Total No. of Questions—8] [Total No. of Printed Pages—3

Seat No.	

[5056]-14

F.E. EXAMINATION, 2016
BASIC ELECTRICAL ENGINEERING
(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Figures to the right indicate full marks.
(*ii*) Neat diagrams must be drawn wherever necessary.
(*iii*) Use of Logarithmic tables, slide rule, Mollier charts and steam tables is allowed.
(*iv*) Use of programmable calculators is not allowed.
(*v*) Assume suitable data if necessary.

1. (*a*) If α_1 and α_2 are RTC's of material at t_1 °C and t_2 °C respectively, then prove that, $\alpha_1 / \alpha_2 = 1 + \alpha(t_2 - t_1)$. [6]

(*b*) An electric kettle is required to raise the temperature of 2 litres of water from 20°C to 100°C in 15 mins. Calculate the resistance of the heating element if the kettle is to be used on 200 V supply. Assume efficiency of the kettle to be 80%. Assume specific heat of water of 4180 J/kg-K. [6]

Or

2. (*a*) Compare magnetic circuit and electric circuit. [6]

(*b*) A coil of 600 turns and of resistance of 20 Ω is wound uniformly over a steel ring of mean circumference of 30 cm and cross-sectional area of 9 cm^2. It is connected to a supply of 20 V. If the relative permeability of a ring is 1600, find :
(*a*) the reluctance
(*b*) the magnetic field intensity
(*c*) the mmf and
(*d*) the flux. [6]

P.T.O.

3. (*a*) What is an Autotransformer ? State the different advantages and applications of an Autotransformer. [6]

(*b*) Find the expression for current which will flow when a pure inductor of 0.2H is connected across 230 V, 50 Hz, AC supply. Draw the phasor daigram. [6]

Or

4. (*a*) Define average value of alternating quantity and derive its expression for sinusoidal current. [6]

(*b*) A 3300/110 V, 50 Hz, 50 kVA transformer has full load copper load of 1600 watts and iron loss of 1800 watts. Estimate the transformer efficiency at :
(*i*) full load and 0.7 lagging pf
(*ii*) half load and 0.85 lagging pf. [6]

5. (*a*) Three coils, each having a resistance of 20 Ω and an inductance of 15 Ω are connected in star to a 400 V, 3-phase, 50 Hz supply.
Calculate :
(*i*) The line current
(*ii*) Power factor and
(*iii*) Power supplied. [6]

(*b*) A sinusoidal voltage $v = V_m \sin \omega t$ is applied across the series R-L circuit. Derive the expression for average power consumed by the circuit. Also draw waveform of power consumed in it. [7]

Or

6. (*a*) Derive the relationship between the line current and phase current, line voltage and phase voltage, for a balanced three phase star connected load across three phase supply. Derive power consumed by 3-phase balanced star connected load. [7]

(*b*) A coil having resistance of 7Ω and an inductance of 31.8 m H is connected to 230V, 50 Hz supply. Calculate :

(*i*) the circuit current

(*ii*) phase angle

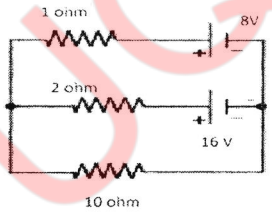
(*iii*) power factor

(*iv*) power consumed

(*v*) voltage drop across resistance and inductor. [6]

7. (*a*) Derive formula to convert STAR connected network into its equivalent DELTA circuit. [6]

(*b*) Apply Kirchhoff's law to calculate current drawn by 10 Ω resistance for the circuit. [7]



Or

8. (*a*) State and explain Superposition theorem as applied to simple DC circuit. [6]

(*b*) Apply Thevenin's theorem to calculate current flowing in 5 Ω resistance for the network. [7]