. Calculate		
8		(i) the speed at which magnetic field of stator is rotating.	7	L4
		(ii) speed of rotor when slip = 4%	6	L2
		(iii) frequency of rotor current when s=0.03		
6	c)	With neat diagram explain any 2 types of Fuses.		
	a)	Explain double field revolving theory of single phase Induction motor.	7	L2
	b)	A induction motor runs at 2900 rpm at full load, when connected to 50 Hz supply. Determine number of poles and slip. The speed of the rotating magnetic field is 3000 rpm.	6	L4
6	c)	Explain two way and three way control of lamps.	7	L3

Γ* Bloom's Taxonomy, L* Level

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c) Two magnetically coupled coils have a co-efficient of coupling 0.85. When connected for series aiding, the total inductance is 100 mH and when connected for series opposing, the total inductance is 40mH. Find L_1,L_2 and M.

Unit – II

3. a) Define the following terms with reference to alternating current.
(i) form factor (ii) power factor (iii) amplitude factor

b) A bulb consumes 75 W when connected to a 60 Hz power supply with a peak voltage of 170V. Calculate (i) the resistance of the bulb (ii) instantaneous voltage across the bulb and (iii) instantaneous current in the circuit.

c) Two impedances Z_1 and Z_2 when connected separately across a 230 V, 50 Hz supply consumed 100 W and 60 W at power factors of 0.5 lagging and 0.6 leading respectively. If these impedances are now connected in series across the same supply, find (i) total power absorbed and overall pf. (ii) the value of the impedance to be added in series so as to raise the overall pf to unity. (iii) value of inductance or capacitance.

4. a) Derive an expression for the instantaneous (i) current (ii) power and (iii) average power delivered to an RC series circuit energized by an AC source. Also, draw the phasor diagram for the same.

b) A series circuit consists of a resistance of 6 Ω and an inductive reactance of 8 Ω. A potential difference of 141.4 V (rms) is applied to it. At a certain instant, the applied voltage is +100V and is increasing. Calculate at this instant (i) the current (ii) the voltage drop across the resistance and (iii) the voltage drop across the inductor.

c) A 50 Ω resistor, a 0.1 H inductor and a 10 μF capacitor are connected in series to a 60 Hz supply. The rms current in the circuit is 2.75A. Find the rms voltages across (i) the resistor (ii) the inductor (iii) the capacitor and (iv) the RLC combination.

Unit – III

5. a) With a neat diagram explain the functioning of a repulsion type moving iron instrument

b) Establish the relationship between the line and phase voltages and currents in a 3 phase star connected system. Draw the phasor diagram.

c) A single phase, 50 Hz transformer has 30 primary turns and 350 secondary turns. The net cross sectional area of the core is 250 sq.cm. If the primary winding is connected to a 230 V, 50 Hz supply, calculate
i) Peak value of the flux density in the core.
ii) Voltage induced in the secondary winding
iii) Primary current when secondary current is 100A

6. a) With a neat diagram explain the working of an induction type single phase watt-hour meter

b) The power input to a 3-phase induction motor running on 400 V, 50 Hz supply was measured by two wattmeter method and the readings were 3000 W and -1000 W. Calculate (i) total input power (ii) power factor (iii) line current

c) Explain the principle of operation of a single phase transformer and deduce its EMF equation with usual notations.

Unit – IV

7. a) Derive an expression for the torque developed by a dc motor in terms of air gap flux and armature current.

b) Determine the phase and line values of the induced emf in a 4 pole, 3 phase, 50 Hz star connected alternator with 36 slots and 30 conductor per slot. Flux per pole is 50m Wb and the winding factor is 0.95.

