BASIC ELECTRICAL ENGINEERING

[ELE15/25]

QUESTION BANK

MODULE-1: MAGNETIC CIRCUITS.

1. Coils A and B in a magnetic circuit have 400 and 500 turns respectively. A current of 6A in coil A produces a flux of 0.03Wb. If co-efficient of coupling is 0.2, calculate (i) self inductance of coil A, with B open circuited, (ii) flux linkage with coil B, (iii) the average emf induced in coil B when the flux with it changes from zero to full value in 0.02 second, (iv) mutual inductance. VTU: Dec'06,Jan 2014 (6M)

2. Develop the relation between self inductances, mutual inductance and co-efficient of coupling? DSCE [Aut] Nov'15,Apr'16 (6M) VTU: Jul'13, Jan'12, Jan'15(6M)

3. A coil consists of 600 turns and a current of 10A in the coil gives rise to a magnetic flux of 1mWb, Calculate (a) self inductance, (b) emf induced, (c) energy stored in when current is reversed in 0.01 sec. VTU: Jan'15, Jan'13(6M)

4. A coil consists of 750 turns. A current of 10A in the coil gives rise to a magnetic flux of 1200 μWb. Determine the inductance of the coil and the average emf induced in the coil when this current is reversed in 0.01 second. VTU: Dec'08, Jan 2010 (4M)

5. State and explain Faraday's laws of electromagnetic induction. VTU: Jan '07,Jul'09 (6M)

6. A solenoid 1m length and 10cm in diameter has 5000 turns. Calculate the inductance and energy stored in the magnetic field when a current of 2A flows in the solenoid.

VTU:

Jun'13,Jan'05,Jul'07(4M)

7. Find the 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?

VTU:

Jul'11,Jan'11,12(6M)

8.Develop the equation for energy stored in a magnetic field?

VTU:

Jun'12'13,Jan'13'14(6M)

9. Explain the concepts of statically induced EMF and dynamically induced EMF.

DSCE [Aut]

Nov'15 (5M)

10. Two identical 1000 turn coils X and Y lie in parallel planes such that 60% of the magnetic flux produced by one coil links the other. A current of 5A in X produces in it a flux of 0.05mWb. If the current in X changes from +6A to -6A in 0.01 sec. What will be the magnitude of the EMF induced in Y? Calculate the self inductance of each coil and the mutual inductance. DSCE [Aut] Nov'15 (8M)

MODULE-2: SINGLE PHASE AC CIRCUITS.

1. Develop the expression for the current through the pure inductor, if the voltage across it is $v=v_m \sin\omega t$. VTU: Jan'15 (6M)

2.The instantaneous values of the voltage across a two element series circuit and the current through it is given by $v = 282 \sin(314t + 30^0)$ volts and $i = 7.05 \sin(314t - 30^0)$ amps. Find a) Impedance b) Circuit elements c) power and d) power factor.

VTU: Dec'11,Jan'12(6M)

3.A voltage of 200V is applied to a series circuit consisting of a resistor, an inductor and a capacitor. The respective voltages across these components are 170V, 150V, 100V and the current is 3A. Find (i) the power factor (ii) resistance (iii) impedance (iv) inductive reactance and capacitive reactance. VTU: Jan'15 (8M)

4. Develop the expression for r.m.s value of sinusoidal voltage in terms of its maximum value. DSCE[Aut] May'16 6M ,VTU: Jul'07(5M)

6. A circuit consisting of a resistance of 10 ohm and an inductance of 12mH and a capacitance of 8μF all in series. A voltage of 150V at 50Hz is applied across the combination. Find i) Impedance ii) ii) current iii) power and iv) power factor?

VTU: Jul'06,Jan'11 (5M)

7. Prove that a pure Inductor or a pure Capacitor does not consume any power. VTU: Jan'11(5M),DSCE [Aut] Nov'15,Apr'16, May'16 (6M)

8. A coil of resistance 10Ω and inductance 0.1 H is connected in series with a 150 μF capacitor across a 200V, 50 Hz supply. Calculate the voltage across the coil and the

capacitor respectively. VTU: MQP, Jul'07(8M)

14. A circuit having a resistance of 20Ω and inductance of 0.08H is connected in parallel with a series combination of 40Ω resistance and 50 μF capacitance. Calculate the total current, when the parallel combination is connected across 230V, 50Hz supply.

