Nirma University

Institute of Technology

Semester End Examination (LR/RPR), May - 2024

Bachelor of Science (Computer Science and Engineering), Semester-I
B. Tech. in CL / CH / ME / EE / CSE, Semester-II
B. Tech. in EC / EI / CSE, Semester-I
Int. B. Tech. (CSE) - MBA, Semester-II
1EE801 Electrical Science

Roll / Exam No.		Supervisor's initial with date	

Time: 3 Hours | Max. Marks: 100

Instructions:
1. Attempt all questions.
2. Use section-wise separate answer book.
3. Figures to right indicate full marks.
4. Draw neat sketches wherever necessary.
5. Assume suitable additional data, if required.
6. All symbols and notations have their usual meaning.

SECTION - A

Q.1 (A) CO1 BL5 Determine the equivalent resistance and the current drawn from 20 V source in the network shown in Fig. 1. [6]

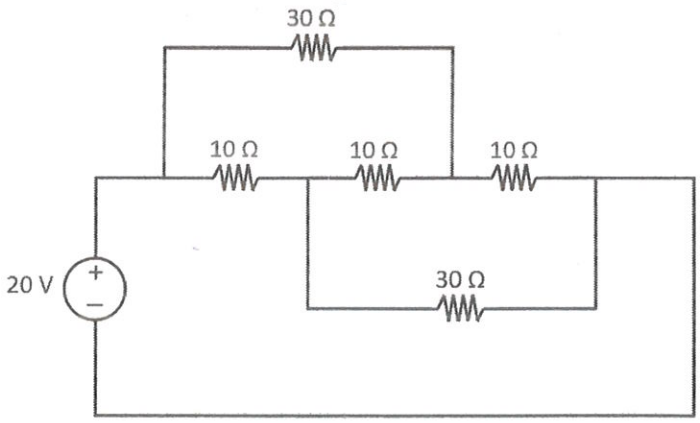

Fig. 1

Q.1 (B) CO1 BL5 Determine the values of V_1 and V_2 in the circuit shown in Fig. 2 using nodal analysis. [6]

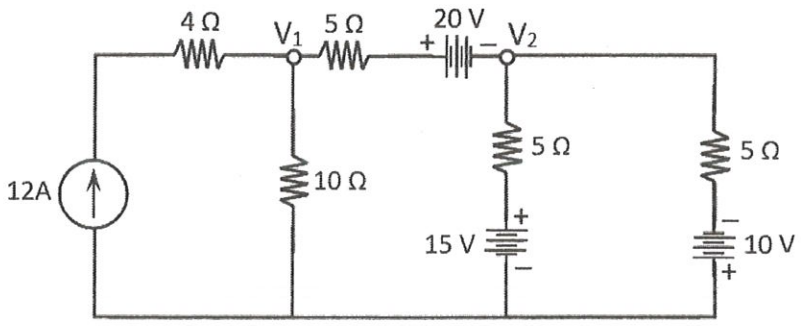

Fig. 2

Q.1 (C) CO1 BL5 Determine the equivalent capacitance for the circuit shown in Fig. 3 between the terminal pair A and B. [4]

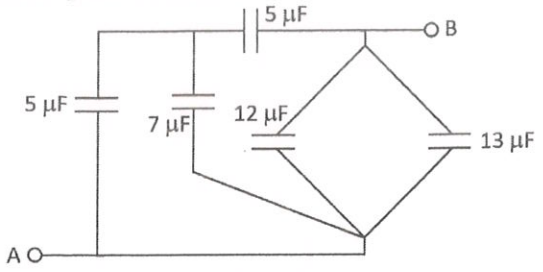

Fig. 3

Q.2 (A) CO1 BL5 Find the current through 20 Ω resistor in the network shown in Fig.4 [6]

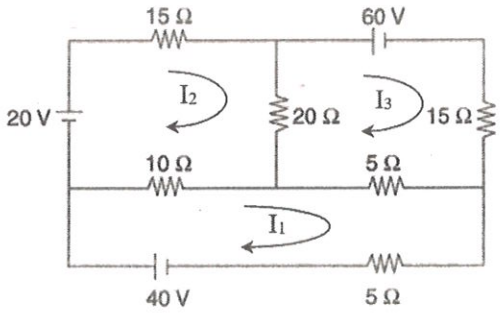

Fig. 4

Q.2 (B) CO1 BL5 Determine the current through 20 ohm resistor using superposition theorem for the network shown in Fig. 5. [6]

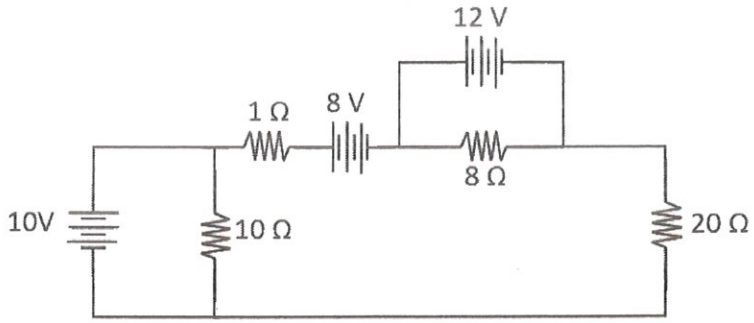

Fig. 5

Q.2 (C) CO1 BL3 Define time constant of a RC circuit. Evaluate the charging voltage and charging current during the charging of a capacitor at 1τ, 2τ, 3τ, 4τ and 5τ. Plot voltage and current variations. [4]

Q.3 (A) CO2 BL2 What are the factors that govern the reluctance of a magnetic circuit? Illustrate with neat sketch the concept of series and parallel magnetic circuits. [6]

Q.3 (B) CO2 BL5 A series RC circuit consumes a power of 7000 W when connected to 250 V, 50 Hz supply. The voltage across the resistor is 130 V. Calculate (i) resistance (ii) current (iii) power factor (iv) capacitance (v) impedance (vi) write the equations for v(t) and i(t). [6]

Q.3 (C) CO2 BL5 In a RLC series circuit, R = 5 Ω, L = 2 mH, and C = 1 μF. Determine (i) resonant frequency (ii) voltage across resistor (iii) voltage across inductor (iv) voltage across capacitor (v) quality factor (vi) comment on the results obtained. [6]

SECTION – B

Q.4 (A) CO2 BL5 Two circuits with impedances of $Z_1 = (20 + j20)\ \Omega$ and $Z_2 = (10 - j10)\ \Omega$ are connected in parallel. If the supply current is 10 A, Determine: (i) the power dissipated in each branch (ii) assuming the supply current of 10 A at reference, determine the source voltage in its rectangular and polar form. [6]

Q.4 (B) CO2 BL5 When the three identical star-connected coils are supplied with 440V, 50 Hz, 3-phase supply, the 1-phase wattmeter whose current coil is connected in line R and pressure coil across the phase R and neutral reads 6 kW and the ammeter connected in R-phase reads 30 Amp. Assuming RYB phase sequence. find: [6]

i) the power factor of the circuit
ii) resistance of the coil
iii) reactance of the coil
iv) reactive power of 3-phase load
v) apparent power of 3-phase load
vi) Comment on the results obtained

Q.4 (C) CO2 BL5 The input power to a three-phase motor was measured by two wattmeter method. The readings were 10.4 kW and -3.4 kW and the voltage was 400 V. Calculate the power factor and the line current. [4]

Q.5 (A) CO3 BL5 A 40-0-40 V (rms) centre tapped transformer is used with a full wave rectifier circuit having an internal resistance of diode : 1 Ω. If the load resistance is 19 Ω, evaluate: (i) Transformer secondary peak voltage (ii) DC output current (iii) DC output power (iv) AC input power (v) rectifier efficiency (vi) voltage across each diode. [6]

Q.5 (B) CO3 BL2 Explain, how a bipolar junction transistor works as an amplifier? [4]

Q.5 (C) CO3 BL2 Enumerate various special purpose diodes. Explain the construction, operating principle and applications of any one type of diode. [6]

Q.6 (A) CO4 BL6 Design the simplest possible logic circuit that implements the output of the logic circuit shown in Fig. 6 with necessary equations and truth table. [6]

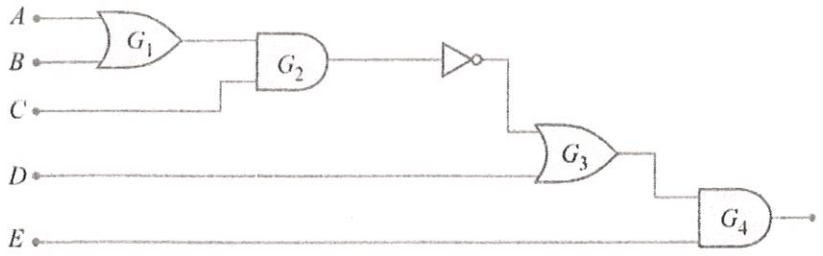

Fig. 6

Q.6 (B) CO4 BL3 Show that any logic circuit can be designed using a NOR gate and NAND gate. [6]

Q.6 (C) CO4 BL3 Convert the following: [6]

i) $(B2F)_{16}$ to octal,
ii) $(24.6)_8$ to decimal and
iii) $(76)_{10}$ to octal number.

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Supplementary Examination (SPE), August - 2023

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1EE801 Electrical Science

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SECTION - A

Q.1 (A) CO1 BL3 Make use of mesh analysis to find the current through 4 Ω resistor in the network shown in Fig. 1. [6]

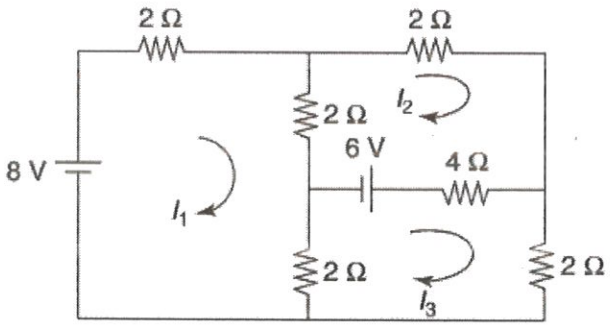

Fig. 1

(B) CO1 BL3 Calculate the current through the 5 Ω resistor for the network shown in Fig. 2 using nodal analysis. [6]

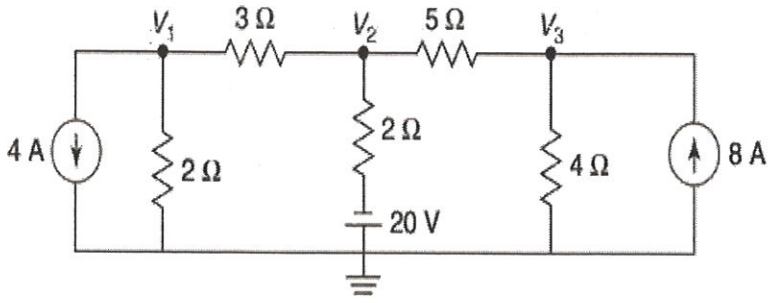

Fig. 2

(C) CO1 BL2 Explain Superposition theorem and discuss the steps involved to solve the circuit. [4]

Q.2 (A) CO1 BL2 Discuss electrolytic capacitor. Also, derive the expression for energy stored in capacitor. [4]

(B) CO1 BL3 Use star delta transformation to determine the equivalent resistance between terminal pair A-B of the network shown in Fig. 3. [6]

