Question Paper

Exam Date & Time: 10-Jun-2019 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
II SEMESTER B.Sc(Applied Sciences) IN ENGINEERING
END SEMESTER THEORY EXAMINATION APRIL / MAY 2019
Elements Of Electrical and Electronics Engg. [IEE 121]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

1) A) Using source transformation techniques, reduce the circuit shown in figure 1A, to a practical voltage source. (10)

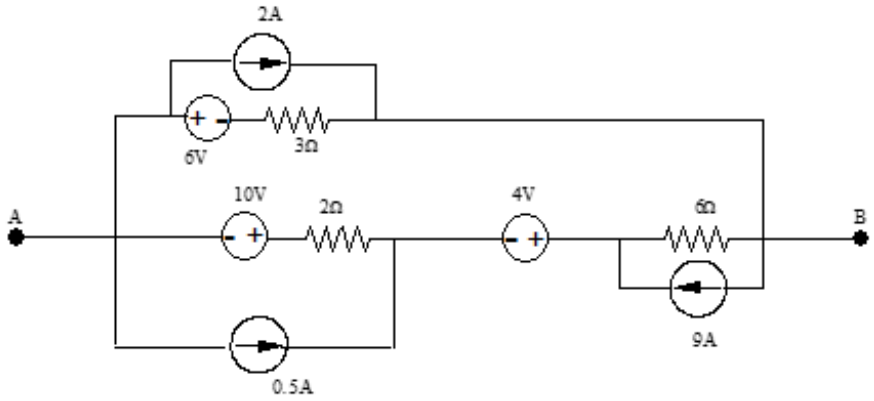

Figure 1A

B) For the circuit shown in Fig 1B, using network reduction techniques, determine the current through the 10 Ω resistor. (10)

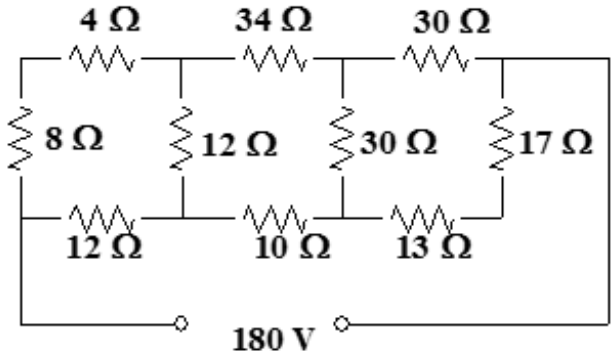

Figure 1B

2) A) For the circuit shown below, apply mesh analysis to determine the current ix. Also determine,(i) power supplied by 100V battery and (ii) power dissipated by 3Ω resistor. (9)

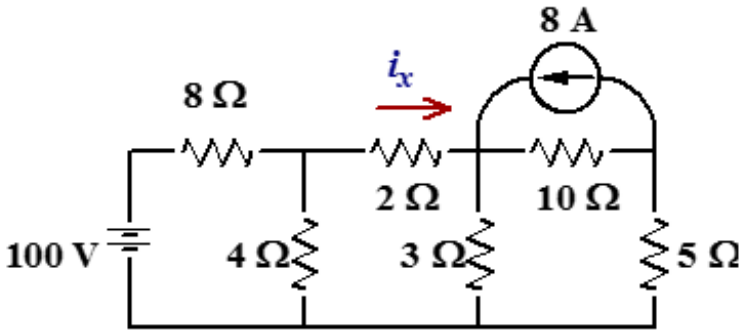

Figure 2A

B) Using Node voltage analysis find (i) the current through 10 resistor (ii) the voltage v across 4Ω resistor, in the circuit shown in Fig 2B. (11)

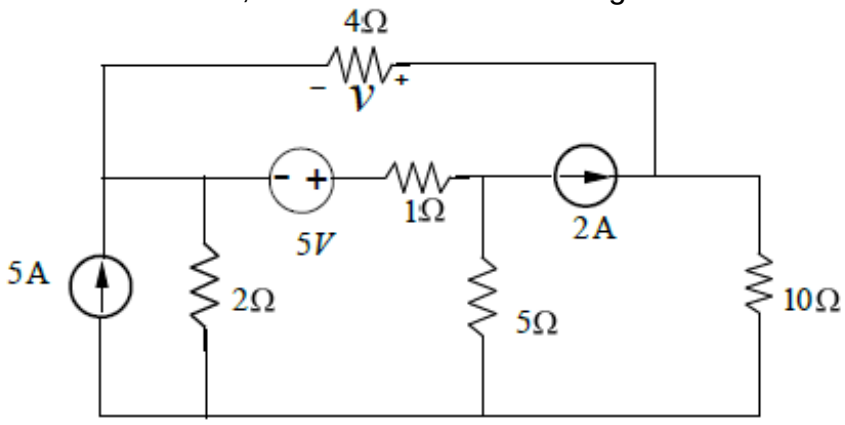

Figure 2B

3) A 100 V, 50 Hz single phase AC voltage is applied across the circuit shown in Fig. 3A. Find (i) the current through each branch and total current in the circuit (ii) power dissipated by 3+4j impedance (iii) Power delivered by the source (iv) draw the phasor diagram. (12)