VTU: Jan'07(8M)

MODULE-3: THREE PHASE AC CIRCUITS.

1."Both power and power factor in a three phase circuit can be measured using two watt meters". Justify this by relevant circuit and vector diagram?

DSCE [Aut] Nov'15(6M) Jan'08,Jan'13,Jul'11,(8M) Dec '10 (10M)

2.The three arms of a three phase load each comprise of an inductor of resistance of 25Ω, and of inductance 0.15H, in series with a 120μF capacitor. The supply voltage is 415V, 50Hz. Calculate the line current, and total power in watts, when the 3 arms are connected in delta? Dec'12,Jan'13(8M)

3. A balanced 3-ϕ star connected load of 150kW takes a leading current of 100A, with a line voltage of 1100V, 50Hz. Find the circuit constants of the load per phase?

DSCE [Aut] Nov'15(5M) Dec'07,Jan'09(5M)

4. A 3ϕ , 230V, supply is given to balanced load which is Δ connected. Impedance in each phase of the load is (8+j6)Ω. Determine the phase current and the total power consumed? VTU: Jul'09,Jan'13 (6M)

5. Two wattmeter's connected to measure the power in a three phase circuit read 5 kW and 2 kW, the latter being read after reversing the potential coil leads. Calculate i)

Power Factor ii) Active power iii) Reactive power and iv) Apparent power? VTU: Jul'10,Jan'11(5M)

6. Calculate the active and reactive components of power in each phase of star connected 12kV, 3ϕ alternator supplying 6MW at 0.8pf. If the total current remains the same, when load pf is raised to 0.9, calculate the new output and its active and reactive components per phase. VTU: Jan'06,Jul'08 (10M)

7. Three coils each of impedance $20\angle 60$ are connected in star to a 3phase , 400V,50Hz supply. Find the reading on each of the two watt meters connected to measure the power input. VTU: Jan'10,Jun'11(6M)

8. Discuss the effects of the variation of power factor on wattmeter readings. VTU:Jan'10(6M), DSCE [Aut] Apr'16 (6M)

9. Define phase sequence and list out the advantages of three phase system as compared to single phase system. VTU: Jul'11, Jan'14,Jul'14, Jan'15, (6M)

10. With aid of phasor diagram obtain the relationship between the line and phase values of voltages in a three phase, delta connected system. DSCE [Aut] Apr'16 (6M) VTU:Dec'09,Jul'10(8M)

11. List the advantages of 3-ϕ systems over a single phase system? DSCE [Aut] Apr'16 (6M) Jul'10,Jan'11(6M)

12. A 3ϕ, 400V, motor takes an input of 40kW at 0.45 pf lag. Find the reading of each of the two single phase watt meters connected to measure the input? VTU: Jan'08,Jul'10(5M)

13.The 3 arms of a 3ϕ load each comprise of an inductor of resistance 20Ω and of inductance 0.10H in series with a 125μF capacitor. The supply voltage is 415V, 50Hz. Calculate the line current and total power in watts, when the three arms are connected in star?

VTU:

Jun'12(8M)

14. With aid of phasor diagram obtain the relationship between the line and phase values of voltages in a three phase, star connected system? DSCE [Aut] May'16 (6M) VTU: Dec'10,Jul'10(8M)

MODULE3:BASICINSTRUMENTS AND DOMESTIC WIRING

1. Explain the construction and working of Dynamometer type Wattmeter.

VTU: Jan'07,Jul'10,Jan'11,Dec'11,Jan'13,Jul'14 (8M) DSCE [Aut] Nov'15,Apr'16 (10M)

2. With the help of neat diagram, explain the construction and principle of operation of a single phase energy meter. VTU:Jan'14,Jul'14,Jul'13,Jan'13(8M) DSCE[Aut]Nov'15 (10M)

3.List out some safety measures against electric shock. VTU: Jan'07,Jul'08,Jan'11,Jul'14(5M)

4. With a neat diagram and switching table, explain the two-way and three way control of lamp.
VTU: Dec'11,Jan'10,Jan'13,Jan'14, Jul'14(8M) DSCE [Aut] Nov'15 (5M)

5. Justify why earthing is necessary. VTU: MQP,Jan '15 (6M)

6.Elaborate plate earthing? VTU: Jan'10,'09,Jul'11(8M)

7. Elaborate pipe earthing? VTU: Jul'12,Jan'07(6M)

MODULE 4: DC MOTORS.

