



P.E.S. College of Engineering, Mandya - 571 401
 (An Autonomous Institution affiliated to VTU, Belagavi)
Second Semester, B.E. - Semester End Examination; Sep. / Oct. - 2023
Introduction to Electrical Engineering
 (Common to AI & ML, CV, and IS)

Time: 3 hrs

Max. Marks: 100

Course Outcomes

The Students will be able to:

CO1: Apply the knowledge of mathematics & electrical laws to solve problems related to electrical circuits.

CO2: Analyze single phase and three phase AC systems to obtain desired expressions.

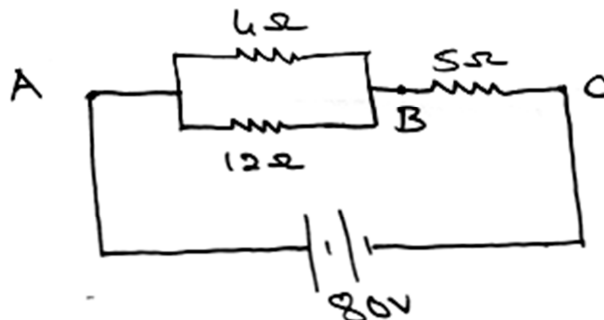
CO3: Describe the construction and working of different Electrical Machines and transformers.

CO4: Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices and personal safety measures and green energy sources.

Note: I) PART - A is compulsory. Two marks for each question.

II) PART - B: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.

Q. No.	Questions	Marks	BLs	COs	POs
I : PART - A		10			
1 a.	Differentiate between Conventional and Non-convention sources of energy with example.	2	L1	CO4	PO2
b.	Define period and frequency of a sinusoidal function.	2	L1	CO2	PO1
c.	List out the different types of generators.	2	L1	CO3	PO2
d.	Define RMF with respect to IM.	2	L1	CO3	PO1
e.	Define two part tariff.	2	L2	CO4	PO1
II : PART - B		90			
UNIT - I		18			
2 a.	With block diagram, explain the concept of power generation from nuclear power plant.	9	L2	CO1	PO1
b.	Draw and explain the single line diagram of a typical transmission and distribution scheme with their voltage levels.	9	L3	CO4	PO2
c. i)	Define KVL and KCL.	4	L1	CO1	PO2
ii)	Determine the voltage across and current through each resistor in the circuit given.				



5 L2 CO1 PO2

UNIT - II**18**

- 3 a. i) Define form factor and peak factor. 3 L2 CO2 PO2
 ii) Prove that in a purely inductive circuit the current lags the voltage by 90° . 6 L2 CO2 PO2
- b. i) Derive an expression for power in a series RC circuit. 6 L2 CO2 PO2
 ii) A circuit consists of R in series with X_c of 60Ω . Determine the value of R for which the power factor of the circuit is 0.8. 3 L2 CO1 PO2
- c. I) Define power factor. Write its significance and also mention when the power factor is leading and lagging? 4 L2 CO2 PO2
 II) An iron choke takes 4 A current when connected to 20 V DC supply when connected to a 65 V, 50 Hz AC supply, it takes 5 A current. Determine; i) The resistance and inductance of a coil 5 L2 CO1 PO1
 ii) The power factor
 iii) The power drawn by the coil

UNIT - III**18**

- 4 a. i) Derive from first principles an expression for the emf equation of a DC generator. 6 L2 CO3 PO2
 ii) A Lap wound DC generator has a useful flux of 0.07 wb/pole. Calculate the generated emf when it is rotated at a speed of 900 rpm with the help of a prime mover. Armature consists of 440 number of conductors. 3 L2 CO1 PO1
- b. i) With a neat sketch, explain the working principle of a DC motor. 5 L3 CO3 PO2
 ii) What is back emf? Explain its significance in DC motor. 4 L2 CO3 PO2
- c. i) Derive the expression for electromagnetic torque developed in a DC motor. 6 L2 CO3 PO2
 ii) A 250 V DC shunt motor takes a line current of 20 A resistance of shunt field winding is 200Ω and resistance of armature is 0.3Ω . Find the armature current and the back emf. 3 L1 CO1 PO1

UNIT - IV**18**

- 5 a. i) Explain the constructional difference between a core type and a shell type transformer. 4 L2 CO4 PO2
 ii) A single phase transformer working at 0.8 PF and has an efficiency of 94% at both three-fourth full load and full load of 600 kW. Determine efficiency at half full load, using power factor. 5 L2 CO4 PO2

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|---|---|----|-----|-----|
| b. Explain the concept of rotating magnetic field in three phase IM. | 9 | L2 | CO4 | PO2 |
| c. i) What is slip in an induction motor? Explain why slip is never zero in an induction motor. | 5 | L2 | CO4 | PO2 |
| ii) A 3 ϕ IM is wound for 4 pole and supplied from 50 Hz supply. Calculate; | | | | |
| i) Synchronous speed | 4 | L2 | CO1 | PO1 |
| ii) Rotor speed when slip is 4% | | | | |
| iii) Rotor frequency when speed is 600 rpm | | | | |

UNIT - V**18**

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| 6 a. Discuss how electricity bill is calculated based on unit consumption of electrical energy using two part tariff for domestic customers. | 9 | L3 | CO4 | PO2 |
| b. Why earthing is essential in a building service? With a neat diagram, explain the pipe earthing. | 9 | L3 | CO4 | PO2 |
| c. i) Explain three way control of lamp. | 4 | L2 | CO4 | PO2 |
| ii) Explain the operation of MCB and Fuse with their difference. | 5 | L2 | CO4 | PO2 |

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