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

First / Second Semester B.E. (Credit System) Degree Examinations

Make up / Supplementary Examinations – July 2016

15EE105 – BASIC ELECTRICAL ENGINERRING

n: 3 Hours

Max. Marks: 100

*Note: Answer **Five full** questions choosing **One full** question from **each Unit.***

Unit – I

		Marks	BT*
	Determine the equivalent resistance between the terminals P & Q of the given network shown in Fig. 1(a)		

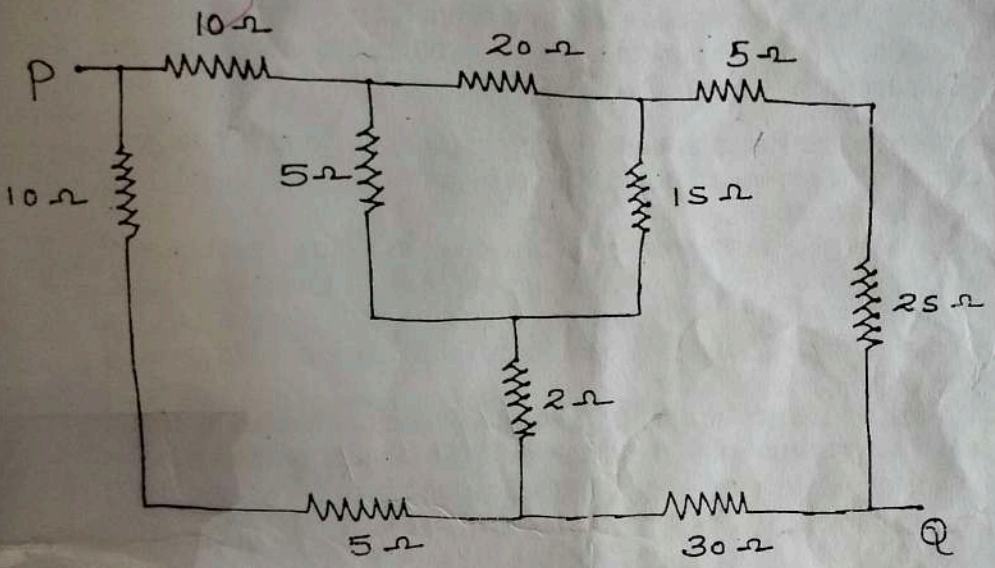

fig 1(a).

		8	L*3
	With an example explain Ohm's Law.	6	L1
	State the faraday's laws of Electromagnetic induction and Lenz's Law.	6	L1
	In the network shown in Fig. 2(a) find the current flowing in Branch AB and BD using Kirchoff's Law.		

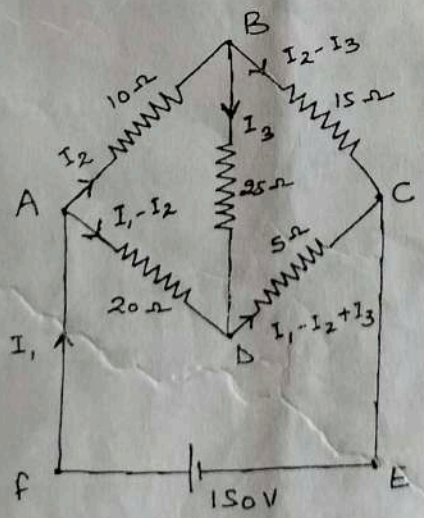

fig 2(a)

		8	L3
	Write a note on statically induced emf.	4	L1

4. a) Obtain an expression for the average power in a single phase series RC circuit energized by a sinusoidal voltage.
   b) A series R-L circuit consists of 100Ω resistance and 0.25H inductance and is connected across 100V, 50Hz a.c. supply. Calculate (i) inductive reactance (ii) Impedance (iii) the current and (iv) the power factor of the circuit.
   c) An alternating voltage has the equation v =141.4sin377t volts. What are the values of (a) r.m.s voltage (b) frequency (c) the instantaneous voltage when t=3ms.

Unit – III

5. a) Prove that two wattmeter are sufficient to measure total power in a balanced 3-phase delta connected system.
   b) With the neat sketch explain the working principle of single phase transformer.
   c) With neat diagram explain the construction and working of a moving iron attraction type ammeter.

6. a) Three identical coils, each having a resistance of 10 Ohm and inductive reactance of 17.32 Ohm are connected in star across 400V, 3phase 50Hz supply. Find line current and the reading of each of two watt meter connected to measure the power input.
   b) With a neat sketch explain the working principle of auto transformer.
   c) With a neat sketch explain the working principle of single phase induction type energy meter.

Unit – IV

7. a) With a neat constructional diagram explain working of DC Machine.
   b) Derive the emf equation of synchronous generator.
   c) The armature current of a series motor is 60 A, when on full load. If the load is adjusted so that this current decreases to 40A, find the new torque expressed as a percentage of full load torque. The flux for a current of 40A is 70% of that when the current is 60A.