1. Develop the expression for armature torque developed in a d.c.motor?
VTU: Jan'15, Jan'13'14(8M)

2. Explain the concept of back e.m.f. and its significance? DSCE [Aut]Apr'16 (6M) VTU:July'11, 08, Jan'11(5M)

3.With neat sketch, explain the construction of a d.c. machine?

DSCE [Aut] Nov'15(6M) VTU: June10,Jul'08,11,Jan'13 (6M)

5.Explain the working principle of a DC Machine as a generator and motor with suitable diagrams. VTU: May/June10, 08Marks, Dec08/Jan09 (5M)

6. Sketch the various characteristics of DC shunt motor and mention its applications?

VTU: Jan10, Jul'14(5M)

9. A 4 pole DC shunt motor takes 22A from 220V supply. The armature and the field resistances are 0.5 Ω and 100Ω respectively. The armature is lap connected with 300 conductors. If the flux per pole is 20mWb, calculate the speed and gross torque.

VTU: Jun'11(7M)

11. A 120V D.C. shunt motor has an armature resistance of 0.2Ω and shunt field resistance of 60Ω. It turns at 1500rpm, when it takes full load current of 30A. Find the speed of the motor while it is operating at half the full load VTU: Jan'03, Jan' 09 (5M)

12. A 200V, 4 pole, lap wound dc shunt motor has 600 conductors on its armature. The resistance of the armature winding is 0.5Ω and shunt field winding is 200Ω. The motor takes a current of 21A, the flux per pole is 30mWb, find the speed and gross torque developed in the motor? VTU: Jan'15, Jan'12'10(6M)

13. A 440V dc shunt motor takes an armature current of 20A and runs at 500rpm. The armature resistance is 0.6Ω. If the flux is reduced by 30% and torque is increased by 40%. Find the new values of armature current and speed? VTU: Aug'05, Jun'10, Jan'12(8M)

14. A 20kW, 200V dc shunt motor has armature and field resistances of 0.05 ohm and 100 ohm respectively. Calculate the total power developed by the armature when it delivers full output power? VTU: Jun'11, Dec'12, Jan'15(8M)

15. A D.C series motor running with a speed of 1000rpm, while taking a current of 22amp from the supply. If the load is changed such that the current drawn by the motor is increased to 55amp, calculate the speed of the motor on new load. The armature and series winding resistances are 0.3ohm and 0.4ohm respectively. Assume supply voltage as 250V. VTU: Jan'06,Jul'09 (6M)

16.List the applications of the following motors.(i) DC shunt motor, (ii) DC series motor, (iii) DC cumulative compound motor and justify. DSCE [Aut] Nov'15(6M)

17. A DC series motor connected to a connected to a 440V supply runs at 600rpm when taking a current of 50A. Calculate the value of resistor which when inserted in series with the motor will reduce the speed to 400rpm, the gross torque being then half its previous value. Resistance of motor is 0.2Ω. Assume the flux to be propotional to the field current. DSCE [Aut] Nov'15(8M)

18. Elaborate the necessity of starter for DC motor? DSCE [Aut] Nov'15(8M)

MODULE 4: SYNCHRONOUS GENERATORS.