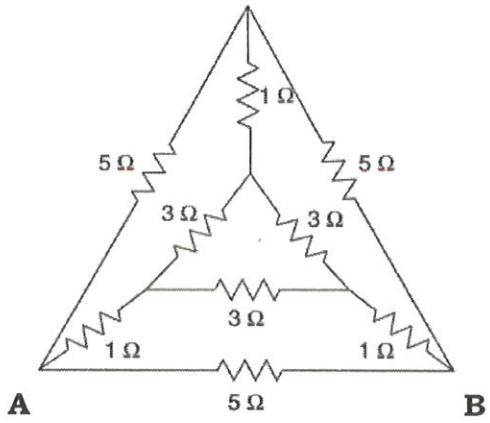

Fig. 3

(C) CO1 BL3 Use Thevenin's theorem to evaluate the current through 2 Ω resistor of the network shown in Fig. 4. [6]

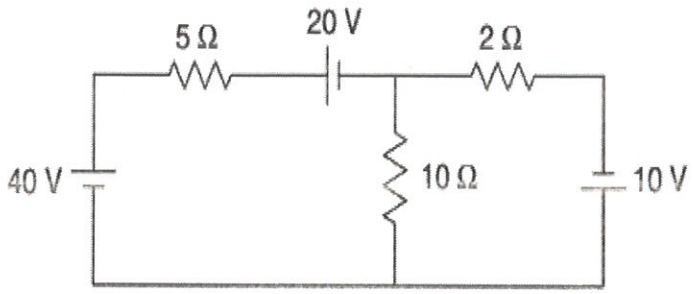

Fig. 4

Q.3 (A) CO2 BL2 What do you mean by active power, reactive power and apparent power? Also, derive the relationship between them. [6]

(B) CO2 BL5 A coil having resistance of 10 Ω and inductance of 21 H is connected across a d.c. voltage of 150 V. Calculate: (a) the value of current at 0.5 sec. after switching on the supply, (b) during the decay of current the time it would take to reach a value of 8 A from its maximum value after switching off the supply [6]

(C) CO2 BL4 A load of 22 kW operates at 0.8 lagging power factor when connected to a 240 V, single-phase, 50 Hz source. Determine (a) current in the load, (b) power factor angle, (c) impedance, (d) resistance of load, (e) reactance of load, (f) voltage and current equations. [6]

Section B

Q.4 (A) CO2 BL2 What are the advantages of three phase system over single-phase system? [4]

(B) CO2 BL5 A three-phase 500 V motor load has a power factor of 0.4 lagging. Two wattmeters connected to measure the power show the input to be 30 kW. Calculate the reading on each wattmeter. [4]

(C) CO2 BL5 A symmetrical three phase, 400 volts system supplies a balanced delta connected load. The current in each delta branch is 30 A and its phase angle is 37° lagging with respect to voltage across each branch. Find the line current and total power. Draw the phasor diagram showing all currents and voltages. [6]

Q.5 (A) CO3 BL5 A crystal diode having internal resistance $r_f = 20\,\Omega$ is used for half wave rectification. If the applied voltage $v = 60 \sin \omega t$ and the load resistance R_L = 800 Ω. Evaluate (i) maximum current (ii) DC current (iii) AC power input (iv) DC power output (v) DC output voltage (vi) efficiency of rectification. [6]

(B) CO3 BL2 Write short notes on special purpose diodes. [6]

(C) CO3 BL2 Explain the working of NPN transistor as a switch and an amplifier. [6]

Q.6 (A) CO4 BL3 Why NAND gate is called as universal gate? Demonstrate the following three gates with the help of NAND gates: [6]

i) AND gate
ii) OR gate
iii) NOT gate

(B) CO4 BL4 Simplify the following Boolean expression to a minimum number of literals and draw the logic circuit and write their truth tables. [6]

$Y = \bar{A}\bar{B}C + A\bar{B}C + AB\bar{C} + ABC$; $Y = A\bar{B}D + A\bar{B}\bar{D}$

(C) CO4 BL4 Develop the logic circuit diagram and truth table of a full adder using two half adders. [6]

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Supplementary Examination (SPE), February - 2024

B. Tech. in CH / EC / CSE / EI Engineering, Semester-I

Bachelor of Science (Computer Science and Engineering), Semester-I

1EE801 Electrical Science

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SECTION - A

Q.1 (A) CO1 BL5 Apply suitable method to determine the current I through 2 Ω resistor in the circuit shown in Fig.1. [6]

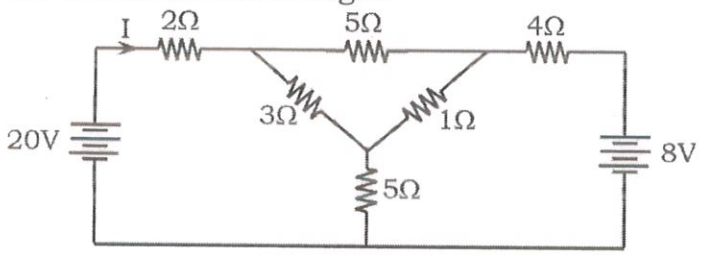

Fig. 1

Q.1 (B) CO1 BL5 Apply nodal method to determine the current through 4 Ω resistor in the circuit shown in Fig.2 [6]

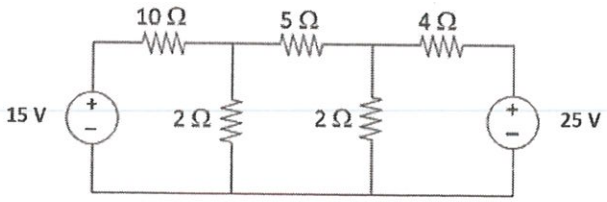

Fig. 2

Q.1 (C) CO1 BL5 Deduce an expression for charging voltage of a capacitor in series RC circuit when supplied by a DC source voltage. [4]

Q.2 (A) CO1 BL2 State and explain Thevenin's theorem using illustrative example. [6]

Q.2 (B) CO1 BL5 Determine the power dissipation in 4 Ω resistor of the circuit shown in Fig. 3 using mesh analysis. [6]

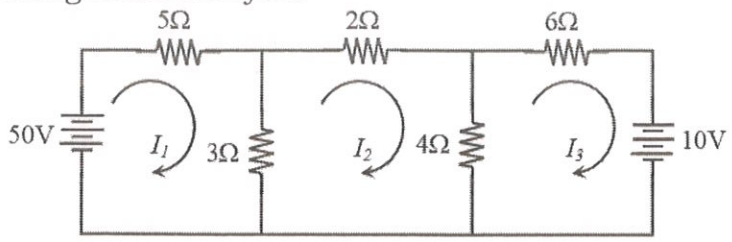

Fig.3

Q.2 (C) CO1 BL5 Two capacitors have capacitances of 6 μF and 10 μF respectively. Find the total capacitance when they are connected in (a) parallel and in (b) series. When the above two capacitances are connected in series across a 200 V supply, find the potential difference across each capacitor and the charge on each capacitor. [4]

Q.3 (A) CO2 BL5 Deduce the equation for decay of current in R-L series circuit. Discuss the role of time constant. [6]

Q.3 (B) CO2 BL2 Define the following terms with respect to magnetic circuit. [6]

i) Magneto-motive force
ii) Magnetic field strength
iii) Reluctance
iv) Permeability
v) Mean length of magnetic path
vi) Leakage flux

Q.3 (C) CO2 BL5 A resistance of 40 Ω and an inductor of 70 mH are connected in parallel across a 200 V, 50 Hz supply. Evaluate: (i) current drawn from the supply (ii) apparent power and (iii) reactive power (iv) impedance (v) power factor (vi) phase angle between voltage and current [6]

SECTION – B

Q.4 (A) CO2 BL5 A star connected load has an impedance of (3 + j 4) Ω in each phase and is connected across a balanced three phase delta connected alternator having line voltage of 200 volts. Calculate the (i) line current (ii) phase voltage across the alternator (iii) phase voltage across the load (iv) impedance per phase (v) average power (vi) phase angle. [6]

Q.4 (B) CO2 BL5 Evaluate the RMS value, average value and form factor of the waveform shown in Fig. 4. [6]

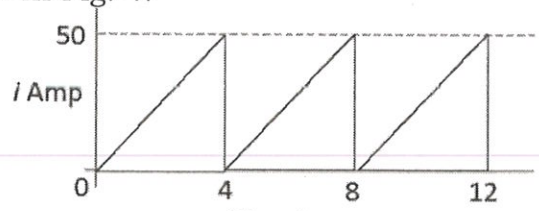

Fig. 4

Q.4 (C) CO2 BL2 Discuss few merits of three phase systems. [4]

Q.5 (A) CO3 BL2 Appraise the phenomenon of transistor as an amplifier using suitable example. [6]

Q.5 (B) CO3 BL5 An AC supply of 230 V is applied to a half-wave rectifier circuit through a transformer of turns ratio 20:1. If the load resistance is 1000 Ω and internal resistance of diode used for half-wave rectification is 10 Ω. Determine: (i) dc output voltage (ii) ac power input (iii) dc output power (iv) dc output current (v) rectification efficiency (vi) comment on the results obtained. [6]

Q.5 (C) CO3 BL5 Design a full adder circuit and discuss its operation in detail. [4]

Q.6 (A) CO4 BL3 [6]

i) Determine the octal value of the binary number 10010111.

ii) Add 54_{10} with 28_{10} using binary numbers.

iii) Determine the MSB and the LSB of 80_{10} when expressed as an Octal number.

Q.6 (B) CO4 BL2 Describe the EX-OR gate. Specify its symbol and write its truth table. Develop a two input EX-OR gate using only NAND gates. [6]

Q.6 (C) CO4 BL6 Design the simplest possible logic diagram that implements the output of the logic diagram shown in Fig. 5 with necessary equations and truth table. [6]

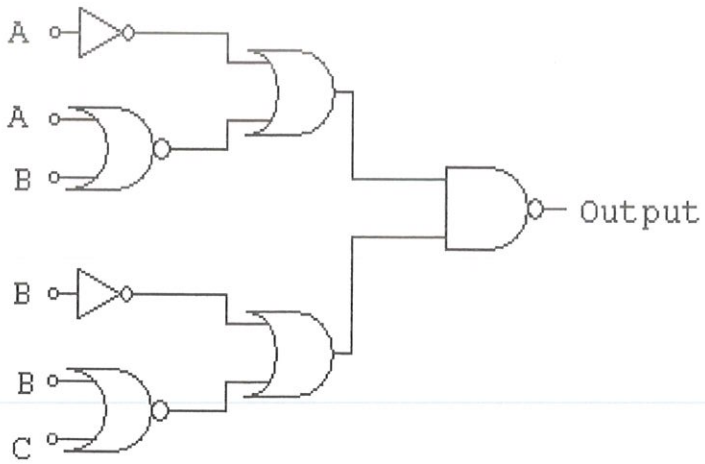

Fig. 5

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Supplementary Examination (SPE), July - 2024

B. Tech. in CL / ME /EE /CSE, Semester-II

Int. B. Tech. (CSE) - MBA, Semester-II

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SECTION - A

Q.1 (A) CO1 BL5 Determine the value of all resistances in the network shown in Fig. 1, if power dissipation in R_2 and R_4 are 75 W and 30 W respectively. [6]

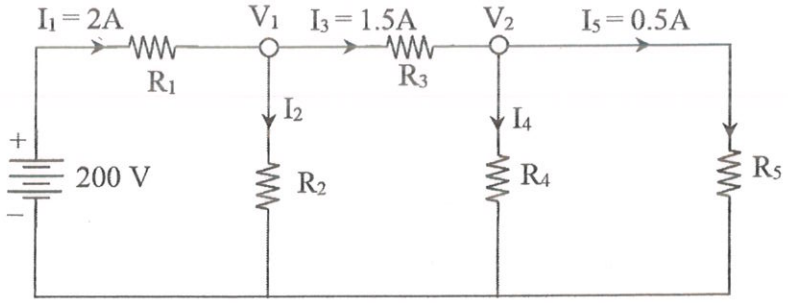

Fig. 1

Q.1 (B) CO1 BL3 Apply mesh analysis to determine the current through 4 Ω resistor in the circuit shown in Fig. 2. [6]

