53 (EE 201) BEEN

2014

BASIC ELECTRICAL ENGINEERING

Paper : EE 201

Full Marks : 100

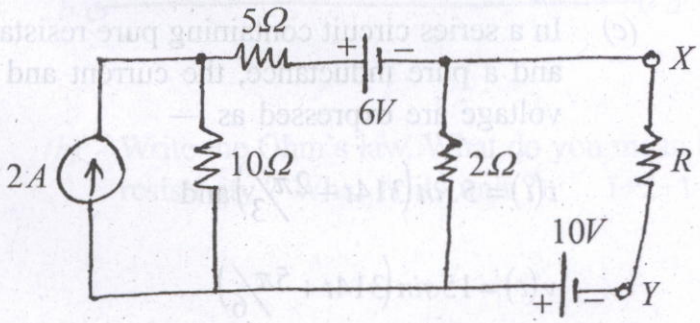
Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

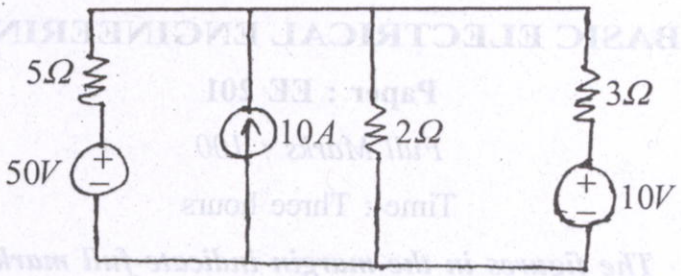
1. *(a)* State the Maximum Power Transfer theorem in *DC* circuit. 4

   (b) Find R to have maximum power transfer in the circuit shown below. Also obtain the amount of maximum power. 8



Contd.

(c) Using mesh analysis, calculate the current through the 5Ω resistor in the given network. 8



2. (a) What do you mean by effective value of AC curernt ? Why for a sinusoidal AC current wave average value is zero over a complete cycle ? Establish a relation between RMS value and Maximum value. 2+2+3=7

(b) Explain the significance of Power factor in AC circuits. 3

(c) In a series circuit containing pure resistance and a pure inductance, the current and the voltage are expressed as — 10

$$i(t) = 5\sin\left(314t + 2\pi/3\right) \text{ and}$$

$$v(t) = 15\sin\left(314t + 5\pi/6\right)$$

(i) What is the impedance of the circuit ?

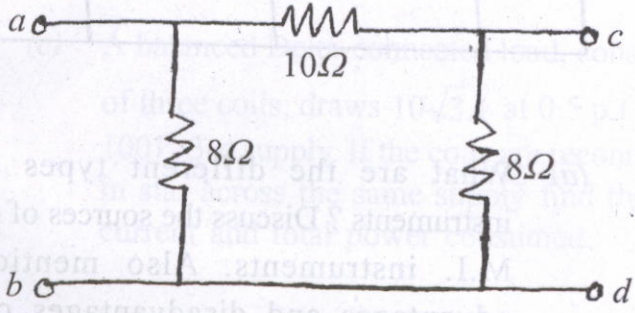
(ii) What is the value of the resistance ?

(iii) What is the inductance in *henry* ?

(iv) What is the average power drawn by the circuit ?

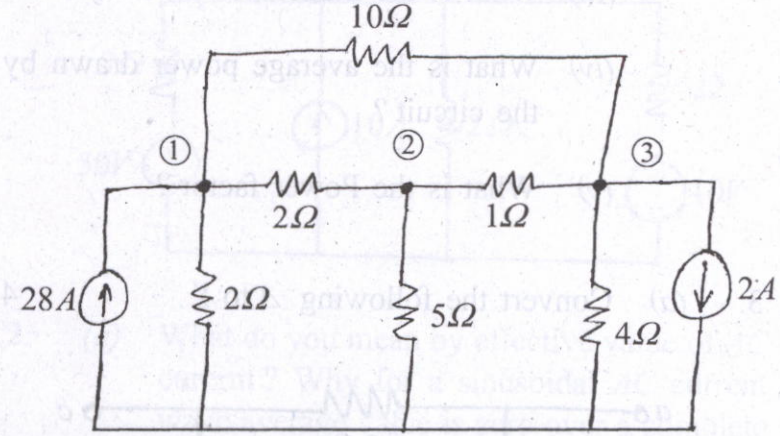
(v) What is the Power factor ?

3. (a) Convert the following Δ to Y. 4



(b) Write the Ohm's law. What do you mean by resistivity ? What is its unit ? 1+2+1=4

(c) Use nodal analysis method to find currents in the various resistors to the circuit shown — 12



4. (a) What are the different types of MI instruments ? Discuss the sources of error in M.I. instruments. Also mention the advantages and disadvantages of M.I. instruments. 8

(b) What is the significance of shunt in Ammeters ? Explain how the range of an ammeter can be extended ? 6

(c) A $250V$ moving-iron voltmeter takes a current of $0{\cdot}05A$ when connected to a $250V$ *d.c.* supply. The coil has an inductance of $1H$. Determine the reading on the meter when connected to a $250V$, $100Hz$ *ac* supply. 6

5. (a) Derive a relation between line voltage and phase voltage in a balance star connected system. 5

(b) Mention *any three* advantages of 3-ϕ system over 1-ϕ system. 3

(c) A balanced Delta-connected load, consisting of three coils, draws $10\sqrt{3}A$ at $0{\cdot}5$ p.f. from $100V$, 3-ϕ supply. If the coils are reconnected in star across the same supply find the line current and total power consumed. 12

6. (a) Write about the following : 6

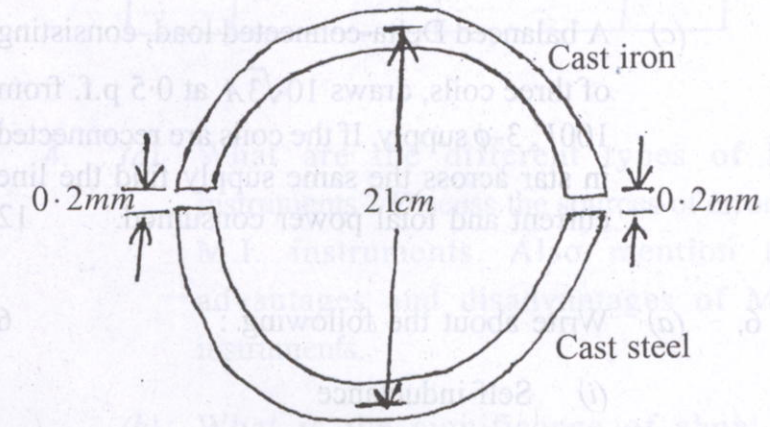
(i) Self-inductance

(ii) Electromagnet

(iii) Reluctance.

(b) State and explain Faraday's laws of electromagnetic induction. 4

(c) A ring has a diameter of 21*cm* and a cross-sectional area of $10cm^2$. The ring is made up of semicircular sections of cast iron and cast steel, with each joint having a reluctance equal to an air-gap of 0·2*mm*. Find the ampere-turns required to produce a flux of $8\times10^{-4}wb$. The relative permeabilities of cast steel and cast iron are 800 and 166 respectively. 10



7. (a) Explain how a fuse protects the appliances from damage when short-circuit occurs. 7

(b) Explain why earthing is very important for an electrical wiring system ? Draw sketch if necessary. 7

(c) It is required to control two bulbs, one fan and a 3-pin socket outlet from $220V$, $50Hz$ supply. Draw a neat diagram. 6