1. List the types of Alternators. With a neat diagram, elaborate the differences between them.
   DSCE [Auton] Nov'15(5M) VTU: Jul'10,11,Jan'13,Jun' 14(8M)
2. Develop the emf equation for a star connected 3phase synchronous generator.
   DSCE[Aut] Apr'16[8M] VTU: Jan'13, Jun'12, Jul'13, Jul'11 (6M)
3. Elaborate the advantages of rotating field over rotating armature used in alternator. VTU: Jan'07, Jan'08, Jul'09, Jan'15 (6M)
4. A 3 phase, 6 pole, star connected alternator revolves at 900 rpm. The stator has 90 slots and 8 conductors per slot. The flux per pole is 0.05Wb (sinusoidally distributed). Calculate the voltage generated by the machine if the winding factor is 0.96 line and phase value. VTU: Jan'14(8M)
5. With neat diagram, describe the main parts of an alternator with their functions.
   VTU: Jan'10, Jul'10, 11Jan'14, Jul'13 (8M)
6. Explain the working principle of alternator. VTU: Jan'09, July'13 (6M)
7. Define pitch factor and Distribution factor? State its expression. Justify why distributed winding is preferred. VTU: Jan'08,10(7M)
8. A 6 pole 3ϕ, star connected alternator has an armature with 90 slots and 10 conductors per slot. It revolves at 1000rpm. The flux per pole is 0.05Wb.

Calculate emf generated per phase, if winding factor is 0.97 and all conductors in each phase are in series?

VTU: Dec'10, Jan14 (8M)

9. A 12 pole 500 rpm star connected alternator has 48 slots with 15 conductors per slots. The flux per pole is 0.02wb. The winding factor is 0.97 and pitch factor is 0.98.Calculate the phase emf and line emf.

VTU:Jan'15, Jan'13 (8M)

10. A 4 pole, 3 phase 50 Hz star connected alternator has a single layer winding in 36 slots with 30 conductors per slot. The flux per pole is 0.05wb and the winding is full pitched. Find the synchronous speed and the line voltage on no load. Assume winding factor as 0.96. VTU: Jan'15 (6M)
11. A 4 pole 1500 rpm star connected alternator has 9 slots per pole and 8 conductors per slot. Determine the flux per pole to give a terminal voltage of 3300V. Take winding factor and pitch factor as unity. DSCE[Aut] May'16 (6M) ,VTU:Jan'15 (8M)
12. A 2 pole, 3 phase alternator running at 3000rpm has armature slot with two conductors in each slot. Calculate flux per pole required to generate a line voltage of 2300V.Distribution factor is 0.952 and pitch factor is 0.956?

VTU: July'08, June'10, July'14 (6M)

13. A 3 phase, star connected synchronous generator driven at 900 r/min is require to generate a line voltage of 460 V at 60 Hz on open circuit. This stator has two slots per pole per phase, and 4 conductors/slot. Calculate i) Number of poles ii)the useful flux per pole. VTU: Feb'08 (9M)
14. A 3 Phase,16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03wb and the speed is 375 rpm. Find the frequency, the phase emf and the line emf. Assume pitch factor is 1 and distribution factor is 0.96. VTU:Jan'09, 11, Aug'09, 11(8M)
15. Find the number of armature conductors in series per phase of 3 phase, 50Hz, 10 pole alternator having 90 slots. The winding is to be star connected to give a line voltage of 11KV, when the flux is 0.16Wb. The winding factor is unity.

DSCE [Aut] Nov'15(5M) VTU: Feb'05 (8M)

16. A 3 phase, 16 pole, star connected alternator has 144 slots on the armature periphery. Each slot contains 10 conductors. It is driven at 375rpm. The line value of emf available across the terminals is observed to be 2.657kV. Solve for the

frequency of the induced emf and flux per pole. DSCE [Aut] Nov'15(5M)

MODULE-5: TRANSFORMERS.

1.Explain the working principle of operation of single phase transformer.

VTU: Jan'03,08, 13,Jul'03, 04, 08, Dec'11, Jun'12 (4M)

2.List the main parts of transformer? Elaborate the functions and main materials used in construction of these parts. VTU: Mar'02, Jan'06 (6M)

3.With neat sketch explain the construction of core and shell type transformer.

DSCE [Aut] Nov'15(6M) VTU: Mar'03,Jul'03,07, (12M)

4.Derive the EMF equation of transformer? VTU:Jan'03,08,14,Jul'03,04,08,Jun'13 (6M)

5.Show the voltage ratio of the primary and secondary winding is same as their turns ratio. VTU : Jul'12 (4M)

6.Explain the various losses in a transformer and how to minimize them?

