# UNIT-2

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| Question | Marks | CO | BTL |
| Define magnetic flux and flux density. | 2 | CO2 | BTL1 |
| What is magnetomotive force and write its unit? |  |  |  |
| What is Lenz's law? | 2 | CO2 | BTL1 |
| What is Fleming's right-hand rule? | 2 | CO2 | BTL1 |
| What is Fleming's left-hand rule? | 2 | CO2 | BTL1 |
| Define Statically induced emf | 2 | CO2 | BTL1 |
| What is coefficient of self-induction or self-inductance? | 2 | CO2 | BTL1 |
| What is mutual inductance? Give its unit. | 2 | CO2 | BTL1 |
| Define coefficient of coupling. | 2 | CO2 | BTL1 |
| A coil of 300 turns, wound on a core of non-magnetic material, has an inductance of 10mH. Calculate the average value of emf induced when a current of 5 A is reversed in 8ms. | 2 | CO2 | BTL3 |
| What is self-induced emf and mutually induced emf? | 2 | CO2 | BTL1 |
| Classify induced emf and give one example. | 2 | CO2 | BTL2 |
| Distinguish between statically and dynamically induced emfs. Give examples of each. | 2 | CO2 | BTL2 |
| What is the energy stored in magnetic field. Write the expression for energy stored in a magnetic field. | 2 | CO2 | BTL1 |
| Find the induced emf in a conductor of length 150 cm, moving at an angle of 30O to the direction of uniform magnetic field of flux density 1.2 Wb/m2 with a velocity of 60 m/s | 2 | CO2 | BTL3 |
| a)State and explain Faraday’s laws of electromagnetic induction. b)A coil of resistance 100 Ω is placed in a magnetic field of 1mWb. The coil has 100 turns, and galvonometer of 400 Ω resistance is connected in series with it. Find the average emf and the current if the emf coil is moved from given field to the to a field of 0 .2 mWb in 0 .1 second. | 7  5 | CO2  CO2 | BTL-2  BTL-3 |
| a) Derive the expression for self- inductance of a coil.  b) A solenoid has 1,200 turns and carries a current of 2 A. The iron core has a length of 0.4m and cross section of 80 cm, the relative permeability is 1,000, Calculate the self-inductance of the solenoid. | 6  6 | CO2  CO2 | BTL2  BTL2 |
| Explain in detail about Dynamically induced emf with neat diagrams. | 12 | CO2 | BTL2 |
| a)Derive the expression for coefficient of coupling in terms of mutual and self-inductance.  b) Two coils A of 1200 turns and B of 800 turns lie nearer each other, so that 60% of the flux produced in one links the other. It is found that a current of 5 amperes in A produces a flux of 0.25mWb, while the same current in B produces the flux of, 0.15 mwb. Determine the self -inductance and coefficient of coupling between the coils. | 6   6 | CO2   CO2 | BTL3   BTL3 |
| a)Derive expression for energy stored in a magnetic field. b) The inductance of a coil is 0.15 H. The coil has 100 turns. Find the following: (i) Total magnetic flux through the coil when the current is 4A. (ii) Energy stored in the magnetic field. (iii)Voltage induced in the coil, when current is reduced to zero in   0 .01second. | 6  6 | CO2  CO2 | BTL2   BTL3 |
| a) Derive the expression for mutually induced emf. b) A coil of 300 turns, wound on a core of non-magnetic material, has an inductance of 10mH. Calculate (i)the flux produced by a current of 5A and (ii) average value of emf induced when a current of 5 A is reversed in 8ms. | 7 5 | CO2 CO2 | BTL2  BTL3 |
| a)Derive the expression for mutual inductance between two coils. b) Two coils having 100 and 50 turns respectively, are wound on a core with permeability of 4000 µ0. Effective core length is 60cm and core area is 9 cm2. Find the mutual inductance between the coils. | 8 4 | CO2 CO2 | BTL3 BTL3 |