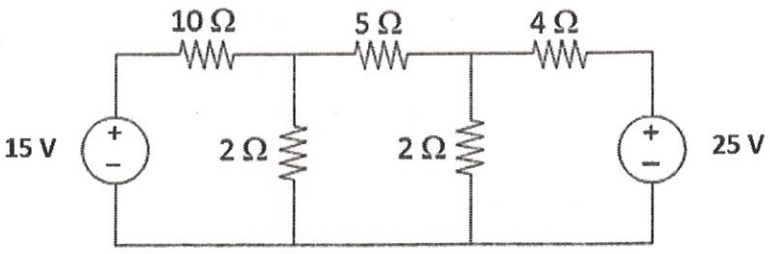

Fig. 2

Q.1 (C) CO1 BL5 In a RC series circuit excited by a DC voltage source, determine the percentage value of capacitor discharging current, capacitor discharging voltage and voltage across resistor at 1τ, 2τ, 3τ, 4τ and 5τ. Plot all these parameters. (τ - time constant). [4]

Q.2 (A) CO1 BL3 Apply star-delta transformation to find the equivalent resistance between the terminal pair A-B for the circuit shown in Fig. 3. [6]

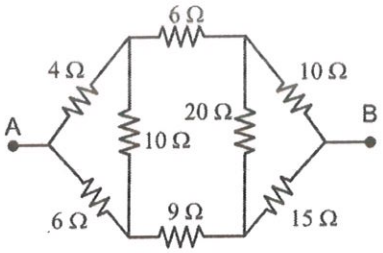

Fig. 3

Q.2 (B) CO1 BL5 Determine Norton's equivalent circuit across the terminal pair a-b for the circuit shown in Fig. 4. Find the current through the load resistance, if $R_L = 4\Omega$. [6]

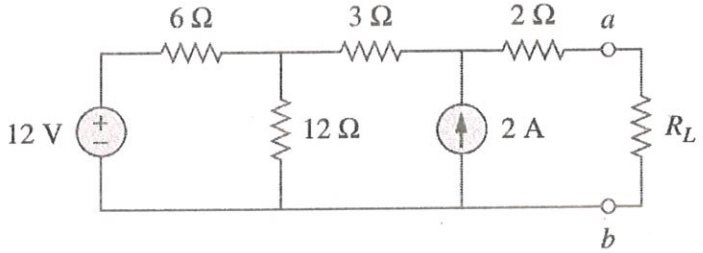

Fig. 4

Q.2 (C) CO1 BL5 Two capacitors A and B are connected in series across a 100 V supply and it is observed that the potential difference across them are 60 V and 40 V respectively. A capacitor of 2 μF capacitance is now connected in parallel with A and the potential difference across B rises to 90 volts. Estimate the capacitance of A and B in microfarads. [4]

Q.3 (A) CO2 BL2 Explain with a neat sketch the concept of magnetic circuit. Tabulate the analogous parameters of magnetic circuit with the parameters of electric circuit. [6]

Q.3 (B) CO2 BL5 If the voltage $v(t) = V_m \sin\omega t$ is applied to a single-phase series RC circuit, prove that the current drawn is expressed as: $i(t) = I_m \sin(\omega t+\phi)$. Draw the voltage, current and power waveforms. [6]

Q.3 (C) CO2 BL5 In a RLC series circuit, R = 2 Ω, L = 1 mH, and C = 0.4 μF. Determine (i) resonant frequency (ii) voltage across resistor (iii) voltage across inductor (iv) voltage across capacitor (v) quality factor (vi) comment on the results obtained. [6]

SECTION – B

Q.4 (A) CO2 BL5 Two circuits with impedances of $Z_1 = (10 + j15)\ \Omega$ and $Z_2 = (6 - j8)\ \Omega$ are connected in parallel. If the supply current is 20 A, Determine: (i) the power dissipated in each branch (ii) assuming the supply current of 20 A at reference, determine the source voltage in its rectangular and polar form. [6]

Q.4 (B) CO2 BL5 Three equal resistances connected in star across a three phase balanced supply consume 2000 watts. If the same three resistors were reconnected in delta across the same supply, determine the power consumed. Comment on the results obtained. [6]

Q.4 (C) CO2 BL2 Explain the concept of phase sequence in voltages induced in a three phase generator. [4]

Q.5 (A) CO3 BL5 Determine the currents I_1, I_2 and I_3 for the network shown in Fig. 5. Assume silicon diodes and use simplified model. [6]

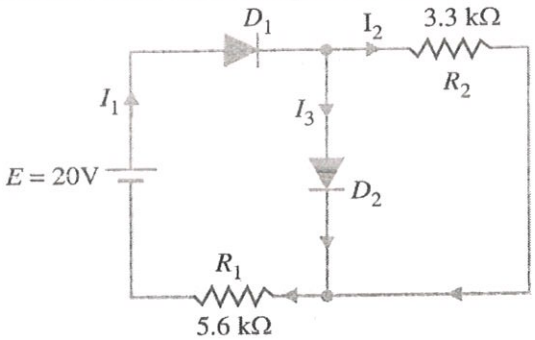

Fig. 5

Q.5 (B) CO3 BL2 Describe the construction and operating principle of a bipolar junction transistor. [6]

Q.5 (C) CO3 BL2 Enumerate various special purpose diodes. Explain the construction, operating principle and applications of any one type of diode. [4]

Q.6 (A) CO4 BL6 Design the simplest possible logic circuit that implements the output of the logic circuit shown in Fig. 6 with necessary equations and truth table. [6]

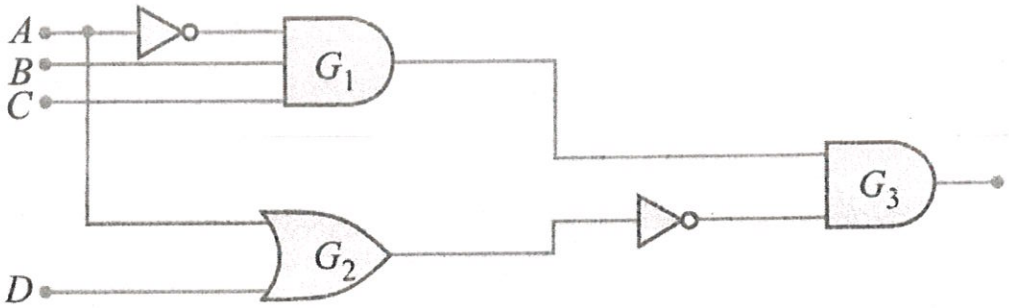

Fig. 6

Q.6 (B) CO4 BL5 Prove that when the AND product of two variables is inverted, this is equal to inverting each variable individually and then ORing them. [6]

Q.6 (C) CO4 BL3 i) Convert the following octal numbers into its binary equivalent. [6]
$(76)_8$, $(255)_8$, $(372)_8$

ii) What is the role of encoder and decoder in digital circuits?

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SECTION - A

Q.1 (A) CO1 BL3 Apply star delta transformation to find the equivalent resistance between the terminal pair a-b of the circuit as shown in Fig. 1. [6]

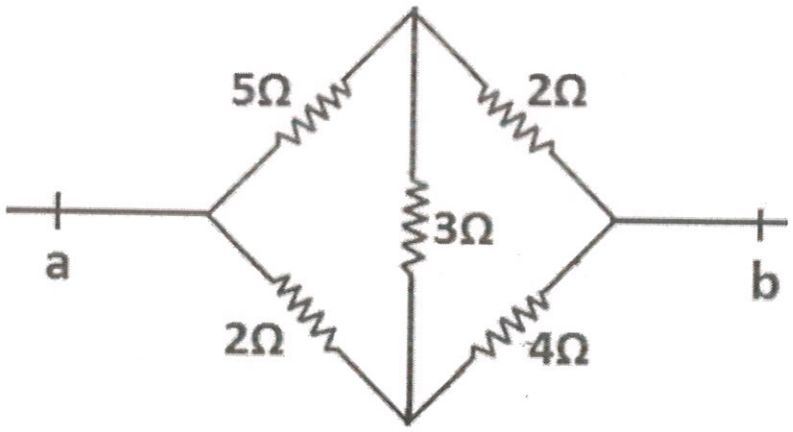


Fig. 1

Q.1 (B) CO1 BL5 Determine the current delivered by the source of 5 volts in the network shown in Fig. 2. [6]

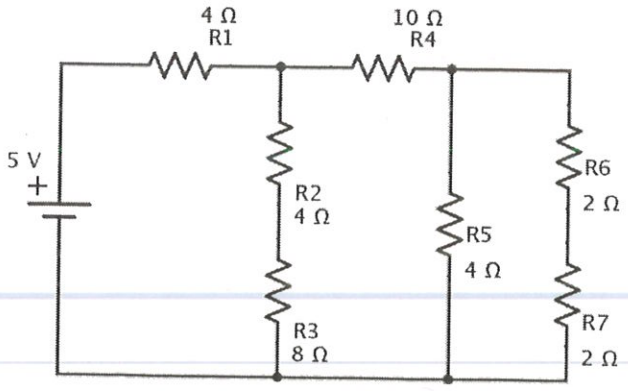


Fig. 2

Q.1 (C) CO1 BL5 Deduce the expression for current through a capacitor at any instant during the charging in an RC series circuit excited by a DC source. [4]

Q.2 (A) CO2 BL2 Explain the phenomenon of generation of alternating voltage. [4]

Q.2 (B) CO1 BL3 Apply Thevenin's theorem to find the current through 4 Ω resistor for the circuit shown in Fig. 3. [6]

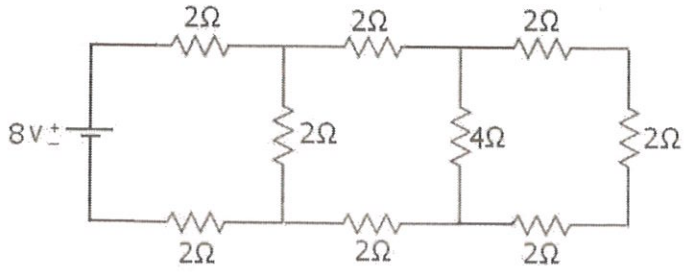


Fig. 3

Q.2 (C) CO1 BL3 Use mesh analysis to find the current through 10 Ω resistor in the network shown in Fig. 4. [6]

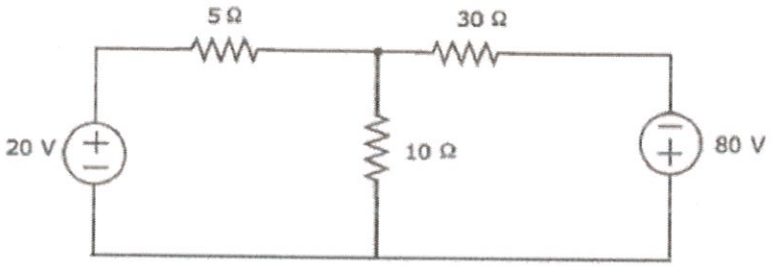
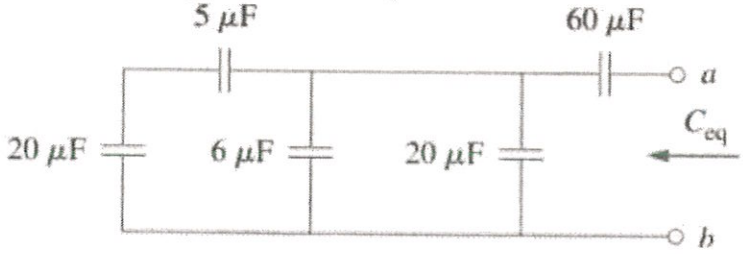


Fig. 4

Q.3 (A) CO2 BL2 Explain with neat sketch the leakage flux and fringing in a magnetic circuit. [6]

Q.3 (B) CO2 BL5 Derive an expression for two series connected coupled coils when the fluxes assist each other. [6]

Q.3 (C) CO1 BL5 Find the equivalent capacitance C_{eq} as seen from terminal pair a-b. [6]



SECTION – B

Q.4 (A) CO2 BL2 List few merits of three phase system over single-phase system. [4]

Q.4 (B) CO2 BL2 Define the following terms with reference to alternating current: i) instantaneous value ii) maximum value iii) average value iv) time period. [4]

Q.4 (C) CO2 BL5 A 3-phase load consists of three star connected similar resistances, each of resistance of 100 Ω. The supply is 400 V, 50 Hz. Calculate (i) line current (ii) total power consumed. [6]
If the frequency of input voltage is changed from 50 Hz to 60 Hz, what is its effect on the line current and the total power consumed.