DSCE [Aut] Nov'15(5M),Apr'16[8M]VTU:Feb'05,Jan'07,08,09,10,11,Jul'08,11 (6M)

9.Define efficiency of the transformer. Explain how to obtain efficiency at different loads? VTU: Jan'03,Jul'05 (6M)

12.A 600 KVA transformer has an efficiency of 92% at full load, upf and at half load, 0.9 Pf. Determine its efficiency at 75% of full load and 0.9 p.f. VTU: Jan'03, Jun'10 (8M)

13.A 40 KVA single phase transformer has core loss of 450W and full load copper loss of 850W.if the power factor of the load is 0.8 calculate full load efficiency, Maximum efficiency at UPF. DSCE Apr'16[Aut] VTU: Feb'07,11,09 (8M)

14.A 600 KVA, transformer has efficiency at 92% both at full load and half full load upf, determine its efficiency at 75%fullload,0.9 pf. VTU: Jul'06, Aug'08,Jan'13,15 (5M)

15.A transformer is rated at 100kVA.At full load its copper loss is 1200W and its iron loss is 960 W calculate efficiency at full load, upf. Efficiency at half load,0.8pf. The load KVA at which maximum efficiency occur. VTU: Jan'14 (6M)

16.A 125KVA transformer has a primary voltage of 2000V, 50Hz, primary turns are 182 and the secondary turns 40. Neglecting the losses, evaluate: (i) no load secondary EMF, (ii) full load primary and secondary currents, (iii) flux in the core. DSCE [Aut] Nov'15(6M)

17. A 100 KVA, 1000/10000V, 50Hz transformer has an iron loss of 1200W. The copper loss with 6A in the high voltage winding is 500W. Calculate the efficiencies at (i) 25%, (ii) 50% for power factor at 1.0 and 0.8 respectively. DSCE [Aut] Nov'15(8M)

MODULE-5: INDUCTION MOTORS.

1.Discuss the important features of squirrel cage and phase wound rotor constructions in an induction motor. VTU: Jan '03,05,Jan' 08 (8M)

2.Explain the working principle of three phase induction motor.

VTU:Jan' 07,09,10,11,13,14; July-03,04,05,06,07,08,11; June 12 (12M)

3.Explain the concept of slip in an induction motor? Under what circumstances the slip is i)unity ii) zero VTU: June'13 (8M)

4. Explain synchronous speed, slip speed and motor speed in case of three phase induction motor. Justify why slip is never zero in an induction motor?

VTU:

Jan'04,08,Jul'05,09,10 (6M)

5.List the applications of three phase induction motor? DSCE Apr'16 (6M) VTU: July-09(4M)

6. Explain the necessity of starter in an Induction motor? VTU: Jan'04,06, Jul'03,04,05,06,10, Dec'11 (4M)

7.Write a neat circuit diagram explain a star-delta starter for a three phase induction motor.

DSCE [Aut] Nov'15(6M) VTU: Jul'03,04,05,06,June'13,Jan'04,06,14 (8M)

8. Derive the expression for the slip and frequency of the rotor currents.

VTU:

Jan'09,Jul'07,11,June'12 (6M)

9. A 6 pole IM is supplied by a 10 pole alternator which is driven at 600 r.p.m. If the motor is running at 970 r.p.m, determine the percentage slip.

VTU:

Aug'06,June'10,Jul'08 (6M)

10. A 12 pole , 3 phase alternator is coupled to an engine running at 500r.p.mIt supplies an IM, which has full load speed of 1440r.p.m Find the percentage slip and the number of poles the motor. VTU: Feb'07,Aug'05,Feb'05,Aug'11 (6M)

11. A – phase, 6 pole, 50Hz IM 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 the rotor current at stand still ; v) frequency of the rotor current at full load.

