K. K. Wagh Institute of Engineering Education and Research, Nashik
(An Autonomous Institute from A.Y. 2022-23)

Marking Scheme Set-01

End-Sem Examination-I, Winter 2025

Academic Year: 2025-2026 **Semester: I**

Name of Program: FY B.Tech **Pattern: 2022**

Name of Course: Fundamentals of Electrical Engineering **Course Code:** FYE221006

Branch Code: COM/ELE/ INT /ADS/ROB/CSD/CIV/MECH/CHEM

Q.1	Define insulation resistance. Derive Formula to calculate insulation resistance for single core cable Definition insulation resistance = 01 Mark Cable Diagram = 02 Marks **Derivation 03 Marks**	[6]
Q.2	Derive formulae to convert DELTA connected network into its STAR connected equivalent network. (6 marks) $R_A = \frac{R_{AB}.R_{AC}}{R_{AB} + R_{BC} + R_{AC}}$ $R_B = \frac{R_{BC}.R_{BC}}{R_{AB} + R_{BC} + R_{AC}}$ $R_C = \frac{R_{AC}.R_{BC}}{R_{AB} + R_{BC} + R_{AC}}$ **Derivation (6 marks)**	[6]
Q.3	a) i) Define following terms in AC fundamentals with its values. 1) Form Factor 2) Amplitude factor (2 Marks) ii) An alternating current varying sinusoidally with a frequency 50Hz has RMS value of 20A. Find its value after passing through zero positive maximum. 1) 0.0025 Sec 2) 0.125 Sec (6 Marks) **i)Each definition - 2 x 01 Marks** 1) Form Factor **01 Marks** 2) Crest Factor or Amplitude Factor Definition: **01 Marks** **ii)** Value of current at 1) 0.0025 Sec = 20 A **03 Marks** 2) 0.125 Sec = 28.28 A **03 Marks** **OR**	[16]

	b) What is meant by resonance in series R-L-C circuit connected across sinusoidal A.C. supply? Derive the equation for resonant frequency (8 Marks) **Resonance in series R-L-C circuit 04 Marks** **Derivation for resonant frequency 04 Marks**	
	c) The voltage and current, in simple series circuit are given by V = 150 $\angle 30^0$ Volt˚ and I = 2$\angle -15^0$ amp. If the supply frequency is 50Hz, determine, impedance, resistance, reactance and power consumed by the circuit, Draw phasor diagram. (8 marks) 1) Impedance = 75$\angle 45^0$ **02 Marks** 2) Resistance= 53.03 Ohm **01 Marks** 3) Reactance = 53.03 Ohm **01 Marks** 4) Power consumed by the circuit = 212.13 Watt **02 Marks** 5) Draw phasor diagram. **02 Marks** **OR** d) Three impedances $Z_1 = 40\angle 0^0$, $Z_2 = 20\angle 90^0$ and $Z_3 = 30\angle -90^0$ ohm are connected in series across single phase 250 V, 50 Hz supply, Calculate, i) Total Impedance, ii) Current Drawn iii) Power Factor iv) Power Consumed by Circuit. v) Draw Phasor Diagram (8 marks)) i) Total Impedance = $41.23\angle -14.04^\circ\ \Omega$ **01 M** ii) Current Drawn = 6.06 A **02 M** iii) Power Factor = 0.97 leading **01 M** iv) Power Consumed by Circuit. = 1.47 kW **02 M** v) Draw Phasor Diagram **02 M**	
Q.4	a) Derive the relation of line & phase values of voltage and current for three phase delta connected balanced load, with phasor (8 marks) **Circuit diagram 02 M** **Equation of Currents 02 M** **Phasor diagram 02 M** **Derivation 02 M** **OR** b) Explain the technical differences between an Earth Leakage Circuit Breaker (ELCB) and a Miniature Circuit Breaker (MCB)? **Differences Any 06 Point = 08 Marks**	[16]

	c) A balance Delta connected load of $45\angle 36.86^\circ$ per phase is connected to a Three phase 440 volt supply. Calculate i)Phase current ii)line current iii)Power Factor iv)Active Power v)Reactive Power vi)Total Volt amperes vii) Draw Phasor Diagram i)Phase current = **$9.78 \angle -36.86^0$ Amp** **01 M** ii)line current = **16.96 Amp** **01 M** iii)Power Factor = **0.8 Lagging** **01 M** iv)Active Power = **10330 Watt** **01 M** v)Reactive Power = **7915 VAR** **01 M** vi)Total Volt amperes = **12916 VA** **01 M** vii) Draw Phasor Diagram= **02 M** **OR** d) A balance Star connected load of (40 - j 25) Ω/phase is connected to a three phase 415 v, 50 Hz supply Calculate i) Phase and Line current ii) Phase voltage iii) Power Factor iv)Active Power v) Reactive Power vi) Total Volt amperes vii) Draw Phasor Diagram (8 marks) (i) Impedance = **$4717 \angle -32^o \Omega$** **01 M** (ii) Line voltage = **415 V** **01 M** (iii) phase voltage = **239.6 V** **01 M** (iv) Line and phase current = **$5.08 \angle 32^o$ Amp** **01 M** (v) Power Factor = **0.848 Leading** **01 M** (v) Active and reactive power = **3.10 KW & 1.94 KVAR** **02 M** (vi) Draw Phasor Diagram = **01 M**	
Q.5	a) What are the different types of losses in a transformer? Also, discuss the methods used to minimize these losses to improve efficiency. (8 marks) **Losses in Transformer 02 M** **Parts in which losses are taking Place 03 M** **How to reduce Losses 03 M** **OR** b) Mention Advantages and Disadvantages of Stepper motor (8 marks) Advantages of Stepper motor = **04 M** Disadvantages of Stepper motor = **04 M**	[16]

	c) A Transformer is rated at 270 KVA, at full load its copper losses is 2.5 KW and its iron losses is 1850 Watt. Calculate i) Efficiency at 70 % of full load,0.8 power factor. ii)Efficiency at 80%of full load at 0.75 power factor iii) Efficiency at full load, unity power factor (8 marks) **(1) Efficiency at 70% full load, 0.8 power factor = 98.01 % 03 M** **(2) Efficiency at 80% full load, 0.75 power factor = 97.91 % 03 M** **(3) Efficiency at full load, unity power factor = 98.41 % 02 M** d) A 3000V/200V,50Hz, single phase transformer is built on a core having an effective cross sectional area of 120cm^2 and 80 turns on the secondary winding Calculate 1) The value of maximum flux density, 2) The number of turns on the HV winding (8 marks) 1) The value of maximum flux density = 0.938 Tesla **04 M** 2) The number of turns on the HV winding = 1200 Turns **04 M**	