

CO Number	Course Outcome
CO1	To define basic laws, terminologies and theories pertaining to DC and AC (1-phase and 3-phase) electrical circuits.
CO2	Explain the concepts of electrical circuits, the components of switchgear, transformers and electromechanical energy conversion devices and their applications.
CO3	Apply the concepts of transformers, AC & DC machines and energy consumption in solving real life numerical problems.
CO4	Analyze and examine different types of DC and AC electrical circuits (1-phase and 3-phase).

Time: 3 Hrs.

M. M. 70

Section A

Q1. Attempt all questions:

(2X7 = 14 Marks)

- Differentiate (i) Ideal & Practical voltage source (ii) Unilateral & Bilateral circuit CO1
- The voltage & current through a circuit element are $v=100\sin(314t+45^\circ)$, $i=10\sin(314t+315^\circ)$. Identify the element and compute its value. CO3
- What will happen if dc supply is applied to the transformer? CO1
- Explain the nature of dynamic impedance with proper reason. CO2
- What is the function of commutator and brush in dc machines? CO1
- How can the direction of rotation of the 3-phase induction motor be reversed? CO1
- Discuss why the earthing pin is made broad? CO2

Section B

Q2. Attempt all questions:

(7X3 = 21 Marks)

- Using nodal analysis, calculate current in each branch for Fig.1. Also calculate total power loss in the circuit. CO4

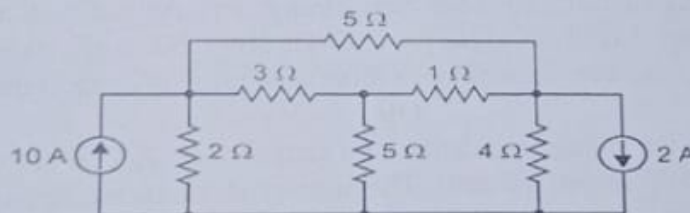


Fig.1

- Explain the principle of operation of a 1-phase induction motor. Describe any one method to start it. CO2

OR

- Define power factor. Discuss the causes & demerits of low power factor. List the methods of power factor improvement and explain any one method in detail. CO2

- c i) Derive the condition for maximum efficiency of transformer. The efficiency of 400KVA transformer is 98.77% at full load (0.8pf) and 99.13% at half load (1pf). Compute iron loss and copper loss at full load and half load. CO3

OR

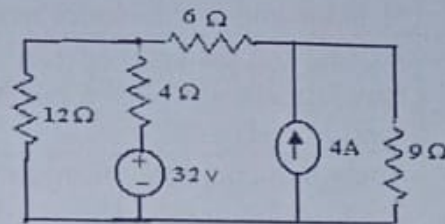
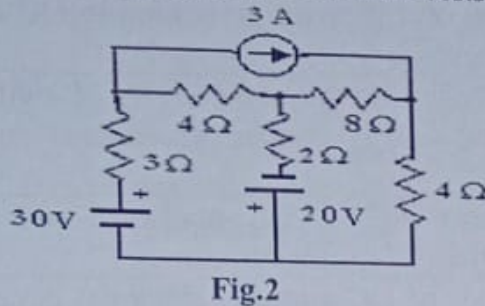
- ii) Derive an expression for emf equation in DC generator. An 8-pole dc generator has 500 armature conductors and a useful flux of 0.05Wb. Compute the emf, if it is lap wound & runs at 1200rpm? What must be the speed to produce same emf, if it is wave wound? CO3

Section C

Q3. Attempt any one part of the following questions:

(7X1 = 7 Marks)

- a) Calculate the value of current in all the resistance using nodal analysis for Fig.2. CO4



OR

- b) Calculate the value of current in all the resistance using mesh analysis for Fig.3. CO4

Q4. Attempt any one part of the following questions:

(7X1 = 7 Marks)

- a) Explain (i) Fuse and SFU (ii) MCB (iii) ELCB (iv) MCCB CO2

OR

- b) Discuss the difference between primary and secondary batteries? Explain lead-acid battery in detail. CO2

Q5. Attempt any one part of the following questions:

(7X1 = 7 Marks)

- a) Illustrate the principle of operation of a 3-phase synchronous motor. Describe any one method to start it. CO3

OR

- b) (i) Define slip with its significance. A 3-phase, 4-pole, 50 Hz induction motor is given. Compute the value of synchronous speed, rotor speed when slip is 4% and rotor frequency when rotor runs at 600 rpm. (ii) Illustrate torque-slip characteristics in detail. CO3

Q6. Attempt any one part of the following questions:

(7X1 = 7 Marks)

- a) Discuss the analogous characteristics between electric and magnetic circuit. A 50KVA, 4400/220V transformer has $R_1=3.45\Omega$, $R_2=0.009\Omega$, $X_1=5.2\Omega$ & $X_2=0.015\Omega$. Calculate equivalent resistance, reactance & impedance referred to primary & secondary. CO4

OR

- b) Derive an expression for voltage regulation of a transformer. A 25KVA transformer has 500 primary turns and 40 secondary turns. The primary is connected across 3000V, 50Hz. Calculate the value of maximum flux density in the core if its area is 80 cm^2 . CO4

Q7. Attempt any one part of the following questions:

(7X1 = 7 Marks)

- a) Derive an expression of bandwidth & quality factor for series resonance. Voltages across R, L & C are 3V, 4V & 5V respectively. If supply frequency is 50Hz, calculate the value of resonant frequency. CO4

OR

- b) Derive an expression for line voltage & phase voltage in a three-phase star connected system. A balanced 3-phase star connected load of 120KW takes a leading current of 85A when connected across 1100V, 50Hz supply. Calculate the value of load connected. CO4