F.E. (Sem-I) CBCGS - BEE / 20-12-2016

Basic Electrical Engineering

K. G. C. E. EXAM KARJAT, RAIGAD

Q.P. Code :803301

(3 Hours) **[Total Marks : 80**

N.B. : (1) Question No.1 is compulsory.
(2) Answer any **THREE** questions from remaining five questions.
(3) **Figures** to right indicate **full** marks.
(4) Assume suitable data if required.

1. A) State Maximum Power Transfer Theorem **2**
   B) Derive the formula to convert a delta circuit into an equivalent star **4**
   C) Define Average value and RMS value of an alternating quantity **4**
   D) Prove that power in a 3-phase delta connected system is 3 times that of a star connected system. **4**
   E) Explain the working principle of a single phase transformer. **4**
   F) What is the use of commutator in a DC machine. **2**

2. A) Obtain current through 1 Ω resistance by using Super position theorem, in fig 2.A. **10**

Fig 2.A

   B) A coil is connected across a non-inductive resistance of 120 Ω. When a 240 V, 50 Hz supply is applied to this circuit the coil draws a current 5 A and total current is 6 A. Determine the power and power factor of **10**
      i) the coil
      ii) the whole circuit

3. A) Obtain Norton's equivalent circuit of the network shown in fig. 3.A, across the terminals A and B **10**

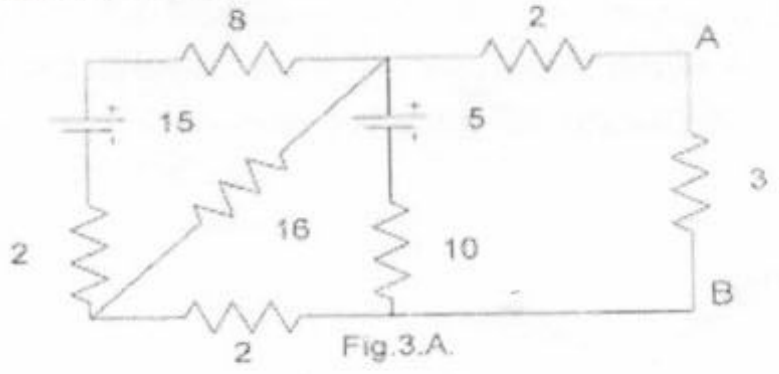

Fig.3.A.

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B) A series RLC circuit, if ω_0 is the resonant frequency, ω_1 and ω_2 are the half power frequencies, prove that $\omega_0 = \sqrt{(\omega_1\ \omega_2)}$ 5

C) Derive the equivalent circuit of a 1-phase transformer. 5

4. A) Obtain current through 15 Ω resistance by nodal analysis in fig.4.A. Take reference node as marked. 10

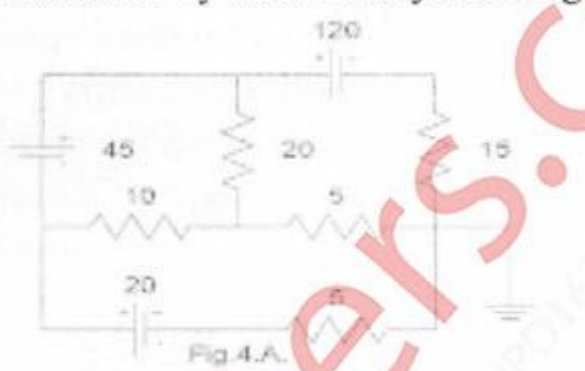

Fig.4.A.

B) In a balanced 3 phase, star connected system, a wattmeter is connected with its current coil in series with Y line and pressure coil between Y and R lines. Draw a neat circuit digram showing the above watmeter connection. Assuming a lagging power factor, draw the corresponding phasor diagram and derive the watmeter reading in terms of line voltage, line current and phase angle. 10

5. A) Obtain current through 60 Ω resistance by Mesh analysis in fig.5.A. 6

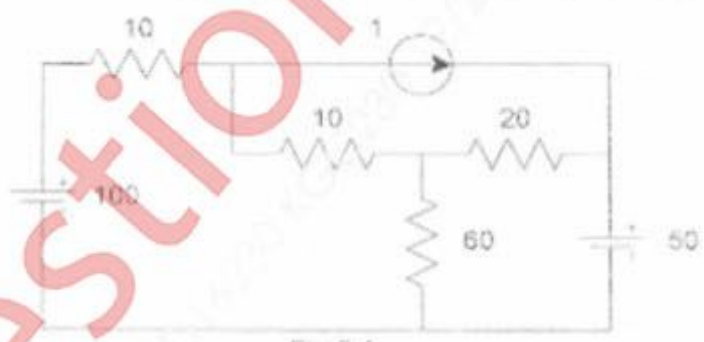

Fig.5.A.

B) Develope the phasor diagram of a single transformer supplying to a resistive load. 8

C) Derive the emf equation of a DC generator. 6

6. A) A resistor and a pure reactance are connected in series across a 150 V ac supply. When the frequency is 40 Hz, the circuit draws 5 A. When the frequency is increased to 50 Hz, the circuit draws 6 A. Find the value of resistance and the element value of the reactance. Also find the power drawn in the second case. 10

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B) A single phase 10 KV A, 500 V/250 V, 50 Hz transformer has the following constants. **10**

Resistance : primary = 0.2 ohms, secondary = 0.5 ohms
Reactance : primary = 0.4 ohms, secondary = 0.1 ohms
Resistance of equivalent exciting circuit w.r.t. primary = 1500 ohms
Reactance of equivalent exciting circuit w.r.t. primary = 750 ohms
What will be the reading of the instruments placed in primary side when the transformer is connected for OC and SC tests ?

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