

TED (15) – 3033

Reg. No.....

(REVISION – 2015)

Signature

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2019**

FUNDAMENTALS OF A C SYSTEMS

[Time : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

I Answer *all* questions in one or two sentences. Each question carries 2 marks.

1. Define R M S value of an AC quantity.
2. Express the impedance of an A C series R-L circuit in regular and rectangular form.
3. Draw the 'Power Triangle' of an A C circuit.
4. What are the possible phase sequences in a 3-phase supply system.
5. List any two equipments used to improve power factor in A C circuits. (5×2 = 10)

PART — B

(Maximum marks : 30)

II Answer any *five* of the following questions. Each question carries 6 marks.

1. In an AC circuit, voltmeter and ammeter indicated 230 V and 10 A respectively. What will be the maximum values and average values of the current and voltage ?
2. Prove that an Alternating Current in a pure inductive circuit will lag behind the applied voltage by 90° .
3. Express the following electrical quantities in trigonometric and rectangular forms : $\vec{V} = 50 \angle 36.8^\circ$ V and $\vec{I} = 40 \angle -42^\circ$
4. Show that the Line value of voltage is greater than the phase value of voltage in a 3-phase balanced star connection.
5. Compare 3-phase Star and Delta connections.
6. Draw a circuit diagram for measuring 3-phase power taken by a load using two watt meters and write the expression for Power.
7. Calculate the active and reactive powers taken by a load whose power measured by 2 watt meters read as $W_1 = 400$ W and $W_2 = -825$ W. Also find power factor.

(5×6 = 30)

PART — C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT — I

- III (a) List the advantages of A C over D C electric supply system. 7
 (b) How can we represent a sinusoidal A C current using four types of values. 8

OR

- IV (a) Derive an expression for an A C voltage generated. 7
 (b) Find the resultant current of the branch currents.
 $i_1 = 4 \sin (\omega t - 45^\circ)$ and $i_2 = 2 \sin (\omega t + 30^\circ)$ using vectors. 8

UNIT — II

- V (a) What is meant by Resonance in series AC circuit ? Derive the expression for resonant frequency. 7
 (b) A 318 μ F capacitor alone is connected across a 230V, 50 Hz system. Determine.
 (i) Capacitive reactance, (ii) RMS value of the current and (iii) the equations for instantaneous voltage and current values. 8

OR

- VI (a) Derive the expressions for impedance, current, power and power factor in an AC series R-C circuit. 7
 (b) Express the following electrical quantities in polar form and draw the phasors.
 (i) $i = (3 + j7)$ (ii) $v = (-2 + j5)$ (iii) $v = (-50 - j75)$ (iv) $i = (6 - j8)$ 8

UNIT — III

- VII (a) Explain the advantages of 3-phase power system. 6
 (b) A balanced star connected load of impedance $(6 + j8) \Omega$ per phase is connected to a 3-phase 400 V, 50 Hz supply. Find the current, power factor, active and reactive power and total volt-ampere. 9

OR

- VIII (a) A 3-phase balanced delta load takes a line current of 15 A at 0.8 leading p.f. Supply given is 400 V, 50 Hz. Calculate the power drawn, resistance and capacitance in each leg of the load. 8
 (b) Draw the lay-out of a star connected lighting load in a 3-floor building of 6 rooms. 7

UNIT — IV

- IX (a) Three identical coils, each having a reactance of 20Ω and resistance of 20Ω are connected in (a) star (b) delta across a 440-V, 3-phase line. Calculate for each method of connection, (i) the line current and (ii) the readings on two watt meters connected to measure the power. 10
 (b) How can we distinguish an unbalanced 3-phase load from a balanced one ? 5

OR

- X (a) Explain about the nature of wattmeter readings with respect to load power factor in three phase power measurement using two watt meters. 9
 (b) State some of the disadvantages of having lower power factor. 6