Question Paper

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

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END SEMESTER THEORY EXAMINATION NOVEMBER/DECEMBER 2019
II SEMESTER B.Sc.(Applied sciences) in engg.
Elements Of Electrical and Electronics Engg. [IEE 121]

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

Answer 5 out of 8 questions.

1) A) Using network reduction techniques, for the circuit shown in figure 1A, determine the power supplied by the 6V source. (10)

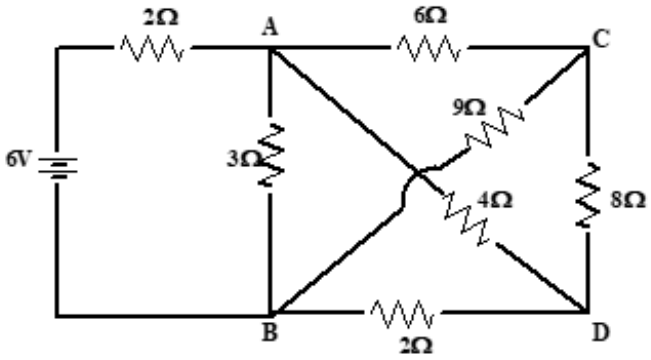

Figure 1

B) For the circuit shown in the figure 1B, determine the power dissipated by 10 Ω resistor. (Use Mesh Analysis) (10)

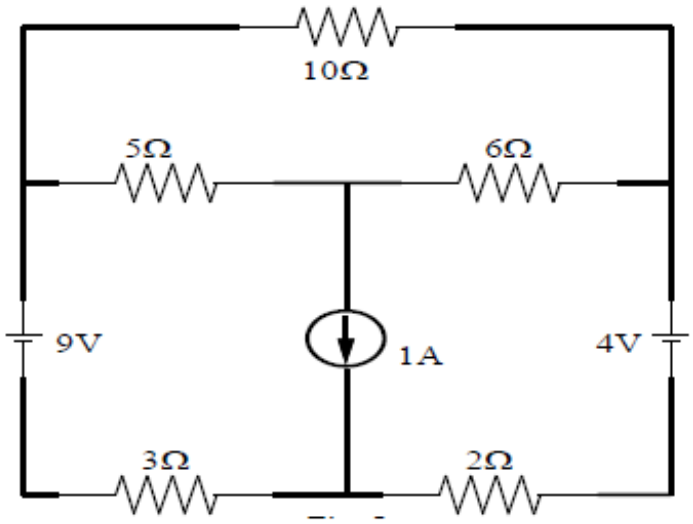

Figure 1B

2) A) For the circuit shown in figure 2A, use Node Voltage Analysis to calculate the power dissipated by the 10 Ω resistor. (13)

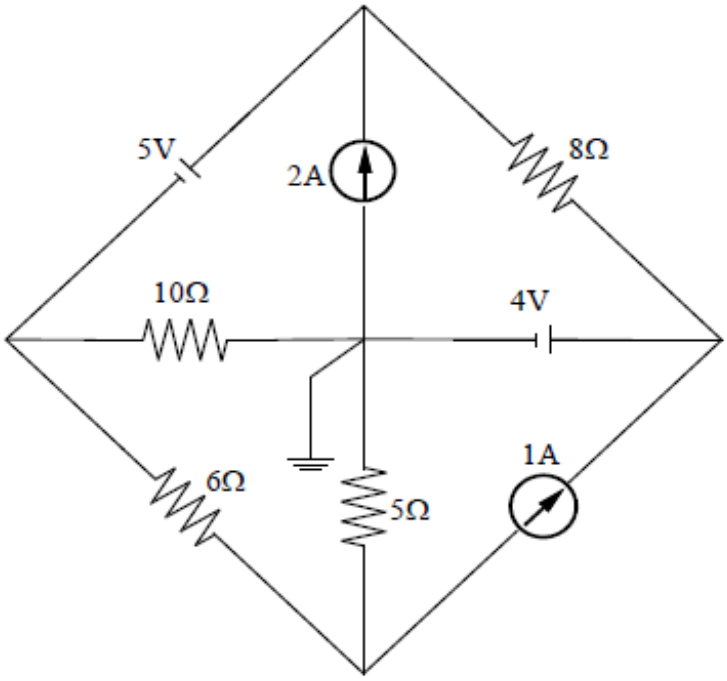

Figure 2A

B) Prove that for a R-L load connected to single phase AC supply, the active power dissipated is $V.\ 1.\ \cos\theta$ where θ is the impedance angle. (7)