| a) Derive the expression for self-induced emf in a coil. b) Two coils having100 and 150 turns respectively are wound side by side on a closed iron circuit of section 125 cm2 and mean length 200 cm. If the permeability of iron is 2000,calculate (a) Self-inductance of each coil (b) mutual inductance between them (c) emf induced in the second coil if current in the first coil changes from 0 to 5A in0.02s | 6  6 | CO2 CO2 | BTL3 BTL3 |
| a) Explain clearly about statically induced emf and dynamically induced emf. b) Two coils have a mutual inductance of 0.3H, if current in one coil is varied from 5A to 2A in 0.4 second. Calculate (i)the average emf induced in the second second coil (ii) the change of flux linked with the second coil assuming that it is wound with 200 turns. | 8   4 | CO2   CO2 | BTL2   BTL3 |
| A conductor of active length 30 cm carries a current of 100 A and lies at right angles to a magnetic field of strength. 0.4 Wb/m2. Calculate the force in newtons exerted on it. If the force causes the conductor to move at a velocity of 10 m/s, calculate the emf induced in it and the power developed by it. | 7 | CO2 | BTL3 |

# UNIT-3

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| Question | Marks | CO | BTL |
| Define an alternating quantity. | 2 | CO3 | BTL1 |
| Define amplitude and instantaneous value of an alternating quantity. | 2 | CO3 | BTL1 |
| What is difference between time period and frequency of a periodic wave. How they are related? | 2 | CO3 | BTL2 |
| What do you understand by angular velocity? | 2 | CO3 | BTL2 |
| Define phase and Phase difference. | 2 | CO3 | BTL1 |
| Define R.M.S value of a sinusoidal wave. | 2 | CO3 | BTL1 |
| What is the significance of peak factor? | 2 | CO3 | BTL1 |
| What do you understand by apparent power and power factor of an AC circuit. | 2 | CO3 | BTL2 |
| What is the relation between apparent power ,true power and reactive power of an ac circuit. | 2 | CO3 | BTL1 |
| Why the inductors are usually iron cored? | 2 | CO3 | BTL2 |
| What do you understand by power factor of an ac circuit? | 2 | CO3 | BTL1 |
| In series circuit analysis why is current taken as reference phasor? | 2 | CO3 | BTL2 |
| An alternating circuit takes a power of 10 kW at a power factor of 0.8 lagging find i) Apparent power ii) Reactive power. | 2 | CO3 | BTL3 |
| What are the advantages of 3 phase circuits over single phase Circuits? | 2 | CO3 | BTL2 |
| Give the relation between line and phase values of voltages and currents in star and Delta connected of 3-phase system. | 2 | CO3 | BTL1 |
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| UNIT-3 A.C.CIRCUITS (LAQ) | MARKS | CO | BTL |
| What is 3-phase system? Give its necessity and advantages? What is the meaning of a sequence and how it can be changed. | 3+5+4 | CO3 | BTL3 |
| Derive the expression for RMS value and average value of sinusoidal current. | 6+6 | CO3 | BTL3 |
| a)Obtain expression for the current through the pure inductor if voltage across it is v =Vm Sinωt. b) An alternating voltage has the equation v=141.4 Sin 377t. Find the values of a) RMS voltage b) frequency c) instantaneous voltage when t=3 ms. | 7   5 | CO3  CO3 | BTL3  BTL3 |
| a)Analyze the series R-L circuit with neat sketch, and also draw the phasor diagram. b) A coil has an inductance of 40 mH and negligible resistance. Calculate its inductive reactance and resulting current is connected to a 240 V, 50 Hz supply. | 6  6 | CO3  CO3 | BTL3  BTL3 |
| Derive an expression for impedance, current and phase angle for R-L-C series circuit with phasor diagram. | 12 | CO3 | BTL3 |
| a) Prove that average power consumption in pure capacitor is zero when ac voltage is applied. b) A capacitor of 100 µF is connected across a 200V,50Hz single-phase supply. Calculate (i) the reactance of the capacitor (ii)RMS value of current and (iii)maximum current. | 6  6 | CO3  CO3 | BTL2  BTL3 |