8. a) With a neat sketch describe the salient pole type and smooth cylindrical type of rotors of synchronous generator.
   b) Derive an expression for armature torque developed in a DC motor.
   c) An 8 pole DC shunt generator with wave wound has 36 slots, each having 10 conductors. The flux per pole is 0.01 Wb. It runs at 1200 rpm. The armature and field resistances are 0.1 Ohm and 100 Ohm respectively. Calculate the terminal voltage when the load current is 120A.

Unit – V

9. a) Explain clearly how rotating magnetic field is set up around the stator of a three phase induction motor when excited by three phase supply.
   b) A 10 pole induction motor is supplied by a 6 pole alternator which is driven at 1200 r.p.m. If the motor runs with a slip of 3% what is its speed?
   c) With neat diagram explain three way control of lamps.

10. a) With neat diagram explain the construction and working of fluorescent lamp.
    b) With neat diagram explain split phase permanent capacitor induction motor.
    c) What is meant by earthing? Explain with a diagram plate earthing with specification.

BT* Bloom's Taxonomy, L* Level

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

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First Semester B.E. (Credit System) Degree Examinations

November - December 2016

16EE105 – BASIC ELECTRICAL ENGINEERING

Duration: 3 Hours | Max. Marks: 100

*Note: 1) Answer **Five full** questions choosing **One full** question from **each Unit.***
2) Assume missing data if any.

Unit – I

			Marks	BT*
1.	a)	Two resistors R_1 and R_2 are connected in parallel to a certain supply. If the current taken from the supply is 5A. Calculate the value of R_1, if $R_2 = 6\Omega$ and current through R_1 is 2A. Also find the total power absorbed by the circuit.	6	L3
	b)	Derive an expression for the energy stored in the magnetic field.	6	L4
	c)	Find the value of R_L in Fig. Q1.c necessary to obtain maximum power in R_L. Also find the maximum power in R_L.		

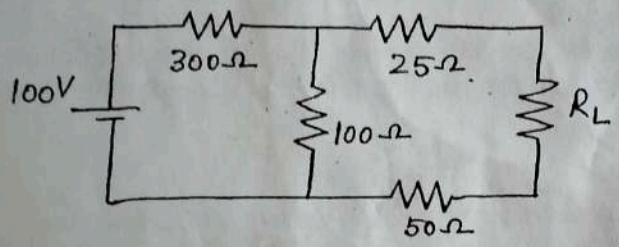

Fig. Q1.c — 8 L3

2.	a.	In the network shown in Fig. Q2.a, find the branch currents I_1, I_2 and I_3 using superposition theorem.		

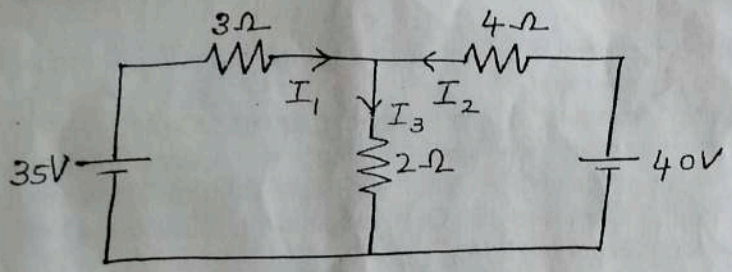

Fig. Q2.a — 8 L3

	b)	Find the self inductance of a coil of 200 turns, wound on a paper core tube of 25cm length and 5cm radius. Also calculate energy stored in it if current rises from 0 to 5A.(Take $\mu r = 1$)	7	L3
	c)	State Ohm's Law. Mention its limitations.	5	L1

Unit – II

3.	a)	Define (i) RMS value (ii) Form Factor (iii) Peak Factor.	6	L1
	b)	Prove that power consumed by a pure inductor is zero.	7	L2
	c)	In a circuit supplied from 50Hz the voltage and current have maximum values of 500V and 10A respectively. At t=0, their respective values are 400V and 4A both increasing positively. (i) Write expressions for their instantaneous values (ii) Find the angle between V and I (iii) Value of I at t =0.015 sec.	7	L3

P.T.O.