Total No. of Questions—**12**] [Total No. of Printed Pages—**4+1**

Seat No.	

[4956]-4

F.E. (First Semester) EXAMINATION, 2016

BASIC ELECTRICAL ENGINEERING

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answers to the two sections must be written in separate answer-books.

(*ii*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**, Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*iii*) Figures to the right indicate full marks.

(*iv*) Neat diagram must be drawn wherever necessary.

(*v*) Use of non-programmable pocket size scientific calculator is permitted.

(*vi*) Assume suitable additional data, if necessary.

SECTION I

1. (A) With usual notation, prove that : [8]

$$(\alpha_1 - \alpha_2) = \alpha_1 \alpha_2 (t_2 - t_1)$$

(B) With neat diagram explain construction and working of Lead acid cell. [8]

P.T.O.

Or

2. (A) A resistance element having cross-sectional area of 10 mm^2 and length of 10 m takes a current of 4 amp from 200 V supply at temperture of 20ºC. Find : [10]

(*i*) Resistivity of material and current it will take when temp. rises to 60ºC. Assume α_{20} = 0.0003/ºC.

(B) Explain the following terms with respect to electrical : [6]

(*i*) Energy

(*ii*) Power.

3. (A) State and explain Thevenin's theorem with example. [8]

(B) Derive formula to convert star connected network into delta connected network. [10]

Or

4. (A) State and explain Kirchhoff's Laws. [8]

(B) State and explain Superposition theorem with example. [10]

5. (A) Compare Electric and Magnetic circuits. [8]

(B) Derive the expression for energy stored in a magnetic field in terms of energy stored per unit volume. [8]

Or

6. (A) Explain what do you mean by statistically induced emf and dynamically induced emf. [8]

(B) A coil of 2000 turns is wound uniformly over a non-magnetic ring of mean circumference of 80 cm and cross-sectional area of 0.6 sq. cm. If the current through the coil is 2 A, calculate : [8]

(*i*) Magnetizing force

(*ii*) Reluctance

(*iii*) Total flux

(*iv*) Flux density.

SECTION II

7. (A) Define with respect to alternating quantities with units : [8]

(*i*) Amplitude

(*ii*) Frequency

(*iii*) Time period

(*iv*) Cycle.

(B) The equation of an alternating current is given by $i = 42.42 \sin(628t)$. Calculate its : [8]

(*i*) Maximum value

(*ii*) Frequency

(*iii*) RMS value

(*iv*) Average value.

Or

8. (A) Derive an expression for average value of alternating current. [8]

(B) Derive an expression for capacitance of parallel plate capacitor. [8]

9. (A) Derive an expression for instantaneous current and power consumed when voltage $V = V_m \sin \omega t$ is applied to pure inductance alone. Also draw waveform for the power. [9]

(B) A circuit consisting of resistance of 20 Ω and inductance of 0.1 H is connected in series across single phase, 200 V, 50 Hz supply. Calculate : [9]

(*i*) Impedance

(*ii*) Current drawn

(*iii*) Power consumed

(*iv*) Draw phasor diagram.

Or

10. (A) If a sinusoidal voltage $V = V_m \sin \omega t$ is applied across R-C series circuit. Derive expression for current and average power consumed by a circuit. Draw waveform of power. [9]

(B) Two impedances $Z_1 = 6 + j8$ Ω and $Z_2 = 5 + j15$ Ω are connected in series across the voltage of 100 V, 50 Hz supply. Calculate : [9]

(*i*) Power factor of the circuit

(*ii*) Total active reactive and apparent power consumed in the circuit.

11. (A) Write a short note on losses taking place in transformer. [6]

(B) 25 kVA, 50 Hz single phase transformer has an iron loss and full load copper loss of 350 W and 400 W respectively. Find percentage efficiency at : [10]

(*i*) 50% of full load at unity power factor.

(*ii*) 50% of full load at 0.8 lagging power factor.

(*iii*) 75% of full load at unity power factor.

(*iv*) 75% of full load at 0.8 lagging power factor.

Or

12. (A) Compare core type and shell type transformer. [6]

(B) A balanced star connected load is supplied by 3-phase, 415 V, 50 Hz supply. Current in phase is 20 A and lags 30º behind phase voltage. Find : [10]

(*i*) Power consumed by load.

(*ii*) Calculate value of load impedance and value of R and X.

(*iii*) Load power factor.