Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

| Seat No. | |
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# [4856]-204

## F.E. (Common) EXAMINATION, 2015

## BASIC ELECRICAL ENGINEERING

## (2012 PATTERN)

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

***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**, Q. No. **7** *or* Q. No. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

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

(*iv*) Use of electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

**1.** (*a*) Obtain the equation for coefficient of coupling between two coils placed on common magnetic field. [6]

(*b*) A water pump lifts 50 $m^3$ of water per hour to a height of 20 m. The overall efficiency of water pump set is 0.60. Find monthly bill, when the pump is used 4 hours a day for a month of 30 days, at the rate of Rs. 5/kWh. [6]

P.T.O.

*Or*

**2.** (*a*) Explain the effect of temperature on resistance of : [6]

(*i*) metal conductors

(*ii*) insulators

(*iii*) alloys.

(*b*) A steel ring of mean diameter of 50 cm is wound with 500 turns on it. A flux density of 1 Tesla is produced in the ring by mmf of 4000 AT/m. Calculate magnetising current. Also find the current when an air gap of 1 mm is cut in it, keeping B = 1 Tesla in the ring. [6]

**3.** (*a*) Obtain the expression for composite capacitor having 3-dielectric materials. [7]

(*b*) A 50 Hz sinusoidal voltage has rms value of 200 V. At $t = 0$, the instantaneous value is positive and half of its maximum value. Write down the expression for voltage and sketch the wave form. [6]

*Or*

**4.** (*a*) Derive an equation for average value of sinusoidal current in terms of its peak value. [6]

(*b*) A 40 kVA, 2200/220 V, 50 Hz, 1-ph transformer has an iron loss of 250 W. The resistances of low and high voltage windings are 0.005 Ω and 0.5 Ω respectively. Calculate efficiency at full load and load p.f. = 0.8 lagging. [7]

**5.** (*a*) Obtain the expression for power, if $x = v_m \sin \omega t$ is applied to R-L series circuit. [6]

(*b*) Three identical impedances each of $6 + j8\ \Omega$ are connected in star across 3-ph, 400 V, 50 Hz a.c. supply. Calculate : [7]

(*i*) line current

(*ii*) active power

(*iii*) reactive power.

*Or*

**6.** (*a*) What is series resonance ? Obtain the equation for resonant frequency. [6]

(*b*) Two circuits having impedances $Z_1 = 8 + j6\ \Omega$ and $Z_2 = 5 + j10\ \Omega$ are connected in parallel across 200 V, 50 Hz, 1-ph a.c. supply. Calculate : [7]

(*i*) current drawn by each circuit

(*ii*) total current

(*iii*) p.f. of whole circuit.

**7.** (*a*) Using simple series-parallel combination, find $R_{BC}$ for Fig. 1. [6]

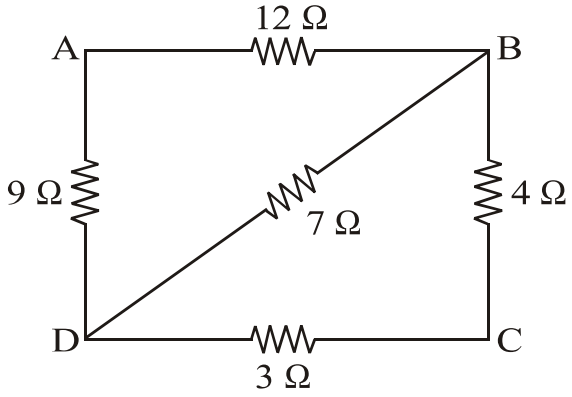


Fig. 1

(*b*) Obtain the equations to convert Δ-connected resistances into equivalent star circuit. [6]

*Or*

**8.** (*a*) State the Thevenin's theorem and explain the steps to find $R_{th}$, $V_{th}$ and $I_{th}$. [6]

(*b*) Using Mesh/Loop analysis, calculate current flowing through $R_{BC}$ for Fig 2. [6]

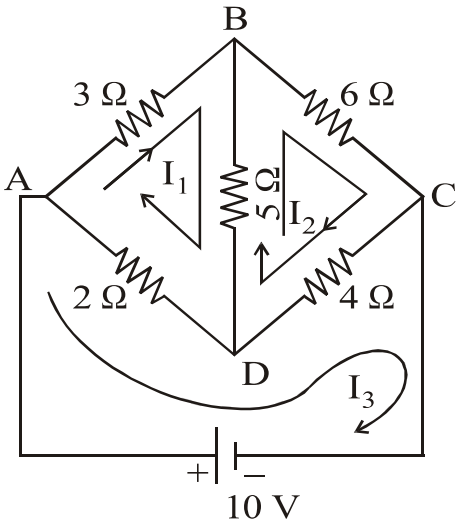


Fig. 2