VTU:

Jan'14 (5M)

12. A 3-phase, 8 pole,50Hz IM 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 at standstill
VTU: Jul'12(6M)

13.The rotor induced voltage of a 3-phase, 4 – pole squirrel cage induction motor fed by a salient pole alternator is observed to make 1.5 alterations per second. The star connected alternator with 592,full pitched armature conductors in series per phase with distribution factor of 0.966 develops a line voltage of 6600 volts when the flux per pole is 60mWb. Determine the speed of the IM.
VTU: Feb'06 (8M)

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QUESTION BANK

Course: Basic Electrical Engineering **Course Code: ELE 15**

1(a)	Explain the laws of Electromagnetic Induction.	6
1(b)	A coil consists of 750 turns. A current of 10A in the coil gives rise to a magnetic flux of 1200 μWb. Determine the inductance of the coil and the average emf induced in the coil when this current is reversed in 0.01 second.	6
1(c)	Define mutual Inductance. Derive the expression for mutual Inductance.	8
2(a)	Two coupled coils self Inductances 0.8H and 0.2H have co-efficient of coupling 0.9, find mutual inductance and turns ratio.	8
2(b)	Explain how a current carrying conductor experiences a force when kept in a magnetic field.	6
2(c)	Define self inductance. Mention its unit. Develop an expression to calculate it.	6
3(a)	Develop the expression for r.m.s value of sinusoidal voltage in terms of its maximum value.	6
3(b)	A voltage of 200V is applied to a series circuit consisting of a resistor, an inductor and a capacitor. The respective voltages across these components are 170V, 150V, 100V and the current is 3A. Find (i) the power factor (ii) resistance (iii) impedance (iv) inductive reactance and capacitive reactance.	8
3(c)	For a R-L-C series circuit, discuss the nature of the power factor for (i)$X_L > X_C$, (ii) $X_L < X_C$, (iii) $X_L = X_C$	6
4(a)	Justify that a pure Inductor or a pure Capacitor does not consume any power with relevant waveforms and phasor diagram.	6
4(b)	Given v=200 sin 377t volts, i=8 sin (377t-30) amps for an A.C. circuit, determine(i)power factor, (ii)Active power, (iii) Reactive power, (iv) Apparent power.	8
4(c)	Define the following terms with respect to A.C circuits: (i) Power factor, (ii)Active power, (iii) Reactive power.	6
5(a)	With aid of phasor diagram construct the relationship between the line and phase values of voltages and currents in a three phase, star connected system.	6
5(b)	The three arms of a three phase load each comprise of an inductor of resistance of 25Ω, and of inductance 0.15H, in series with a 120μF capacitor. The supply voltage is 415V, 50Hz. Solve for the line current, and total power in watts, when the 3 arms are connected in delta.	8

5(c)	Justify with relevant phasor diagram that two watt meters are sufficient to measure three phase power.	6
6(a)	With a neat diagram, explain the two-way and three way control of lamp.	6
6(b)	Describe any one type of Earthing	8
6(c)	Give an outline of classification of measuring instruments.	6
7(a)	Explain the concept of back e.m.f. and its significance.	6
7(b)	Sketch the various characteristics of DC shunt motor and list its applications.	8
7(c)	A 4 pole DC shunt motor takes 22A from 220V supply. The armature and the field resistances are 0.5Ω and 100Ω respectively. The armature is lap connected with 300 conductors. If the flux per pole is 20mWb, calculate the speed and gross torque.	6
8(a)	Develop the EMF equation for a star connected 3phase synchronous generator.	8
8(b)	A 4 pole 1500 rpm star connected alternator has 9 slots per pole and 8 conductors per slot. Determine the flux per pole to give a terminal voltage of 3300V. Take distribution factor and pitch factor as unity.	6
8(c)	Elaborate the advantages of rotating field over stationary armature used in alternator.	6
9(a)	Explain the working principle of operation of single phase transformer.	6
9(b)	A 250kVA, 11000/415V, 50Hz single phase transformer has 80 turns on secondary. Calculate the (i) rated primary and secondary current, (ii) number of primary turns, (iii)max value of flux, (iv) voltage induced per turn.	8
9(c)	Explain the various losses in a transformer and recommend measures to minimize them.	6
10(a)	Describe the important features of squirrel cage and phase wound rotor construction in an induction motor.	8
10(b)	Explain the working principle of three phase induction motor.	6
10(c)	A three phase 50Hz, 6 pole induction motor has full load percentage slip of 3%. Solve for synchronous speed and actual speed.	6
11(a)	Develop an expression for coefficient of coupling of the two coils in terms of self inductance of each coil and the mutual inductance.	6
11(b)	Coils A and B in a magnetic circuit have 400 and 500 turns respectively. A current of 6A in coil A produces a flux of 0.03Wb. If co-efficient of coupling is 0.2, calculate (i) self inductance of coil A, with B open circuited, (ii) flux linkage with coil B, (iii) the average emf induced in coil B when the flux with it changes from zero to full value in 0.02 second, (iv) mutual inductance.	6