Q.5 (A) CO3 BL2 Elucidate the working of a PN junction diode. Draw and explain its forward and reverse characteristics. [6]

Q.5 (B) CO3 BL2 Explain the working of a biased positive clipper and biased negative clipper. [6]

Q.5 (C) CO3 BL2 Illustrate with neat sketch the working of half wave bridge rectifier circuit and draw its input and output waveforms. [6]

Q.6 (A) CO4 BL2 Describe the following number systems used in digital electronics. [6]
i) Decimal number system
ii) Binary number system
iii) Octal number system

Q.6 (B) CO4 BL2 Give reasons, why digital circuits are preferred over analog circuits? [6]

Q.6 (C) CO4 BL3 Solve the following Boolean expressions: [6]
i) $Y = A + \bar{A}.B$
ii) $Y = A \cdot B + A \cdot \bar{B} + B \cdot C$
iii) $Y = A \cdot B + A \cdot B \cdot C + A \cdot B \cdot \bar{C}$

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Nirma University

Institute of Technology

Semester End Examination (IR/RPR), April - 2025

B. Tech. in All Programmes, Semester - I / II

Int. B. Tech. (CSE) - MBA, Semester - I / II

Bachelor of Science (CSE), Semester - I

1EE801CC22 / 1EE801 Electrical Science

Roll / Exam No. | Supervisor's initial with date

Time: 3 Hours | Max. Marks: 100

Instructions:

1. Attempt all questions.
2. Use section-wise separate answer book.
3. Figures to right indicate full marks.
4. Draw neat sketches wherever necessary.
5. Assume suitable additional data, if required.
6. All symbols and notations have their usual meaning.

SECTION - A

Q.1 (A) CO1 BL5 For the given network shown in figure 1, determine the current through 6 Ω and 5 Ω resistance using mesh analysis. [6]

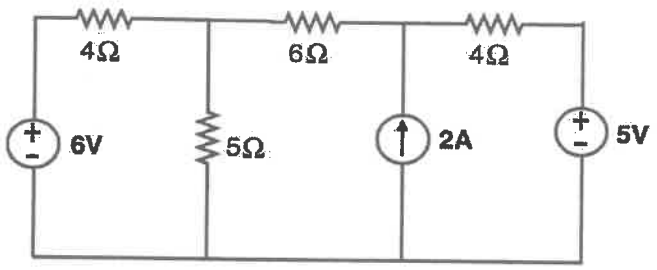

Fig. 1

Q.1 (B) CO1 BL5 Write the node voltage equations and determine currents in each branch for the network shown in Fig. 2. [6]

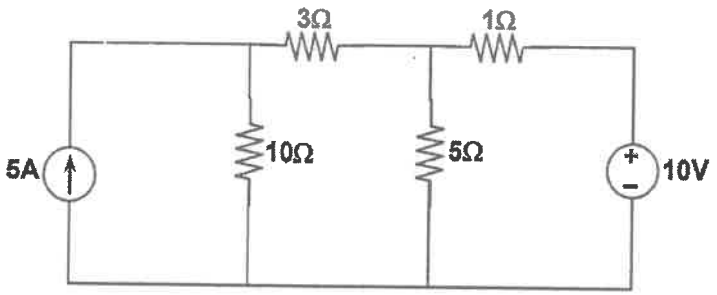

Fig. 2

Q.1 (C) CO1 BL2 Explain the concept of source transformation. [4]

Q.2 (A) CO1 BL5 Use star-delta transformation to determine the equivalent resistance between terminal pair A-B of the network shown in Fig. 3. [6]

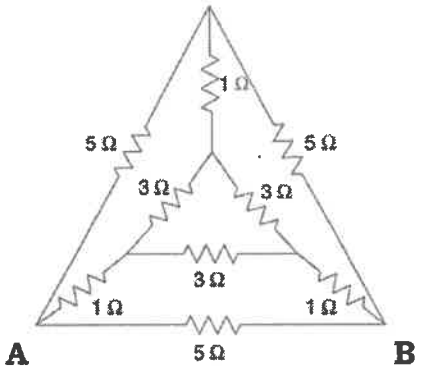

Fig. 3

Q.2 (B) CO1 BL5 Apply superposition theorem to estimate the current through 2Ω resistor in Fig. 4. [6]

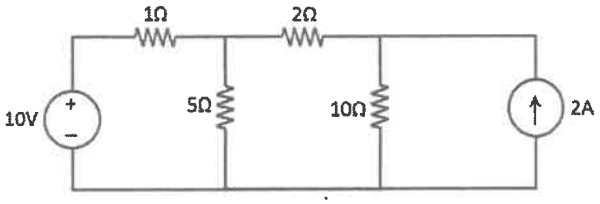

Fig.4

Q.2 (C) CO1 BL5 A 2μF capacitor is connected by closing a switch to a supply of 100V through a 100 MΩ series resistance. Evaluate: (i) Time constant (ii) Initial charging current (iii) Initial rate of rise of voltage across capacitor (iv) Voltage across the capacitor 6 sec after the switch has been closed. [4]

Q.3 (A) CO2 BL5 Deduce the expression for the frequency at which voltage across inductor and the voltage across capacitor becomes maximum in a RLC series circuit excited by a sinusoidal source with variable frequency. Supplement the arguments with suitable phasor diagram. Write any two properties of RLC series resonant circuit. [6]

Q.3 (B) CO2 BL5 Estimate the RMS value, average value and form factor of the periodic waveform shown in Fig. 6. [6]

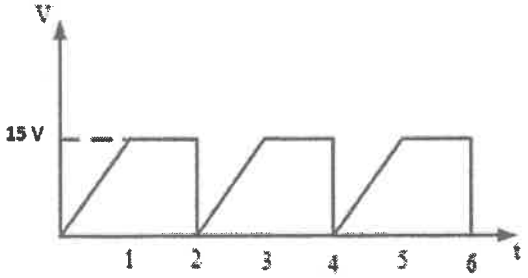

Fig. 6

Q.3 (C) CO2 BL5 A series RC circuit is excited by a sinusoidal source at a frequency of 'f' hertz. If the applied voltage is e(t) = V_m sin ωt. Derive the expression for current in trigonometric form. Support the mathematical expressions with suitable phasor diagram. Draw the impedance triangle, voltage triangle and power triangle. [6]

SECTION – B

Q.4 (A) CO2 BL5 If a three phase balanced delta connected load is supplied from a balanced three phase voltage source, derive the relationship between (i) line voltage and phase voltage (ii) line current and phase current. Draw the phasor diagram. [6]

Q.4 (B) CO2 BL5 Three similar coils each having a resistance of 4 Ω and an inductance of 0.03H are connected in star to a 415 V, 3-phase, 50Hz supply. Calculate the phase voltage, line voltage, phase current, line current, power factor and total power absorbed. [6]

Q.4 (C) CO2 BL5 A 3-phase induction motor load has a power factor of 0.4 lagging. Two wattmeters connected to measure power shows the input as 25 kW. Estimate the reading of each wattmeter. [4]

Q.5 (A) CO3 BL2 Draw and explain the working of a full wave bridge rectifier with suitable waveforms. [6]

Q.5 (B) CO3 BL5 The positive shunt clipper shown in Fig. 7 below has the input waveform as indicated. Determine the value of V_{out} for each of the input alternations. [6]

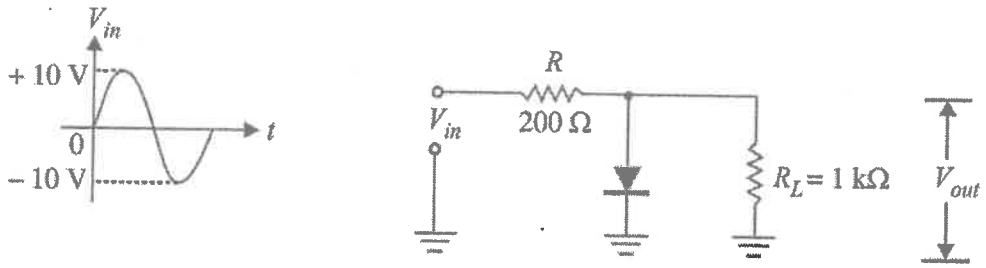

Fig. 7

Q.5 (C) CO3 BL2 Write comparison between analog circuit and digital circuits. [4]

Q.6 (A) CO4 BL2 Explain half adder circuit with neat sketch and its truth table. [6]

Q.6 (B) CO4 BL3 Solve the following boolean expressions and represent them using suitable logic circuit. [6]

i) $Y = A + \bar{A}.B$

ii) $Y = A \cdot B + A \cdot \bar{B} + B \cdot C$

iii) $Y = A \cdot B + A \cdot B \cdot C + A \cdot B \cdot \bar{C}$

Q.6 (C) CO4 BL3 [6]

i) Convert $(1111011011)_2$ into its equivalent hexadecimal number.

ii) Convert $(755)_8$ into its equivalent decimal number.

iii) Convert $(352)_{10}$ into its equivalent binary number.

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Nirma University

Institute of Technology

Semester End Examination (IR/RPR), December - 2024

B. Tech. in All Programmes / Int. B. Tech. (CSE) - MBA, Semester-I/II

Bachelor of Science (CSE), Semester-I

1EE801CC22 / 1EE801 Electrical Science

Roll / Exam No.		Supervisor's initial with date	

Time: 3 Hours | Max. Marks: 100

Instructions:

1. Attempt all questions.
2. Use section-wise separate answer book.
3. Figures to right indicate full marks.
4. Draw neat sketches wherever necessary.
5. Assume suitable additional data, if required.
6. All symbols and notations have their usual meaning.

