Total No. of printed pages = 6

EE 131104

Roll No. of candidate | | | | | | | | | | |

2017

B.Tech. 1st Semester End-Term Examination

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING — I

(Old Regulation)

Full Marks – 100 Time – Three hours

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

Answer question No. 1 and any *six* from the rest.

1. Choose the correct answer : (10 × 1 = 10)

(a) A voltage source with a resistance in series can be converted to a current source with its

(i) Resistance in parallel

(ii) Conductance in parallel

(iii) Conductance in series

(iv) Resistance in series

(b) Maximum power can be transferred to a load when

(i) $R_L = R_{th}$ (ii) $R_L = 2R_{th}$

(iii) $R_L = 1/R_{th}$ (iv) $R_L = R_{th}/2$

[Turn over

(c) The unit of magnetic field intensity (H) is

(i) AT (ii) A/m^2

(iii) Tesla (iv) Weber

(d) The magnetic energy stored in a coil is given by

(i) $\frac{1}{2} LI^2$ (ii) $\frac{1}{2} BH^2$

(iii) $\frac{1}{2} IL^2$ (iv) BH^2

(e) The RMS value of a sinusoidal voltage wave is

(i) $\frac{1}{2}$ Vm (ii) 0.637 Vm

(iii) Vm (iv) 0.707 Vm

Where Vm is the peak value of the voltage?

(f) Form Factor (FF) is defined as the ratio of

(i) Maximum value to RMS value

(ii) Maximum value to Average value

(iii) RMS value to Maximum value

(iv) RMS value to Average value

(g) A sinusoidal current wave is expressed by I = 350 sin(314t). The frequency of the current wave is

(i) 50 Hz (ii) 314 Hz

(iii) 350 Hz (iv) 60 Hz

(h) PMMC instrument is used to measure

(i) Alternating Voltage

(ii) Alternating Current

(iii) Direct Voltage and Alternating Current

(iv) Direct Voltage and Direct Current

(i) The ripple factor of half wave rectifier is

(i) 0.5 (ii) 2

(iii) 1.21 (iv) 1.5

(j) The energy meter is

(i) Indicating Instrument

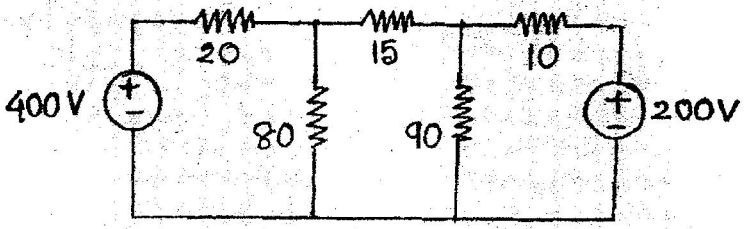
(ii) Integrating Instrument

(iii) Recording Instrument

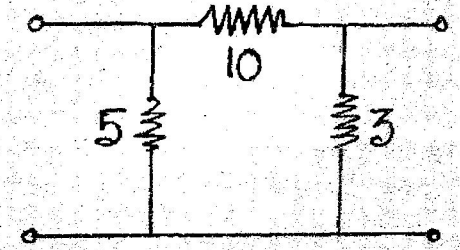
(iv) Digital Instrument

2. (a) Write short notes on Source Conversion Technique and Kirchhoff's Voltage Law. (4)

(b) Find current in the 15Ω resistor using Nodal method. (7)

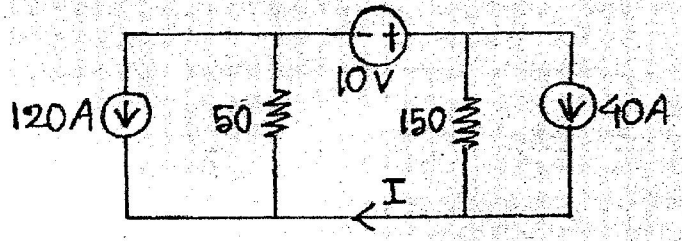


(c) Convert the delta network into equivalent star network. (4)



3. (a) State and explain Thevenin's theorem and Noreton's theorem. (3 + 4 = 7)

(b) Find current "I" of the network using superposition theorem. (8)



4. (a) An alternating current is given by $I = 14.14 \sin 377 t$. Find (8)

(i) RMS value of the current

(ii) Frequency

(iii) Instantaneous value of the current when $t = 3$ ms.

(iv) The time taken for the current to reach 10 A for the first time after passing through zero value.

(b) Define (i) power factor and (ii) Q factor of a coil. (3)

(c) Calculate the maximum value and RMS value of the following : (4)

(i) $40 \sin (wt)$

(ii) $B \sin(wt-\pi/2)$.

5. (a) Explain Resonance in R-L-C series circuit. (3)

(b) Two impedance given by $Z_1 = (10+j5)$ and $Z_2 = (8+j6)$ are joined in parallel and connected across a voltage of $V = (200+j0)$. Calculate the circuit current and branch currents. (7)

(c) Three equal impedances each having a resistance of 25Ω and reactance of 40Ω are connected in star to a 400V, 3ϕ, 50 Hz system. Calculate (5)

(i) The line current

(ii) Power factor

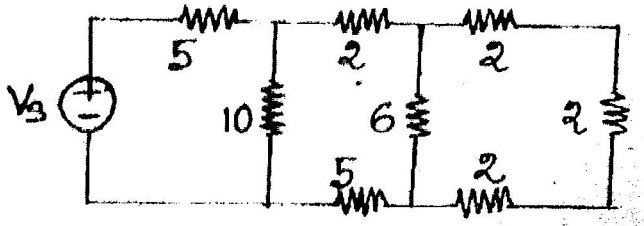
(iii) Power consumed.

(a) Define (i) self-inductance and (ii) mutual inductance. (4)

(b) Derive the expression for energy stored in a magnetic field. (4)

(c) Two coils A of 1200 turns and B of 800 turns lie near each other so that 60% of the flux produced in one coil links with the other. It is found that a current of 5A in coil A produces a flux of 0.25 mWb while the same current in coil B produces a flux of 0.15 mWb. Find the mutual inductance and co-efficient of coupling between the coils. (7)

(a) For the resistive network shown below, find the equivalent resistance seen by the source. (3)



(b) What do you mean by indicating, integrating and recording type of instruments? (6)

(c) A moving coil milliammeter having a resistance of 10Ω gives full scale deflection when a current of 5mA is passed through it. Explain how this instrument can be used measurement of (6)

(i) Current upto 1 A.

(ii) Voltage upto 5 V.

8. (a) Explain the working of a single phase half wave rectifier with its waveforms. (8)

(b) Calculate the collector and base current for the NPN transistor in CB configuration whose emitter current is 8mA and alpha current gain is 0.975. (4)

(c) What is Biot-Savert law? Explain briefly. (3)

9. (a) Discuss the two wattmeter method for power measurement in 3ϕ system and determine the power factor from wattmeter readings. (8)

(b) Determine the node voltage and currents through the resistors using mesh analysis. (7)