| a) Draw the power triangle. Explain the relation between various terms. b)If load draws a current of 10A at 0.8 power factor lagging when connected to 100V supply, calculate the value of real, reactive and apparent powers. Also find the resistance of the load. | 6 6 | CO3 CO3 | BTL2 BTL3 |
| a)Derive the relation between line and phase quantities of voltages and currents for a balanced three phase star connected system. b) Three star connected inductors take 8 KW at a power factor of 0.8 when connected across a 460V,3-phase,3 wire supply. Find the circuit constants of the load per phase. | 8   4 | CO3  CO3 | BTL3  BTL3 |
| a)Prove that in a three- phase balanced delta connected system IL = √3 IPh b)A 220V 3-Φ Voltage is applied to a balanced delta connected three phase load of impedance(15+j20)Ω Find phase current in each line and phase angle. | 7  5 | CO3  CO3 | BTL3  BTL3 |
| A series circuit consists of a 10 Ω resistor, 100 µF capacitor and 10 mH Inductor is driven by a 50Hz ac voltage source of maximum value 100 V. Calculate the equivalent impedance, current in the circuit, power factor and power dissipated in the circuit. | 12 | CO3 | BTL3 |
| UNIT-4 D.C MACHINES AND TRANSFORMERS (SAQ) |  | CO | BTL |
| What is the basic principle of a DC generator? | 2 | CO4 | BTL1 |
| What is the function of commutator in dc machine. | 2 | CO4 | BTL2 |
| What do you understand by self-excitation mode of DC machine? Name two dc machines working in this mode? | 2 | CO4 | BTL1 |
| Write the applications of self-excited generators | 2 | CO4 | BTL2 |
| What is the significance of back emf in the working of DC motor? | 2 | CO4 | BTL1 |
| List the applications of D.C Motors. | 2 | CO4 | BTL1 |
| What is the function of armature in dc machine? | 2 | CO4 | BTL2 |
| Give the voltage equation of a DC motor with neat diagram. | 2 | CO4 | BTL1 |
| A 6-pole lap wound armature has 1200 conductors and flux per pole of 0.02 wb. Determine the generated emf when running at 600 rpm. | 2 | CO4 | BTL2 |
| What is a transformer? | 2 | CO4 | BTL1 |
| Define turns ration in transformer. | 2 | CO4 | BTL1 |
| Write any three differences between the core type transformer and shell type transformer. | 2 | CO4 | BTL2 |
| Define efficiency of a transformer. | 2 | CO4 | BTL1 |
| Mention the various application of 1-Φ transformers. | 2 | CO4 | BTL2 |
| What are the various losses occurring in the transformer? | 2 | CO4 | BTL2 |
| UNIT-4 D.C MACHINES AND TRANSFORMERS (LAQ) |  | CO | BTL |
| With neat diagram explain the construction and working principle of a DC Generator. | 12 | CO4 | BTL2 |
| a)Derive the EMF equation of a D.C Generator.  b) A 4-pole lap wound armature has 144 slots with four conductors per slot. If the flux per pole is 200 mWb, and the armature rotates at 720 rpm, what is the induced voltage? | 7 5 | CO4 CO4 | BTL3 BTL3 |
| Classify the DC generators and explain briefly with neat diagrams. | 12 | CO4 | BTL2 |
| a)Explain the operating principle of a DC Motor with neat diagram. b)A 4-pole dc shunt motor working on 220 V dc supply takes a line current of 3A at no-load. Determine the back emf when the motor takes a line current of 50 A. Assume armature and field resistances as 0.2 Ω and 400 Ω respectively. | 6 6 | CO4 CO4 | BTL2  BTL3 |
| Explain the constructional features and working of a single-phase Transformer in detail. | 12 | CO4 | BTL3 |
| a)Derive the Equation for emf induced in the windings of a transformer . b) It is desired to have 4.3 mWb maximum core flux in a transformer at 110 volt and 50 Hz. Determine the required number of turns in the primary. | 7  5 | CO4 CO4 | BTL2 BTL4 |
| a) Draw the phasor diagram for a practical transformer on no-load and explain its working. b) What do you understand by ideal transformer? Explain the operation of ideal transformer with vector diagram. | 6  6 | CO4  CO4 | BTL3  BTL2 |