SECTION - A

Q.1 (A) CO1 BL3 Apply nodal analysis to determine the current through 4 Ω resistor in the circuit shown in Fig.1 [6]

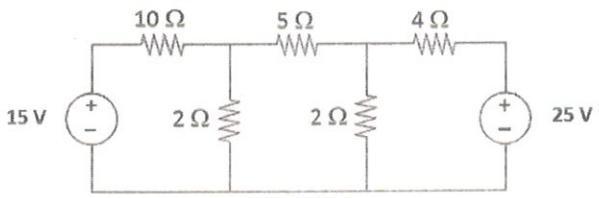

Fig. 1

Q.1 (B) CO1 BL5 Determine the power dissipation in 4 Ω resistor of the circuit shown in Fig. 2 using mesh analysis. [6]

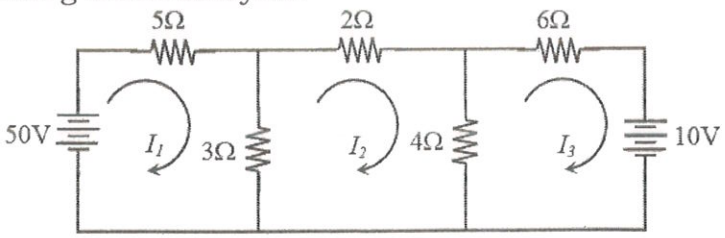

Fig. 2

Q.1 (C) CO1 BL5 A series R – C circuit is connected through a switch S to a dc supply of V volts. For such a circuit, deduce an expression for the variation of voltage across the capacitor plates when the capacitor is charging. [4]

Q.2 (A) CO1 BL5 Evaluate the current I in the circuit shown in Fig. 3 using star – delta transformation. [6]

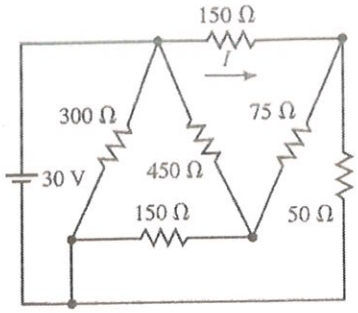

Fig. 3

Q.2 (B) CO1 BL5 Determine the current *Io* using superposition theorem for the network shown in Fig. 4. [6]

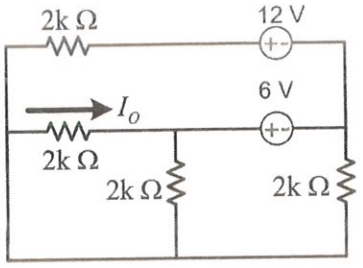

Fig. 4

Q.2 (C) CO1 BL5 A 2μF capacitor is charged to 600 V. If the capacitor is then discharged to 450V, estimate, how much energy has been left on the capacitor. [4]

Q.3 (A) CO2 BL5 Deduce the expression for equivalent inductance of two inductors connected in series for additive mutual coupling. [6]

Q.3 (B) CO2 BL5 Determine the form factor of the waveform shown in Fig. 5 [6]

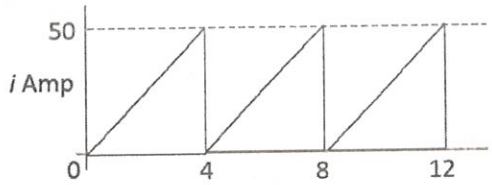

Fig. 5

Q.3 (C) CO2 BL1 Define the following terms with reference to a sinusoidal waveform: [6]

i) Instantaneous Value
ii) Alteration
iii) Phase Difference
iv) Time Period
v) RMS value
vi) Frequency

SECTION – B

Q.4 (A) CO2 BL5 Estimate the resultant of the following voltages when they are added together. Draw the phasor diagram. [6]

$$V_1 = 4\sqrt{2}\ \sin(\omega t + 135°)$$
$$V_2 = -4\sqrt{3}\ \sin(\omega t + 60°)$$
$$V_3 = 4\ \cos(\omega t - 150°)$$

Q.4 (B) CO2 BL5 Three similar coils each having a resistance of 5Ω and an inductance of 0.02H are connected in delta to a 440V, 3-phase, 50Hz supply. Calculate the phase voltage, line voltage, phase current, line current, power factor and total power absorbed. [6]

Q.4 (C) CO2 BL5 A 3-phase induction motor load has a p.f. of 0.397 lagging. Two wattmeters connected to measure power shows the input as 30 kW. Find the reading of each wattmeter. [4]

Q.5 (A) CO3 BL5 Draw and explain the working of a center tap rectifier. Deduce its expression for efficiency. [6]

Q.5 (B) CO3 BL2 Discuss the working of diode as clipper and clamper. [6]

Q.5 (C) CO3 BL6 Design a full adder circuit and discuss its operation in detail. [4]

Q.6 (A) CO4 BL5 Evaluate the Boolean expression for the output Y for the logic circuit shown in Fig.6. Also write the truth table. [6]

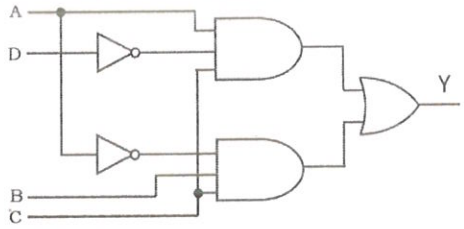

Fig. 6

Q.6 (B) CO4 BL6 Design X-OR gate using NAND gate only. [6]
Simplify the following Boolean expressions:
(*i*) $Y = \bar{A}\bar{B}C + A\bar{B}C + AB\bar{C} + ABC$ (*ii*) $Y = AB + A(B + C) + B(B + C)$

Q.6 (C) CO4 BL3 [6]
i) Convert octal number (24.6)8 to the equivalent decimal number
ii) Convert (177)10 to its 8-bit binary equivalent by first converting to octal.
iii) Convert decimal number 378 to a 16-bit number by first converting to hexadecimal

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Nirma University

Institute of Technology

Supplementary Examination (SPE), February - 2025

B. Tech. in All Programmes, Semester-I

Bachelor of Science (CSE), Semester-I

1EE801CC22: ELECTRICAL SCIENCE

Roll / Exam No.		Supervisor's initial with date	

Time: 3 Hours | Max. Marks: 100

Instructions:

1. Attempt all questions.
2. Use section-wise separate answer book.
3. Figures to right indicate full marks.
4. Draw neat sketches wherever necessary.
5. Assume suitable additional data if required.
6. All symbols and notations have their usual meaning.

SECTION - A

Q.1 (A) CO1 BL3 Apply star delta transformation to find the equivalent resistance between the terminal pair X-Z for the circuit shown in Fig. 1. [6]

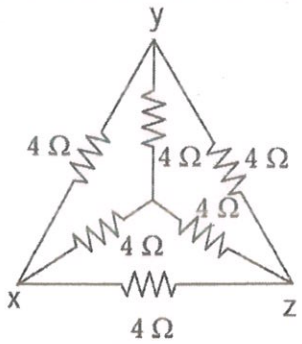

Fig. 1

Q.1 (B) CO1 BL5 Determine the current delivered by the source of 10 volts in the network shown in Fig. 2. [6]

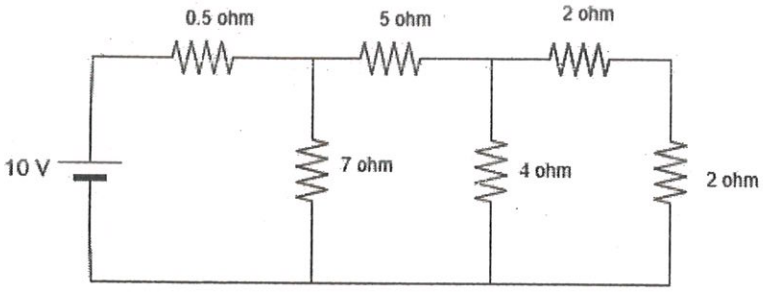

Fig. 2

Q.1 (C) CO1 BL5 A 10 μF capacitor is connected in series with 1 MΩ resistor across the supply of 100 volts. Calculate: (i) time constant (ii) initial charging current (iii) voltage across capacitor after time equal to time constant and (iv) final steady state current. [4]

Q.2 (A) CO2 BL2 Explain the concept of source conversion. [4]

Q.2 (B) CO1 BL3 Apply Thevenin's theorem to find the current through 5 Ω resistor for the circuit shown in Fig. 3. [6]

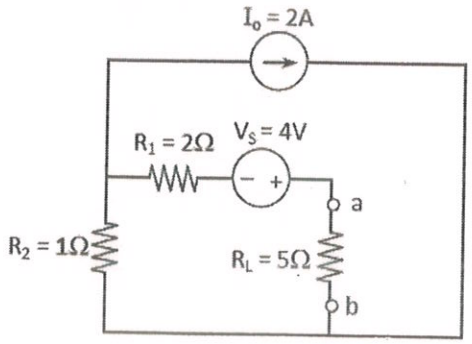

Fig. 3

Q.2 (C) CO1 BL5 Use nodal analysis to find the current through 5 Ω resistor in the network shown in Fig. 4. [6]

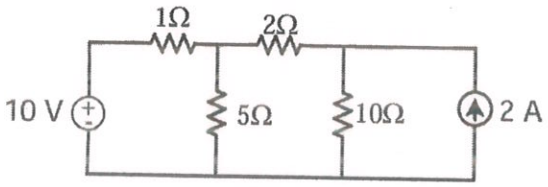

Fig. 4

Q.3 (A) CO2 BL2 Summarise the similarities between a magnetic circuit and electrical circuit. [6]

Q.3 (B) CO2 BL2 Explain with neat sketch the generation of sinusoidal voltage. [6]

Q.3 (C) CO2 BL5 Estimate the RMS value, average value, form factor and peak factor for the waveform shown in Fig. 5. [6]

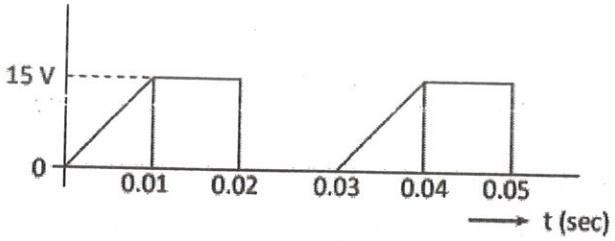

Fig. 5

SECTION – B

Q.4 (A) CO2 BL2 List few merits of three phase system over single-phase system. [4]

Q.4 (B) CO2 BL2 Define the following terms with reference to alternating current: i) instantaneous value ii) maximum value iii) average value iv) time period. [4]

Q.4 (C) CO2 BL5 A 3-phase load consists of three star connected similar resistances, each of resistance of 50 Ω. The supply is 400 V, 50 Hz. Calculate (i) line current (ii) total power consumed (iii) phase voltage (iv) power factor. [6]

Q.5 (A) CO3 BL2 Illustrate with neat sketch the working of half wave rectifier circuit and draw its input and output waveforms. [6]

Q.5 (B) CO3 BL2 Explain any two special purpose diodes and mention their application areas. [6]

Q.5 (C) CO3 BL2 Compare bipolar junction transistor in common base, common emitter and common collector mode configurations. [6]

Q.6 (A) CO4 BL3 Design X-OR gate using NAND gate only. [6]
Simplify the following Boolean expressions:

i) (*i*) $Y = \bar{A}\bar{B}C + A\bar{B}C + AB\bar{C} + ABC$ (*ii*) $Y = AB + A(B + C) + B(B + C)$

Q.6 (B) CO4 BL2 Give reasons, why digital circuits are preferred over analog circuits? [6]

Q.6 (C) CO4 BL6 Design a full adder using half adders. [6]

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Nirma University

Institute of Technology

Supplementary Examination (SPE), July - 2025

B. Tech. in Ch / EC / CSE, Semester-I

B. Tech. in CL / ME / EE / CSE / AI&ML, Semester-II

1EE801CC22 Electrical Science

Roll / Exam No.		Supervisor's initial with date	

Time: 3 Hours | Max. Marks: 100

Instructions:

1. Attempt all questions.
2. Use section-wise separate answer book.
3. Figures to right indicate full marks.
4. Draw neat sketches wherever necessary.
5. Assume suitable additional data, if required.
6. All symbols and notations have their usual meaning.