11(c)	Describe the concepts of statically induced EMF and dynamically induced EMF.	8
12(a)	Explain Faraday's laws of electromagnetic induction.	6
12(b)	A coil consists of 600 turns and a current of 10A in the coil gives rise to a magnetic flux of 1mWb, Calculate (a) self inductance, (b) emf induced, (c) energy stored in when current is reversed in 0.01 sec.	6
12(c)	Explain Fleming's rules and list its applications.	8
13(a)	Illustrate with suitable phasor diagram and waveforms, that a pure resistor consume power.	8
13(b)	The equation of an alternating current is given by i= 42.42 sin 628t, find its (i) max. value, (ii) frequency, (iii) RMS Value, (iv) average value, (v)form factor	6
13(c)	Predict the r.m.s value of sinusoidal current in terms of its maximum value.	6
14(a)	A circuit consists of a resistance of 10Ω, an inductance of 16mH, a capacitance of 150μF, connected series. A supply of 100V at 50 Hz is given to the circuit. Determine the current, pf, power consumed by the circuit.	6
14(b)	Develop an expression for impedance, phase angle and power for series R-L-C circuit energized by sinusoidal voltage.	8
14(c)	Define the following: (i)Instantaneous value, (ii)Cycle, (iii)frequency, (iv)Amplitude,(v) Form factor, (vi) Average value.	6
15(a)	With aid of phasor diagram, develop the relationship between the line and phase values of voltages and currents in a three phase, delta connected system.	6
15(b)	Two wattmeter's connected to measure the power in a three phase circuit read 5 kW and 2 kW, the latter being read after reversing the potential coil leads. Calculate i) Power Factor ii) Active power iii) Reactive power and iv) Apparent power.	8
15(c)	Define phase sequence and list out the advantages of three phase system as compared to single phase system.	6
16(a)	With the help of neat diagram, explain the construction and principle of operation of a single phase energy meter.	8
16(b)	Define an Electric Shock. Discuss the factors on which severity of the shock depends.	6
16(c)	Explain plate Earthing.	6
17(a)	Develop the expression for armature torque developed in a d.c.motor.	6
17(b)	A 440V dc shunt motor takes an armature current of 20A and runs at 500rpm. The armature resistance is 0.6Ω. If the flux is reduced by 30% and torque is increased by 40%. Determine the new values of armature current and speed.	8
17(c)	With neat sketch, explain the construction of a d.c. machine.	6

18(a)	Differentiate between salient pole and smooth cylindrical type alternator.	6
18(b)	A 12 pole 500 rpm star connected alternator has 48 slots with 15 conductors per slots. The flux per pole is 0.02wb. The winding factor is 0.97 and pitch factor is 0.98.Calculate the phase emf and line emf.	8
18(c)	Elaborate the advantages of rotating field over stationary armature used in alternator.	6
19(a)	With neat sketch elaborate the construction of core and shell type transformer.	6
19(b)	A 600 KVA transformer has an efficiency of 92% at full load, UPF and at half load, 0.9 Pf. Determine its efficiency at 75% of full load and 0.9 p.f	8
19(c)	A 125kVA transformer has a primary voltage of 2000V, 50Hz, primary turns are 182 and the secondary turns 40. Neglecting the losses, evaluate: (i)no load secondary EMF,(ii) full load primary and secondary currents, (iii) flux in the core.	6
20(a)	Explain synchronous speed, slip speed and motor speed in case of three phase induction motor. Justify why slip is never zero in an induction motor.	6
20(b)	A 12 pole, 3 phase alternator is coupled to an engine running at 500r.p.m. It supplies an Induction Motor, which has full load speed of 1440r.p.m Calculate the percentage slip and the number of poles the motor.	6
20(c)	Write a neat circuit diagram, elaborate a star-delta starter for a three phase induction motor.	8