53 (EE 201) BEEN

2012C
2013
(May)

BASIC ELECTRICAL ENGINEERING

Paper : EE 201

Full Marks : 100

Pass Marks : 30

Time : Three hours

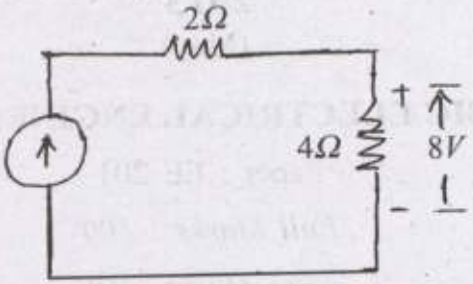
The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. *(a)* State Superposition theorem and Maximum Power transfer theorem. 2.5+2.5=5

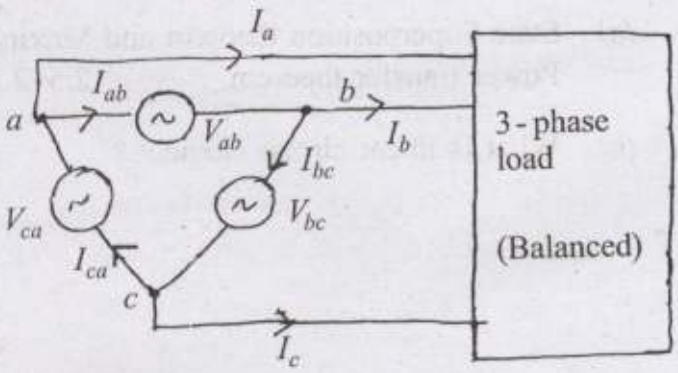
   (b) What is linear circuit element ? 3

(c) In the following circuit, find the value of the current and terminal voltage of the current source. Also determine the power that is dissipated in the 2Ω resistor. 6



(d) A resistor R is connected in series with a parallel circuit comprising two resistances of 12Ω and 8Ω respectively. The total power dissipated in the circuit is $70W$ when the applied voltage is $20V$. Calculate R. 6

2. (a)



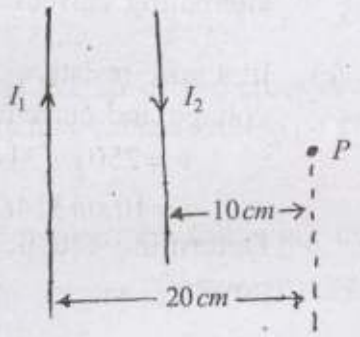
For the above 3-phase circuit, three voltage sources have same amplitude and frequency but phase displacement from one another by 120°. Derive the relationship between phase current and line current. Also draw the phasor diagram. 10

(b) A three phase 440*V* power supply has a load of power factor 0·6. Two wattmeters are connected to measure the power. If the input be 15*KW*, find the reading of each wattmeter. 10

3. (a) State Ampere's law and comment about the motion of lines of forces. 5

(b) What is magnetomotive force ? How does it differ from electromotive force ? How is it similar ? 5

(c) In the following figure, the current I_1 has a value of 40*A*. Find the value of I_2 that causes the magnetic field intensity at point *P* to disappear. 5



(d) Show that the flux density produced by an infinitely long straight wire, carrying a current I, in a point at a distance 'a' normal to the wire is given by $\mu_o\mu_r I / 2\pi a$. 5

4. (a) A sinusoidal current of $50Hz$ has maximum value of $120A$.

(i) Write down the equation for instantaneous value.

(ii) Reckoning time from the instant the current is zero and becoming positive, find the instantaneous value after 1/360 second.

(iii) Time taken to reach $96A$ for the first time. 6

(b) Find the average value, r.m.s. value, form factor, and peak factor of half wave rectified alternating current. 8

(c) In a pure resistive circuit, the instantaneous voltage and current are given by

$$v = 250 \sin 314t$$

$$i = 10 \sin 314t$$

Determine the peak power and average power. 6

5. *(a)* Make a comparison of characteristics of MI and MC instruments. 6

(b) A coil resistance 100Ω and inductance 100 *micro-henry* is connected in series with a 100 *picofarad* capacitor. The circuit is connected to a $10V$ variable frequency supply.
Calculate *(i)* Resonant frequency *(ii)* Current at resonance *(iii)* Q-factor of the circuit. 6

(c) The meter element of a PMMC instrument has a resistance of 5 *ohms* and requires $15mA$ for full scale deflection. Calculate the resistance to be connected

(i) In parallel to enable the instrument to read upto $1A$

(ii) In series to read upto $15V$. 8

6. *(a)* Compare the merits and demerits of underground system versus overhead system. 5

(b) Draw a neat sketch of the cross-section of *(i)* 3-core belted cable *(ii)* H-type cable. 6

(c) Define and explain the following terms : 4

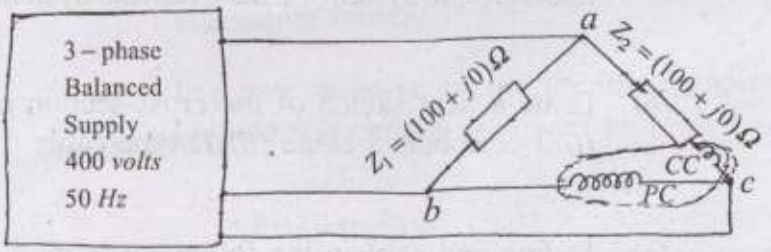
(i) Fusing current *(ii)* Cutoff current.

(d) What do you mean by grounding or earthing ? Explain it with an example. 5

7. (a) An emf given by $326 sin 314t$ is applied to a certain circuit and current is $2 sin(314t - 1 \cdot 3736)$.
Find (a) Frequency of voltage (b) Phase angle between current and voltage in degrees. (c) Resistance of the circuit. 6

(b) A bulb rated at $110V$, $60W$ is connected in series with another bulb rated $110V$, $100W$ across $220V$ mains. Calculate the resistance that should be connected in parallel with the first bulb so that both the bulbs may take their rated power. 5

(c)



The pressure coil (*PC*) and current coil (*CC*) of a wattmeter are connected to the load as shown, with the coil polarities suitably selected to ensure a positive deflection. Calculate the wattmeter reading. 9