SECTION - A

Q.1 (A) CO1 BL5 Compute the potential difference across the 4 Ω resistor for the network shown in Fig. 1 using nodal analysis. [6]

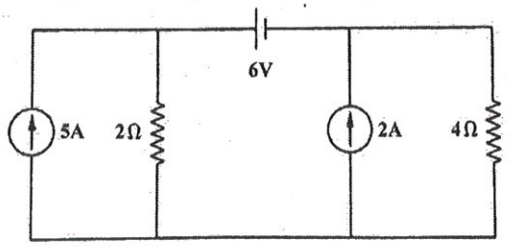

Fig. 1

Q.1 (B) CO1 BL5 Use source transformation and mesh analysis to determine the current through 3 Ω resistor for the network shown in Fig. 2. [6]

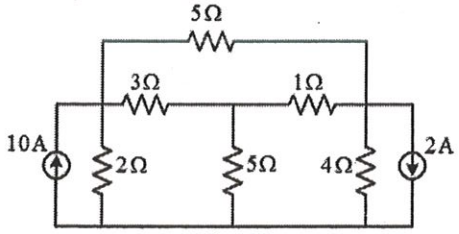

Fig. 2

Q.1 (C) CO1 BL2 State and explain superposition theorem. [4]

Q.2 (A) CO1 BL3 Apply star-delta transformation to find the current delivered by the source of 196 V for the circuit shown in Fig. 3. [6]

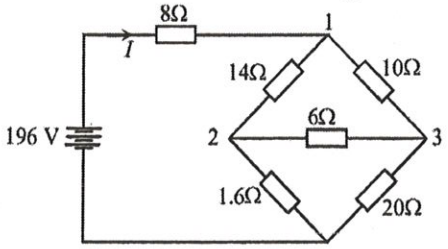

Fig. 3

Q.2 (B) CO1 BL3 Apply Norton's theorem to find the current through 5 Ω resistor for the circuit shown in Fig. 4. [6]

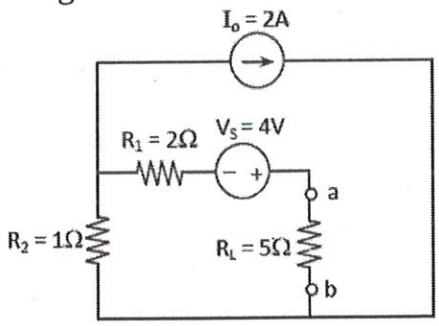

Fig. 4

Q.2 (C) CO1 BL5 A 5 μF capacitor is connected by closing a switch to a supply of 150 volts through a 80 MΩ series resistance. Evaluate: (i) Time constant (ii) Initial charging current (iii) Initial rate of rise of voltage across capacitor (iv) Voltage across the capacitor 6 sec after the switch has been closed. [4]

Q.3 (A) CO2 BL5 For the AC network shown in Fig. 5, calculate: [6]
(a) Supply current, and
(b) Real power consumed.

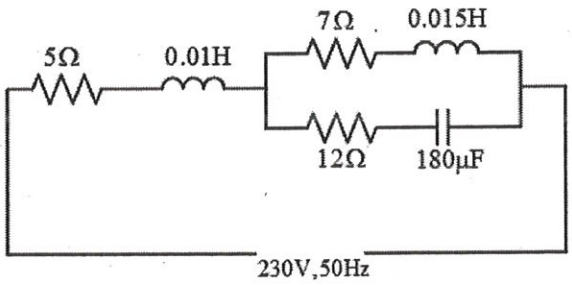

Fig. 5

Q.3 (B) CO2 BL3 Make use of complex algebra to find the following in polar form : [6]
i) Add (40 + j20) to (20 + j120)
ii) Subtract (10 + j30) from (20 – j20)
iii) Multiply (15 + j20) with (20 + j30)
iv) Divide (6 + j7) by (5 + j3)

Q.3 (C) CO2 BL5 An alternating current is given by: *i(t) = 10 sin 942t Amperes* [6]
Determine:
(a) the frequency,
(b) time period,
(c) time taken from t = 0 for the current to reach a value of 6 A for the first time.

SECTION – B

Q.4 (A) CO2 BL5 If a three phase balanced star connected load is supplied from a balanced three phase voltage source, derive the relationship between (i) line voltage and phase voltage (ii) line current and phase current. Draw the phasor diagram. [6]

Q.4 (B) CO2 BL5 Three similar coils each having a resistance of 3 Ω and an inductance of 0.04 H are connected in star to a 415 V, 3-phase, 50 Hz supply. Calculate the phase voltage, line voltage, phase current, line current, power factor and total power absorbed. [6]

Q.4 (C) CO2 BL5 A 3-phase induction motor load has a pf of 0.45 lagging. Two wattmeters connected to measure power shows the input as 35 kW. Estimate the reading of each wattmeter. [4]

Q.5 (A) CO3 BL2 Draw and explain the working of a half wave rectifier with suitable waveforms. [6]

Q.5 (B) CO3 BL2 Explain positive biased clipper and negative biased clipper with neat sketches. [6]

Q.5 (C) CO3 BL2 Write short notes on the following: [4]
(a) Zener diode (b) Photo diode

Q.6 (A) CO4 BL3 Write the Boolean expression for the output Y for the logic circuit shown in Fig.6. Also write the truth table. [6]

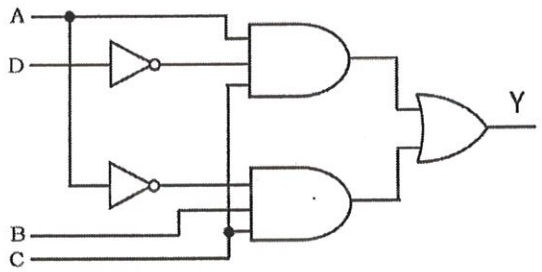

Fig. 6

Q.6 (B) CO4 BL3 Explain full adder circuit with neat and clean diagram and truth table. [6]

Q.6 (C) CO4 BL3 Solve the following Boolean expressions: [6]

i) $Y = \bar{A}\bar{B}C + A\bar{B}C + AB\bar{C} + ABC$

ii) $Y = AB + A(B + C) + B(B + C)$

iii) $Y = AC\bar{D} + \bar{A}B(CD + BC)$

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Nirma University

Institute of Technology

Semester End Examination (IR/RPR), April - 2025

B. Tech. in All Programmes, Semester - I / II

Int. B. Tech. (CSE) - MBA, Semester - I / II

Bachelor of Science (CSE), Semester - I

1EE801CC22 / 1EE801 Electrical Science

Roll / Exam No. | Supervisor's initial with date

Time: 3 Hours | Max. Marks: 100

Instructions:

1. Attempt all questions.
2. Use section-wise separate answer book.
3. Figures to right indicate full marks.
4. Draw neat sketches wherever necessary.
5. Assume suitable additional data, if required.
6. All symbols and notations have their usual meaning.

SECTION - A

Q.1 (A) CO1 BL5 For the given network shown in figure 1, determine the current through 6 Ω and 5 Ω resistance using mesh analysis. [6]

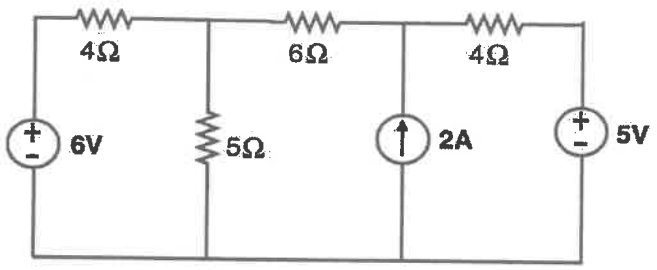

Fig. 1

Q.1 (B) CO1 BL5 Write the node voltage equations and determine currents in each branch for the network shown in Fig. 2. [6]

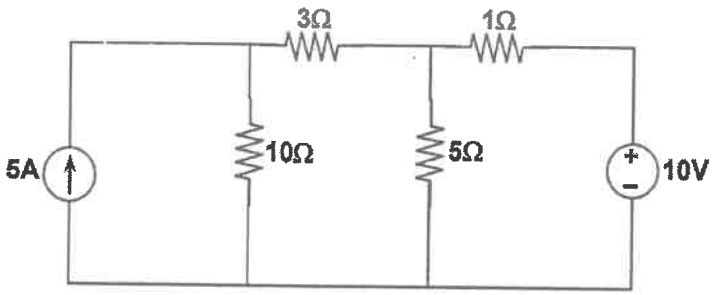

Fig. 2

Q.1 (C) CO1 BL2 Explain the concept of source transformation. [4]

Q.2 (A) CO1 BL5 Use star-delta transformation to determine the equivalent resistance between terminal pair A-B of the network shown in Fig. 3. [6]

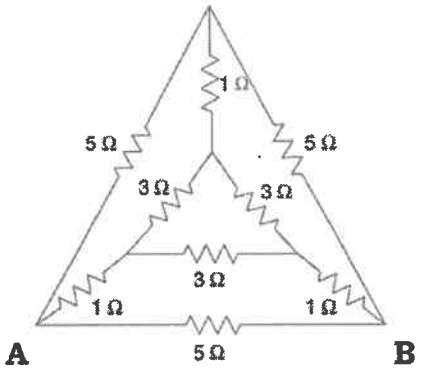

Fig. 3

Q.2 (B) CO1 BL5 Apply superposition theorem to estimate the current through 2Ω resistor in Fig. 4. [6]

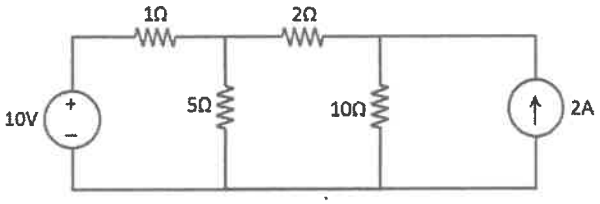

Fig.4

Q.2 (C) CO1 BL5 A 2μF capacitor is connected by closing a switch to a supply of 100V through a 100 MΩ series resistance. Evaluate: (i) Time constant (ii) Initial charging current (iii) Initial rate of rise of voltage across capacitor (iv) Voltage across the capacitor 6 sec after the switch has been closed. [4]

Q.3 (A) CO2 BL5 Deduce the expression for the frequency at which voltage across inductor and the voltage across capacitor becomes maximum in a RLC series circuit excited by a sinusoidal source with variable frequency. Supplement the arguments with suitable phasor diagram. Write any two properties of RLC series resonant circuit. [6]

Q.3 (B) CO2 BL5 Estimate the RMS value, average value and form factor of the periodic waveform shown in Fig. 6. [6]

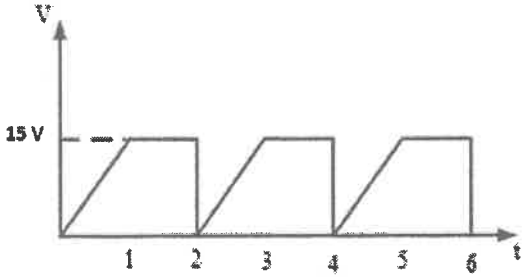

Fig. 6

Q.3 (C) CO2 BL5 A series RC circuit is excited by a sinusoidal source at a frequency of 'f' hertz. If the applied voltage is e(t) = V_m sin ωt. Derive the expression for current in trigonometric form. Support the mathematical expressions with suitable phasor diagram. Draw the impedance triangle, voltage triangle and power triangle. [6]

SECTION – B

Q.4 (A) CO2 BL5 If a three phase balanced delta connected load is supplied from a balanced three phase voltage source, derive the relationship between (i) line voltage and phase voltage (ii) line current and phase current. Draw the phasor diagram. [6]

Q.4 (B) CO2 BL5 Three similar coils each having a resistance of 4 Ω and an inductance of 0.03H are connected in star to a 415 V, 3-phase, 50Hz supply. Calculate the phase voltage, line voltage, phase current, line current, power factor and total power absorbed. [6]

Q.4 (C) CO2 BL5 A 3-phase induction motor load has a power factor of 0.4 lagging. Two wattmeters connected to measure power shows the input as 25 kW. Estimate the reading of each wattmeter. [4]

Q.5 (A) CO3 BL2 Draw and explain the working of a full wave bridge rectifier with suitable waveforms. [6]

