

**K. K. Wagh Institute of Engineering Education & Research, Nashik**

(An Autonomous Institute From A.Y. 2022-23)

	WINTER-2023		
	Exam Seat No.:		
	Academic Year:2023-2024	Semester: I	
	Name of Programme: F. Y. B.Tech	Pattern: 2023	
	Name of Course: Fundamentals of Electrical Engineering	Course Code: 2300105A	
	Max. Marks: 60	Duration: 2.5 Hrs.	

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains _03_ page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

Question No. 1 Attempt following Question

- 1) Solve any one (6) CO4
- a) Determine the expression for a single core - cable in terms of insulation resistance
- or
- b) Derive the expression for effect of temperature on R.T.C considering final as α_2 and initial conditions as α_1

Question No. 2 Attempt following Question

- 2) Solve any one (6) CO4
- a) State and Explain superposition theorem
- or
- b) Derive the formula for delta to star transformation

Question No. 3 Attempt following Question

- 3a) Define following terms in AC fundamentals with its values. (5) CO1

- 1) Form Factor 2) Crest factor 3) Power factor 4) Active Power 5) Reactive Power

OR

3b) Define what is RMS value and state the expression for rms value of sinusoidal alternating current in terms of its peak value. (5) CO1

3c) A sinusoidal voltage of $v = V_m \sin \omega t$ is applied across a series R-C circuit. Derive the expression for average power consumed by the circuit and draw circuit diagram, phasor diagram and voltage triangle (5) CO1

OR

3d) What is meant by resonance in series R-L-C circuit connected across sinusoidal A.C. supply? Derive the equation for resonant frequency (5) CO1

3e) A series R-L circuit with $R = 25\Omega$ and $L = 0.2$ H is connected to a 240V, 50Hz source. Calculate (1) impedance, (2) current, (3) power (4) power factor and (5) draw vector diagram. (6) CO4

OR

3f) An AC circuit connected across 230V, 50Hz, supply has two parallel branches A and B. Branch A draws a current of 4 Amp. at 0.8 lagging power factor while the total current drawn by parallel combination is 6 Amp. at unity power factor. Find (i) current and power factor of branch B. (ii) Admittance of branch A, B and its parallel combination both in rectangular and polar form. (6) CO4

Question No. 4 Attempt following Question

4a) Differentiate between ELCB and MCB? (5) CO3

OR

4b) Define Earthing and State the need of Earthing? (5) CO3

4c) State relations between line value and phase value of voltage and current for three-phase delta connected load and state power equation in terms of line value of voltage and current. (5) CO4

OR

4d) State relations between line value and phase value of voltage and current for three-phase star connected load and state power equation in terms of line value of voltage and current. (5) CO4

4e) A delta-connected balanced load is connected to a 3-phase 440V supply. The load p.f. is 0.8 lagging. The line current is 34.64 ampere. Find: (1) The resistance, reactance and impedance of the load per phase, (2) Total power and, (3) Total reactive volt-ampere. (6) CO4

OR

4f) A balanced star-connected load of $5\angle 36.86^\circ$ per phase is connected to a 3-phase, 440V supply. Calculate: 1) Phase current 2) Line current 3) Power Factor 4) Power Consumed 5) Reactive power 6) Apparent Power. (6) CO4

Question No. 5 Attempt following Question

5a) Differentiate between Core type and Shell type of Transformer. (5) CO3

OR

5b) Mention Advantages and Disadvantages of Stepper motor (5) CO3

5c) Derive the emf equation of transformer. (5) CO3

OR

5d) What are the different losses in the transformer? Explain one in detail along with equation. (5) CO3

- 5e) A transformer is rated at 90 kVA at full load its copper losses is 1100W and its iron losses is 950 W, (6) CO6
calculate:
- (1) Efficiency at full load, unity power factor
 - (2) Efficiency at 60% full load, 0.8 power factor

OR

- 5f) A 3000V/200V, 50Hz, single phase transformer is built on a core having an effective cross sectional (6) CO6
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.