T0131 / T1869 BASIC ELECTRICAL ENGINEERING

26/05/2017 (16)

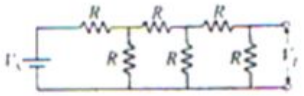
F.E. sem. I. (Choice Based)

Q.P. Code: 16830

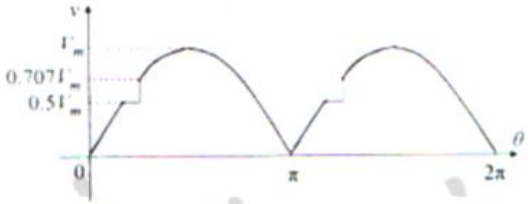
Time: 3 hours **Total Marks: 80**

1. **Question No. 1 is compulsory**
2. **Attempt any three questions from the remaining five**
3. **Figures to the right indicate full marks**
4. **Wherever not mentioned value of resistance is in ohms**
5. **Assume suitable data if necessary**

Q1. a) Find the ratio V_L/V_S in the circuit shown below using Kirchoff's laws. 4



b) Find the rms value for the following waveform. 4

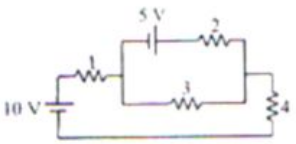


c) Draw the phasor diagram for a three phase star connected load with leading power factor. Indicate all the line and phase voltages and currents. 4

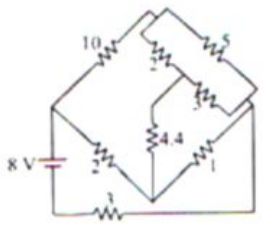
d) A 5 kVA, 240/2400 V, 50 Hz single phase transformer has the maximum value of flux density as 1 Tesla. If the emf per turn is 10. Calculate the number of primary & secondary turns and the full load primary and secondary currents. 4

e) Explain the principle of operation of DC generator. 4

Q2. a) Find the current through 3 Ω resistor by mesh analysis. 4



b) Find the current delivered by the source. 8

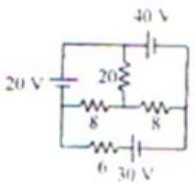


c) The voltage and current in a circuit are given by $\bar{V} = 12 \angle 30^\circ$ V and $\bar{I} = 3 \angle 60^\circ$ A. The frequency of the supply is 50 Hz. Find 8
i) Equation for voltage and current in both the rectangular and standard form.
ii) Impedance, reactance and resistance,
iii) phase difference, power factor and power loss.
Draw the circuit diagram considering a simple series circuit of two elements indicating their values.

Q3. a) Find the resultant voltage and its equation for the given voltages which are connected in series. 4

$e_1 = 2 \sin \omega t$, $e_2 = -\cos\left(\omega t - \frac{\pi}{6}\right)$, $e_3 = 2\cos\left(\omega t - \frac{\pi}{4}\right)$, $e_4 = -2\sin\left(\omega t + \frac{\pi}{3}\right)$.

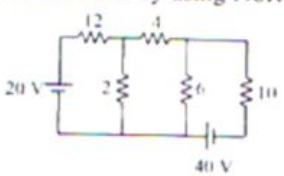
b) Find the current through 20 Ω resistor by using superposition theorem. 8



c) Two parallel branches of a circuit comprise respectively of i) a coil having 5 Ω resistance and inductance of 0.05 H, ii) a capacitor of capacitance 100 μF in series with a resistance of 10 Ω. The circuit is connected to a 100 V, 50 Hz suppiy. Find 8
i) impedance and admittance of each branch,
ii) equivalent admittance and impedance of the circuit,
iii) the supply current and power factor of the circuit.
Draw its equivalent series circuit using two elements indicating their values.

Q4. a) How are DC machines classified? 4

b) Find the current through 10 Ω resistor by using Norton's theorem. 8



c) An inductive coil has a resistance of 20 Ω and inductance of 0.2 H. It is connected in parallel with a capacitor of 20 μF. This combination is connected across a 230 V supply having variable frequency. Find the frequency at which the total current drawn from the supply is in phase with the supply voltage. What is this condition called? Find the values of total current drawn and the impedance of the circuit at this frequency. Draw the phasor diagram and indicate the various currents & voltages in the circuit. 8