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

Seat No.	

[4856]-14

F.E. (First Semester) EXAMINATION, 2015

BASIC ELECTRICAL ENGINEERING

(2008 PATTERN)

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

N.B. **:—** (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I; Q. No. **7** *or* Q. No. **8** Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*ii*) Answers to the two Sections must be written in separate answer-books

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

(*iv*) Neat diagrams 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*) What is insulation resistance ? State its unit and derive expression for insulation resistance of the single core cable. [8]

(*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 temperature of 25°C. Find :

Resistivity of material and current it will take when temp. rises to 75°C. Assume α_{25} = 0.0003/°C. [10]

(*b*) State applications of Ni-Iron cell and Nickel-Cadmium cell. [6]

3. (*a*) State and explain Kirchhoff's Laws. [8]

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

Or

4. (*a*) State and explain maximum power transfer theorem with example. [8]

(*b*) State and explain superposition theorem with example. [10]

5. (*a*) Compare electric and magnetic circuits. [8]

(*b*) Derive the equation $L = N^2/S$. Where L = self-induced e.m.f. of coil; N = no. of turns of coil; S = reluctance of magnetic circuit. [8]

Or

6. (*a*) Explain what do you mean by statistically induced e.m.f. and dynamically induced e.m.f. [6]

(*b*) A steel ring of 25 cm mean diameter and circular cross section 3 cm diameter has an airgap of 1.5 mm length is wound uniformly with 700 turns of wire carrying a current of 2 amp. Calculate :

(*a*) MMF

(*b*) Flux density

(*c*) Reluctance

(*d*) Relative permeability of steel ring. [10]

SECTION II

7. (*a*) Define with respect to alternating quantities : [4]

(*i*) Form factor

(*ii*) Crest factor

(*b*) Sketch waveform of current and find its r.m.s. value and average value for the equation : [12]

(*i*) $i_1 = 15 \sin (314.159t)$

(*ii*) $i_2 = 10 \sin (314.159t) - \pi/2)$

Or

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

(*b*) Derive an expression for energy stored in a capacitor. [8]

9. (*a*) Define :

(*i*) Admittance

(*ii*) Conductance

(*iii*) Susceptance

Express admittance in rectangular and polar form. State unit of admittance and draw admittance triangle. [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–L series circuit. Derive expression for current and average power consumed by a circuit. Draw waveform of power. [9]

(*b*) Two impedances $Z_1 = 12 + j16\ \Omega$ and $Z_2 = 8 - j4\ \Omega$ are connected in parallel across the voltage of 23 V. Calculate :

(*i*) Total current drawn

(*ii*) Total power

(*iii*) Overall power factor of the circuit [9]

11. (*a*) Derive an expression for e.m.f. induced in the transformer. [8]

(*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 efficiency at 50% of full load at unity power factor. [8]

Or

12. (*a*) Explain advantages of 3 phase system over single phase system. [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 30° behind phase voltage. Find : [10]

(*i*) Power consumed by load

(*ii*) Circuit parameters

(*iii*) Load power factor.