| a)Derive the condition for maximum efficiency occurred in transformer. b)Determine the efficiency of a single Phase 150 KVA transformer at 50% full load and 0.8 power factor lag, if the copper loss at full load is 1600 watts and iron loss is 1400 watts. | 6 6 | CO4 CO4 | BTL3 BTL3 |
| Explain open circuit and short circuit tests as performed on a single-phase transformer. | 12 | CO4 | BTL4 |
| A transformer is rated at 100KVA. At full load its copper loss is 1200W & its iron loss is 960W.Calculate (i) the efficiency at full load, UPF (ii) efficiency at half load, 0.8 p.f (iii) the efficiency at 75% full load, 0.7 p.f lag (iv) load KVA at which maximum efficiency occurs. | 12 | CO4 | BTL3 |

# UNIT-5

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| Question | Marks | CO | BTL |
| What is meant by an induction motor? | 2 | CO5 | BTL1 |
| Define slip of three phase induction motor and what is its value at starting and synchronous speed? | 2 | CO5 | BTL1 |
| Explain what is rotating magnetic field? | 2 | CO5 | BTL1 |
| List the advantages of three phase induction motor. | 2 | CO5 | BTL1 |
| How are 3-Φ induction motors are self-starting. | 2 | CO5 | BTL2 |
| Mention the various application of 3-Φ induction motor. | 2 | CO5 | BTL1 |
| Define the synchronous generator. | 2 | CO5 | BTL1 |
| Mention the applications of alternator. | 2 | CO5 | BTL1 |
| Write the advantages of stationary armature and revolving field system in case of synchronous machine. | 2 | CO5 | BTL2 |
| Compare three phase squirrel cage and slip ring induction motor. | 2 | CO5 | BTL2 |
| A 3-Φ ,50Hz induction motor has 4poles.if the slip is 3% at a certain load. Determine the speed of the rotor and frequency of the induced EMF in the rotor. | 2 | CO5 | BTL3 |
| Why single phase induction motor is not self starting? | 2 | CO5 | BTL2 |
| What are the methods adopted to start a single-phase induction motor. | 2 | CO5 | BTL1 |
| Explain why a capacitor is connected in one of the windings of single-phase induction motor. | 2 | CO5 | BTL2 |
| Explain the choice of synchronous generator on the basis of the generating station. | 2 | CO5 | BTL2 |
| Describe the constructional features of three-phase induction motor with suitable diagrams. | 12 | CO5 | BTL2 |
| a)Explain the working principle of three-phase induction motor with neat diagram. b) A 3-phase, 4-pole induction motor is supplied from 3-phase 5Hz ac supply. Calculate synchronous speed and the rotor speed with slip is 4%. | 7  5 | CO5 CO5 | BTL3  BTL2 |
| Explain the construction and principle of operation of synchronous generator. | 12 | CO5 | BTL2 |
| Explain OC and SC tests conducted on synchronous generator. | 12 | CO5 | BTL3 |
| a) Differentiate between salient pole type rotor and smooth-cylindrical type rotor.  b) Write the applications of different types of synchronous generators. | 6 6 | CO5 CO5 | BTL2  BTL2 |
| a)Write the differences between squirrel cage and slip ring induction motors. b) An 8-pole alternator runs at 750 rpm, and supplies a power to a 6-pole induction motor, which runs at 970 rpm. What is the slip of the induction motor. | 6  6 | CO5  CO5 | BTL2  BTL3 |
| a) Explain the construction and working of resistance split phase induction motor and give its applications. | 12 | CO5 | BTL2 |
| Describe the construction and principle of working of a shaded pole induction motor and write its applications. | 12 | CO5 | BTL2 |
| Draw the connection diagram of a capacitor start induction motor showing starting and main windings and explain its operation. | 12 | CO5 | BTL2 |
| Describe the construction and principle of working of a capacitor-start capacitor run single-phase induction motor. Also give its applications. | 12 | CO5 | BTL2 |