3) In a series parallel circuit the two parallel branches Z_a & Z_b are in series with Z_c as shown in Figure 3A. The impedances are Z_a = (5+j20) Ω and Z_c= (5+j5) Ω. When 220V AC supply is applied to the circuit, the total power input is 3.25kW and current is 20A. (Assume that the net power factor is lagging in nature.) (12)

A) Find (i) Impedance Z_b (ii) Current through Z_b

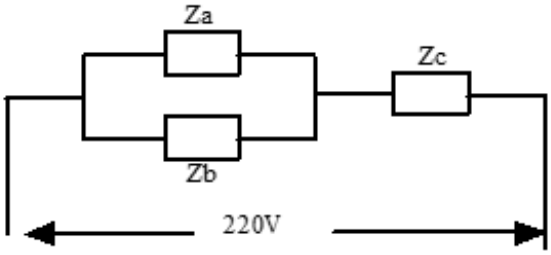

Figure 3A

B) The following loads are connected in parallel, across a single phase 110V, 50 Hz supply. (8)

- 400 W, 0.8 p.f lagging
- 540 VAr, 0.45 p.f. lagging
- 100 VA, UPF

Draw the equivalent power triangle, and hence determine the value of capacitance required to improve the power factor to 0.95 lagging.

4) A 3 phase, 400 V, 50 Hz, RYB, 3 wire supply feeds an unbalanced Y-connected load. The branch impedances of the loads are: Z_R = (4 + j3) Ω, (13)

A)

$Z_Y = (6 + j8)\ \Omega$, $Z_B = (5 + j12)\ \Omega$. Using Mesh Analysis, find the line currents, the neutral displacement voltage and the readings of the 2 watt-meters connected to measure the 3 phase power with the current coils of the same inserted in the R and Y lines respectively. Sketch the Phasor diagram representing load voltages and currents.

B) A 3 phase, 415 V, 50 Hz, RYB system supplies to three equal impedances of values (12 + j5) Ω each connected in delta. Determine the line and phase currents, total active power and the readings of the 2 watt-meters connected to measure the 3 phase power. (7)

5) A) With a neat block diagram and relevant equations, explain the working of a single phase transformer. Also list the various losses associated with a transformer. (10)

B) Plot and briefly explain the effect of temperature variation on the I-V characteristics of a Silicon diode. Mark all salient points on the plot. Hence, derive the expression for dynamic resistance of a diode. (10)

6) A) **Starting from the fundamentals**, for a Half Wave rectifier, derive the expressions for the following (14)

- Rectification efficiency
- Ripple factor

Explain, with waveforms, how a capacitor filter reduces the ripple in a half wave rectifier output.

B) In a FWR with a capacitor filter, the load current from the circuit operating from 230V, 50Hz supply is 10 mA. Estimate the value of capacitor required to keep the ripple factor to less than 1%. (6)

7) A) In a Full wave bridge rectifier, the transformer secondary voltage is 100 sin ωt. The forward resistance of each diode is 25 Ω and load resistance is 950 Ω. Calculate (10)

a) Dc output voltage
b) Ripple Factor
c) Rectification Efficiency
d) PIV across non conducting diode
e) Percentage regulation
f) Peak Load Current

B) Sketch and briefly explain the common - emitter output characteristics. Define $\alpha_{dc}\ and\ \beta_{dc}\ for\ a\ transistor$. Derive the relationship between $\alpha_{dc}\ and\ \beta_{dc}$ Hence Calculate the values of I_C, I_E and β_{dc} for a transistor with $\alpha_{dc} = 0.98$ and $I_B = 120\ \mu A$. (10)

8) A) With a neat circuit diagram, explain the working of a RC coupled amplifier. (10)

B) Draw the block diagram of digital communication system and explain the function of each block. (10)

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