Q.5 (B) CO3 BL5 The positive shunt clipper shown in Fig. 7 below has the input waveform as indicated. Determine the value of V_{out} for each of the input alternations. [6]

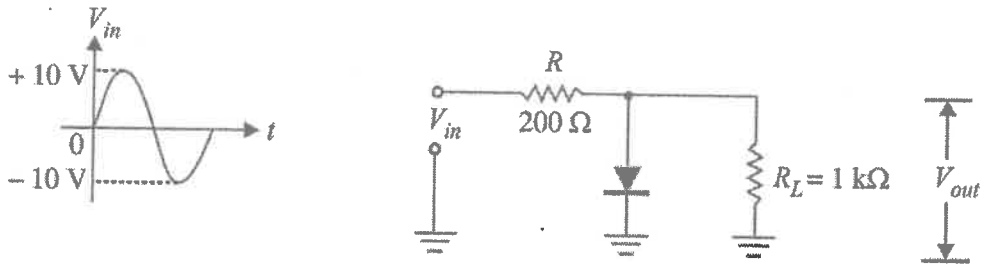

Fig. 7

Q.5 (C) CO3 BL2 Write comparison between analog circuit and digital circuits. [4]

Q.6 (A) CO4 BL2 Explain half adder circuit with neat sketch and its truth table. [6]

Q.6 (B) CO4 BL3 Solve the following boolean expressions and represent them using suitable logic circuit. [6]

i) $Y = A + \bar{A}.B$

ii) $Y = A \cdot B + A \cdot \bar{B} + B \cdot C$

iii) $Y = A \cdot B + A \cdot B \cdot C + A \cdot B \cdot \bar{C}$

Q.6 (C) CO4 BL3 [6]

i) Convert $(1111011011)_2$ into its equivalent hexadecimal number.

ii) Convert $(755)_8$ into its equivalent decimal number.

iii) Convert $(352)_{10}$ into its equivalent binary number.

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Nirma University

Institute of Technology

Semester End Examination (IR/RPR), December - 2024

B. Tech. in All Programmes / Int. B. Tech. (CSE) - MBA, Semester-I/II

Bachelor of Science (CSE), Semester-I

1EE801CC22 / 1EE801 Electrical Science

Roll / Exam No.		Supervisor's initial with date	

Time: 3 Hours | Max. Marks: 100

Instructions:

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SECTION - A

Q.1 (A) CO1 BL3 Apply nodal analysis to determine the current through 4 Ω resistor in the circuit shown in Fig.1 [6]

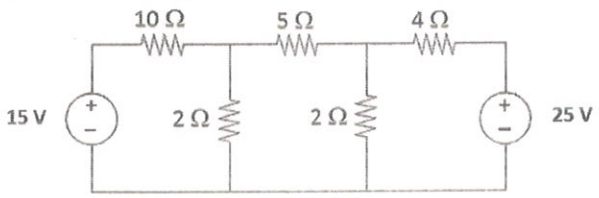

Fig. 1

Q.1 (B) CO1 BL5 Determine the power dissipation in 4 Ω resistor of the circuit shown in Fig. 2 using mesh analysis. [6]

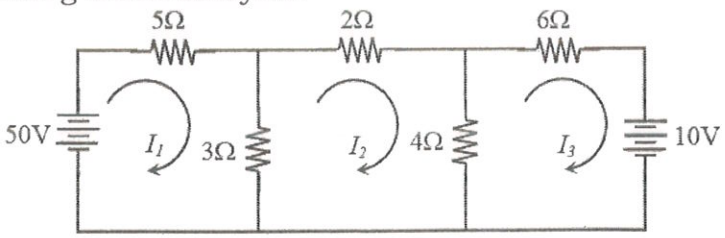

Fig. 2

Q.1 (C) CO1 BL5 A series R – C circuit is connected through a switch S to a dc supply of V volts. For such a circuit, deduce an expression for the variation of voltage across the capacitor plates when the capacitor is charging. [4]

Q.2 (A) CO1 BL5 Evaluate the current I in the circuit shown in Fig. 3 using star – delta transformation. [6]

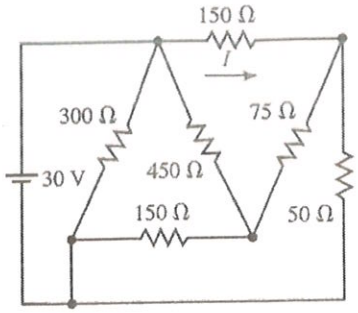

Fig. 3

Q.2 (B) CO1 BL5 Determine the current *Io* using superposition theorem for the network shown in Fig. 4. [6]

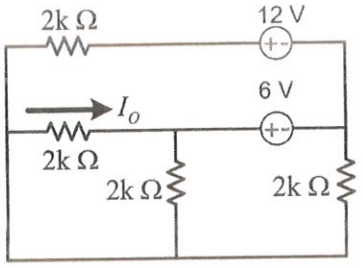

Fig. 4

Q.2 (C) CO1 BL5 A 2μF capacitor is charged to 600 V. If the capacitor is then discharged to 450V, estimate, how much energy has been left on the capacitor. [4]

Q.3 (A) CO2 BL5 Deduce the expression for equivalent inductance of two inductors connected in series for additive mutual coupling. [6]

Q.3 (B) CO2 BL5 Determine the form factor of the waveform shown in Fig. 5 [6]

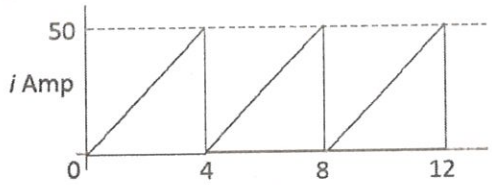

Fig. 5

Q.3 (C) CO2 BL1 Define the following terms with reference to a sinusoidal waveform: [6]

i) Instantaneous Value
ii) Alteration
iii) Phase Difference
iv) Time Period
v) RMS value
vi) Frequency

SECTION – B

Q.4 (A) CO2 BL5 Estimate the resultant of the following voltages when they are added together. Draw the phasor diagram. [6]

$$V_1 = 4\sqrt{2}\ \sin(\omega t + 135°)$$
$$V_2 = -4\sqrt{3}\ \sin(\omega t + 60°)$$
$$V_3 = 4\ \cos(\omega t - 150°)$$

Q.4 (B) CO2 BL5 Three similar coils each having a resistance of 5Ω and an inductance of 0.02H are connected in delta to a 440V, 3-phase, 50Hz supply. Calculate the phase voltage, line voltage, phase current, line current, power factor and total power absorbed. [6]

Q.4 (C) CO2 BL5 A 3-phase induction motor load has a p.f. of 0.397 lagging. Two wattmeters connected to measure power shows the input as 30 kW. Find the reading of each wattmeter. [4]

Q.5 (A) CO3 BL5 Draw and explain the working of a center tap rectifier. Deduce its expression for efficiency. [6]

Q.5 (B) CO3 BL2 Discuss the working of diode as clipper and clamper. [6]

Q.5 (C) CO3 BL6 Design a full adder circuit and discuss its operation in detail. [4]

Q.6 (A) CO4 BL5 Evaluate the Boolean expression for the output Y for the logic circuit shown in Fig.6. Also write the truth table. [6]

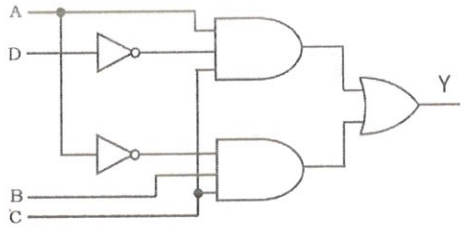

Fig. 6

Q.6 (B) CO4 BL6 Design X-OR gate using NAND gate only. [6]
Simplify the following Boolean expressions:
(*i*) $Y = \bar{A}\bar{B}C + A\bar{B}C + AB\bar{C} + ABC$ (*ii*) $Y = AB + A(B + C) + B(B + C)$

Q.6 (C) CO4 BL3 [6]
i) Convert octal number (24.6)8 to the equivalent decimal number
ii) Convert (177)10 to its 8-bit binary equivalent by first converting to octal.
iii) Convert decimal number 378 to a 16-bit number by first converting to hexadecimal

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Nirma University

Institute of Technology

Semester End Examination (IR/RPR), December - 2023

B. Tech. in All Programmes, Semester-I/II

Int. B. Tech. (CSE) – MBA, Semester-I

Bachelor of Science (Computer Science and Engineering), Semester-I

1EE801 Electrical Science

Roll / Exam No. | Supervisor's initial with date

Time: 3 Hours | Max. Marks: 100

Instructions:

1. Attempt all questions.
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SECTION - A

Q.1 (A) CO1 BL5 Apply star delta transformation to find the equivalent resistance between the terminal pair a-b for the circuit shown in Fig. 1. [6]

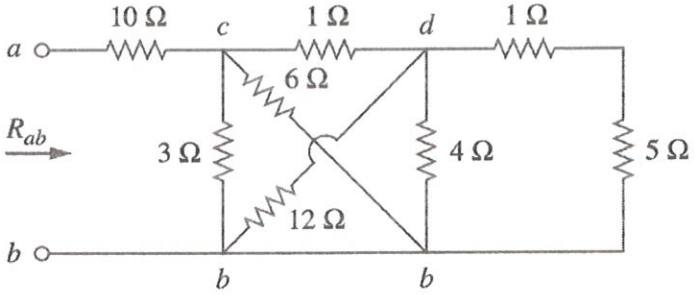

Fig. 1

Q.1 (B) CO1 BL5 For the circuit shown in Fig. 2, find: (a) v_1 and v_2 (b) power dissipated in 3 kΩ and 20 kΩ resistors, and (c) power supplied by the current source. [6]

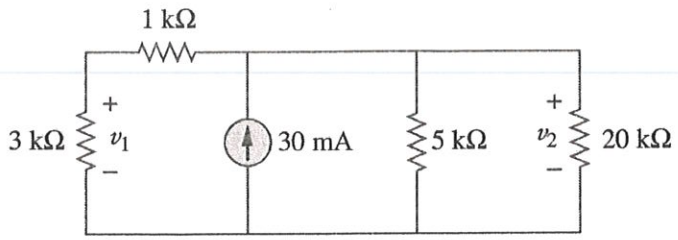

Fig. 2

Q.1 (C) CO1 BL5 Three capacitors of 1 μF, 2 μF and 3 μF are connected in series across a supply of 100 V. Find the equivalent capacitance of the combination and energy stored in each capacitor. [4]

Q.2 (A) CO1 BL2 State and explain Superposition theorem using illustrative example. [6]

Q.2 (B) CO1 BL3 Use mesh analysis to find the current delivered by 240 V source for the network shown in Fig. 3. [6]

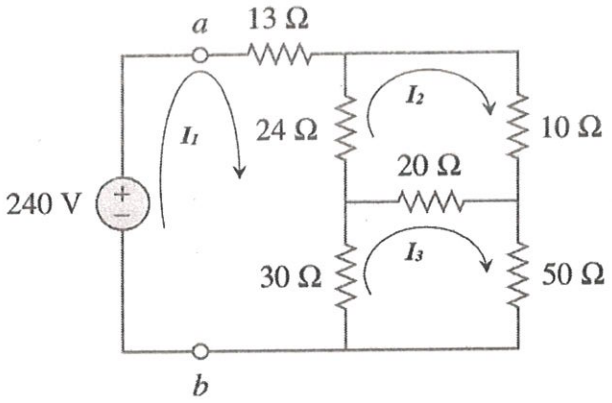

Fig. 3

Q.2 (C) CO1 BL3 A capacitor 'C' in series with a resistor 'R' and the series combination is connected to a DC source of 'E' volts. Find an expression for the charge 'Q' as a function of time. [4]

Q.3 (A) CO2 BL2 Define the following terms with respect to magnetic circuit. [6]
(i) MMF, (ii) Permeance, (iii) Reluctance, (iv) Fringing.