A)

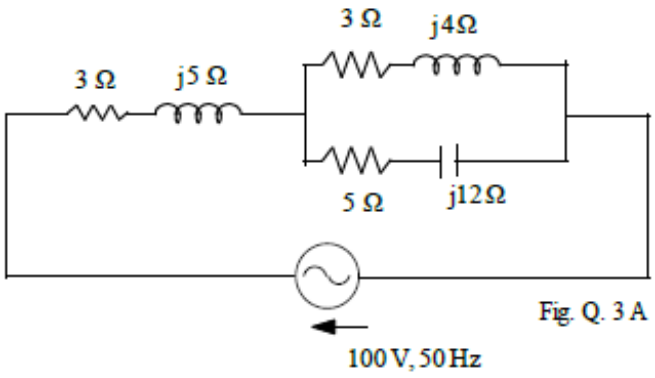

Fig. Q. 3 A

B) Find active power, reactive power and apparent power for the circuit diagram shown in Fig. 3A. Also, draw the power triangle. Determine the value of capacitor to be connected in parallel with the given circuit to improve the power factor to 0.9 leading. (8)

4) (13)

A) Three impedances Z_{RY} = (10 + j7) Ω, Z_{YB}= (8 - j9) Ω and Z_{BR} = (7 + j6) Ω are connected in delta across a balanced 3 phase, 3 wire, 400 V supply. Find the line currents, and also determine the readings of the two watt meters, whose current coils are inserted in lines Y and B. Assume RYB phase sequence. Draw the phasor diagram.

B) Using instantaneous values prove that 2 watt meters are needed for the three phase power measurements for a Star connected load. Draw the circuit diagram, labelling all currents and voltages. (7)

5) With a neat block diagram, explain a simple electrical power system network. Clearly mark all important ratings associated with generation, transmission and distribution. (6)

A)

B) A half-wave rectifier has a load resistance of 3.5 kΩ. If the diode forward resistance is 10Ω and transformer secondary peak voltage is 15V at 50 Hz, determine: (i) rms and average values of voltage (ii) rectification efficiency. Determine the value of capacitance required to limit the ripple factor to less than 1%. (8)

C) With a neat block diagram, explain the working of a simple D.C power supply. Clearly bring out the role of each component used, along with relevant waveforms at every stage. (6)

6) Sketch the circuit of a bridge rectifier and describe its operation. Starting from fundamentals, derive expressions for rectification efficiency of a full wave bridge rectifier. Draw the output voltage waveform of a rectifier with a capacitor filter. Mark all salient points on the waveform. (12)

A)

B) Derive the expression for dynamic resistance of a diode. (8)
A Silicon diode has a saturation current of 1pA at 20 °C. Determine (a) Diode bias voltage when diode current is 3mA (b) Diode bias current when the temperature changes to 1000C, for the same bias voltage? (n=2 for silicon)

7) A full wave single phase rectifier consists of two diodes, each having an internal resistance of 500 Ω. The circuit feeds a pure resistive load of 2000 Ω. The secondary voltage with reference to centre tap is 280V. Assuming supply frequency of 60 Hz, Calculate (10)

A)

i) Dc output voltage
ii) RMS current
iii) Rectification Efficiency
iv) Percentage regulation

Hence, determine the value of the filter capacitor to limit the ripple to less than 1%

B) (10)

Sketch and briefly explain the common – emitter output characteristics.
Define α_{dc} and β_{dc} for a transistor.
Derive the relationship between α_{dc} and β_{dc}. Hence Calculate the values of I_C, I_E and β_{dc} for a transistor with $\alpha_{dc} = 0.98$ and $I_B = 120\ \mu A$.

8) A) Design a Zener Diode voltage regulator to meet the following requirements: (8)
Unregulated dc input voltage V_i = 13 - 17 V
Load current = 0 - 10 mA
Regulated output voltage = 10 V
Minimum Zener current = 5 mA
Maximum power dissipation in Zener, PZ_{max} = 500 mW
Draw the circuit diagram showing the components and its values.

B) Explain the principle of electronic communication using a block diagram. (12)

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