Q.3 (B) CO2 BL5 A large coil of inductance 1.405 H and resistance 40 Ω is connected in series with a capacitor of 20 μF. Calculate the frequency at which the circuit resonates. If a voltage of 100 V at the corresponding frequency is applied to the circuit, calculate the current drawn from the supply and voltage across the coil and across the capacitor. [6]

Q.3 (C) CO2 BL5 A circuit shown in Fig. 4 consists of the following in parallel: (i) A resistance of 500 Ω, (ii) an inductance of 2 H, (iii) A capacitance of 10 μF. A source of 200 V, 50 Hz is applied. Determine the current drawn from the source, active power, reactive power and the apparent power. [6]

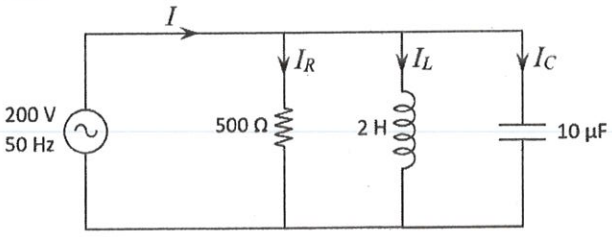

Fig. 4

SECTION – B

Q.4 (A) CO2 BL5 A three-phase balanced load connected across a three phase 400 V AC supply draws a line current 10 A. Two wattmeters are used to measure the input power. The ratio of two wattmeter readings is 2:1. Find the readings of the two wattmeters. [6]

Q.4 (B) CO2 BL5 Calculate the RMS value, average value and form factor of the function shown in Fig. 5. [6]

If $y = 10(1 - e^{-100t})$ for 0 < t < 0.1 and;

$y = 10\, e^{-50(t-0.1)}$ for 0.1 < t < 0.2.

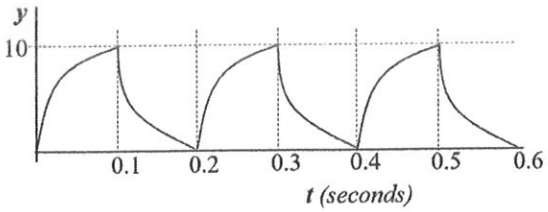

Fig. 5

Q.4 (C) CO2 BL2 Differentiate between balanced and unbalanced three phase loads. Give reasons why is an unbalanced load not normally used on 3 - phase 3-wire system? [4]

Q.5 (A) CO3 BL2 Draw the circuit for a common-emitter bipolar transistor amplifier and explain its working. [6]

Q.5 (B) CO3 BL2 Explain with neat sketches, the working of: [6]
(i) Half-wave rectifier, (ii) Centre-tap full-wave rectifier, (iii) Bridge type full-wave rectifier.

Q.5 (C) CO3 BL2 Write the comparison between astable multivibrator, bistable multivibrator and monostable multivibrator. [4]

Q.6 (A) CO4 BL3 [6]
i) Determine the decimal value of the binary number 10011010.
ii) Add 45_{10} with 25_{10} using binary numbers.
iii) Determine the MSB and the LSB of 50_{10} when expressed as an Octal number.

Q.6 (B) CO4 BL2 Draw a logic circuit, incorporating any gates of your choice, which will produce an output 1 when its two inputs are different. Also draw a logic circuit, incorporating only NOR gates, which will perform the same function. [6]

Q.6 (C) CO4 BL3 For the given logic circuit of Fig. 6, obtain the simplified output expression. Write the truth table for the same. [6]

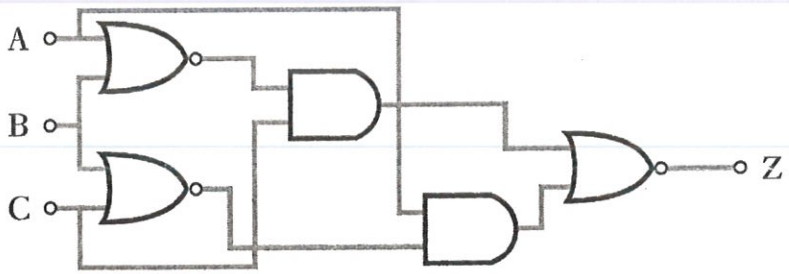

Fig. 6

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Nirma University

Institute of Technology

Semester End Examination (IR/RPR), June - 2023

B. Tech. in CL / CH / ME / EE, Semester-II

B. Tech. in EI / EC / CSE, Semester-I

Int. B. Tech. (CSE) - MBA, Semester-II

1EE801 Electrical Science

Roll / Exam No. | Supervisor's initial with date

Time: 3 Hours | Max. Marks: 100

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SECTION - A

Q.1 (A) CO1 BL4 Use mesh analysis to find the current through each resistor in the network shown in Fig. 1. [6]

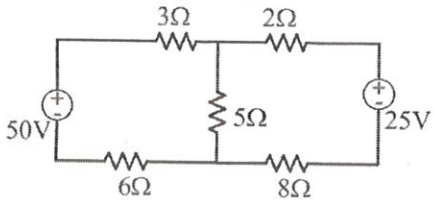

Fig. 1

(B) CO1 BL4 Use suitable method to find the current through 10 Ω resistor in the network shown in Fig. 2. [6]

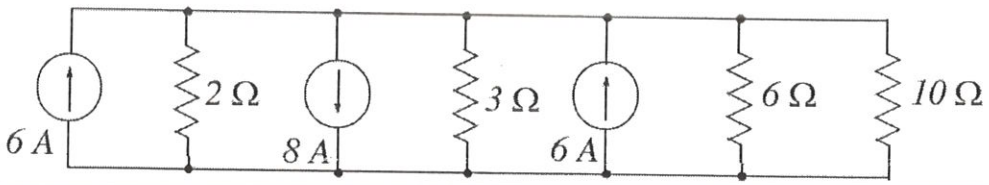

Fig. 2

(C) CO1 BL2 Draw a neat sketch of RC series circuit excited by a DC source. Write the equations for charging and discharging of capacitor. Draw the nature of graph showing voltage across resistor and voltage across capacitor. [4]

Q.2 (A) CO2 BL5 Derive an expression for the equivalent inductance when two inductances are connected in parallel opposition. [4]

(B) CO1 BL4 Use star delta transformation to find the resistance between terminal pair P-Q of the network shown in Fig. 3. [6]

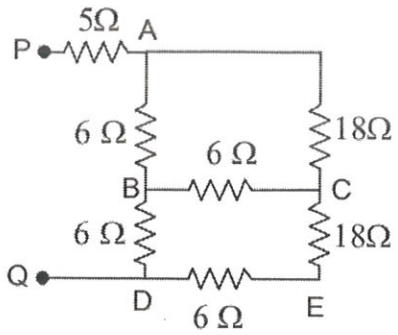

Fig. 3

(C) CO1 BL4 Use Superposition theorem to find the current through 1 Ω resistor for the network shown in Fig. 4. [6]

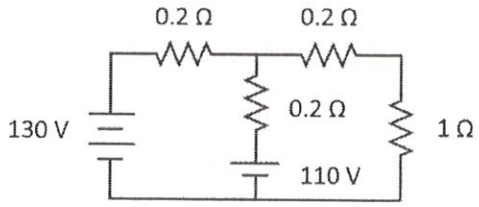

Fig. 4

Q.3 (A) CO2 BL2 Explain the concept of composite series and composite parallel magnetic circuit. How will you find the mean length and reluctances of various sections composed of different magnetic material? What is the effect of air gap in magnetic circuits? Illustrate with neat sketch. [6]

(B) CO2 BL5 An iron ring of 300 cm mean circumference with a cross section of 5 cm^2 is wound uniformly with 350 turns of wire. Estimate the current required to produce a flux of 0.5 milli-Wb in iron. Assume relative permeability of iron as 400. [6]

(C) CO2 BL5 Evaluate the average and RMS value for the periodic wave shown in Fig. 5 [6]

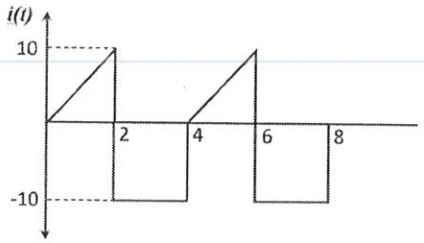

Fig. 5

SECTION – B

Q.4 (A) CO2 BL3 Solve the following expressions and obtain the results in polar form. [4]

i) (12 + j 15) x (18 – j 12)
ii) (3 + j 4) ÷ (10 – j 8)
iii) (5 + j 12) + (10 – j 12)
iv) (100 + j 150) – (90– j 85)

(B) CO2 BL2 What are the merits of three-phase system over single-phase system? [4]

(C) CO2 BL5 The power drawn by 440 volts, 50 Hz, three phase induction motor on full load is measured by two-watt-meters which indicate 250 W and 1000 W respectively. Evaluate (i) the input power (ii) power factor (iii) current (iv) motor output if the efficiency is 80% (v) reactive power (vi) apparent power. [6]

Q.5 (A) CO3 BL2 Explain the following terms with reference to a crystal diode. [6]
(i) Forward current (ii) Reverse current (iii) peak inverse voltage

(B) CO3 BL2 Write short notes on (i) LED (ii) photo-diode (iii) Zener diode [6]

(C) CO3 BL5 Figure 6 has the input waveform as indicated. Determine the value of V_{out} for each of the input alternations. [6]

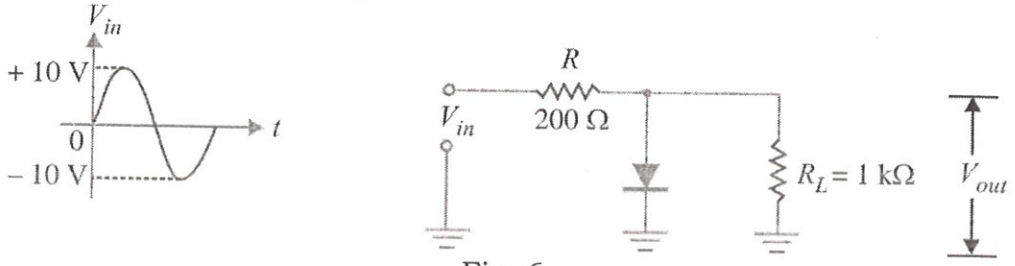

Fig. 6

Q.6 (A) CO4 BL3
i) Convert the octal number $(24.6)_8$ to its equivalent decimal number. [6]
ii) Convert the hexa-decimal number $(9F2)_{16}$ to its equivalent binary number.
iii) Convert binary $(1101)_2$ to its equivalent decimal number.

(B) CO4 BL5 Determine the complement of the following Boolean expressions: [6]
i) $Y = \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + AB\bar{C} + ABC$ (ii) $Y = AB + A(B + C) + B(B + C)$

(C) CO4 BL4 Write the Boolean expression for the output Y for the logic circuit shown in Fig.7. Write the truth table. [6]

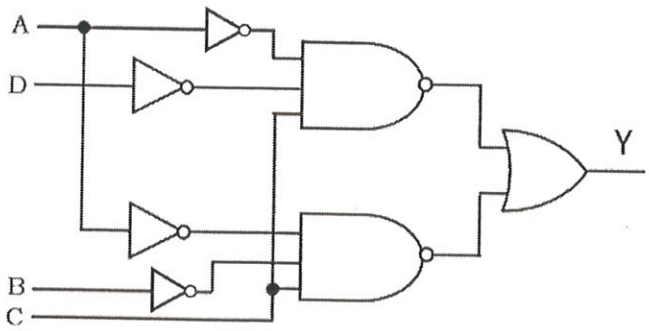

Fig. 7

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