B.Sc. Engineering **First** Year **Even** Semester Examination, 2018

EEE 1241

Basic Electrical Engineering

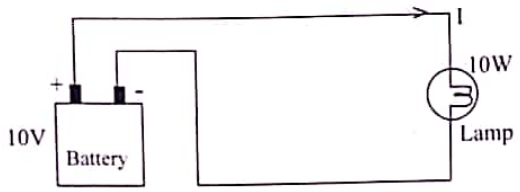
Full Marks: 72 **Time: 3 Hours**

N.B.:-
(i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION-A

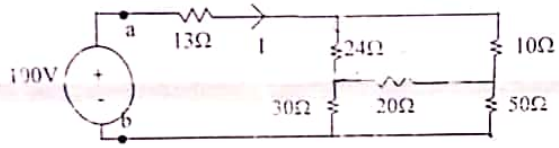
Q.1 (a) Define voltage source and current source. Also classify the dependent and independent sources with symbols. 4.0

(b) Find out the current through the following circuit. 4.0



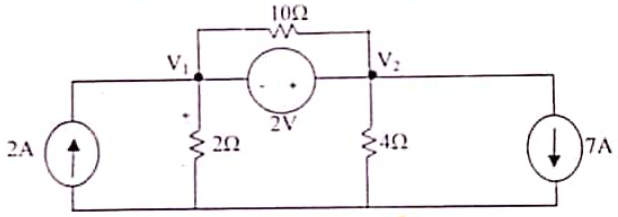
(c) Prove that the source voltage is divided among the resistors is directly proportional to their resistances. 4.0

Q.2 (a) For the bridge network in the figure shown below, find R_{ab} and I. 5.0

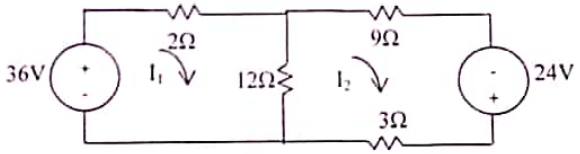


(b) Define supernode. Write down the steps to determine the node voltages. 3.0

(c) For the circuit shown below, find out the node voltages. 4.0

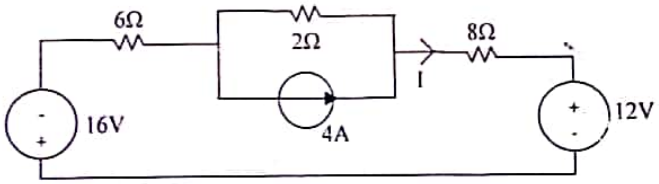


Q.3 (a) Calculate the mesh currents I_1 and I_2 for the following circuit shown below. 4.0



(b) State and explain the superposition theorem. 3.0

(c) Find out the current I for the circuit shown below. 5.0



Q.4 (a) For the following pair of sinusoids, determine which one leads and by how much. 4.0

(i) $v(t) = 10\cos(4t-60^O)$ and $i(t) = 4\sin(4t+60^O)$

(ii) $v_1(t) = 4\cos(377+10^O)$ and $v_2(t) = -20\cos 377t$

(b) Define phasor. Find the phasors corresponding to the following signals. 4.0

(i) $v(t) = 21\cos(4t-15°)V$

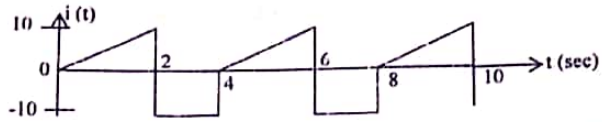
(ii) $i(t) = -8\sin(10t+70°)mA$

(iii) $v(t) = 120\sin(10t-50°)V$

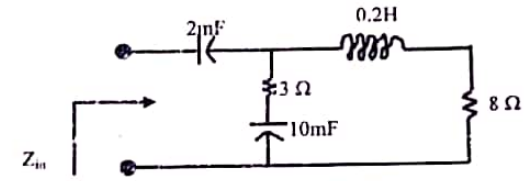
(c) For a pure capacitor and inductor prove that voltage and current are 90° out of phase. 4.0

SECTION-B

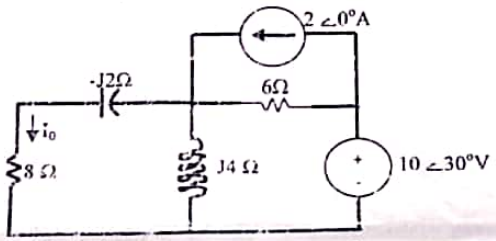
Q.5 (a) Define RMS value. Determine the rms value of the current waveform shown in figure below. If the current is passed through a 2-Ω resistor, find the average power absorbed by the resistor. 6.0



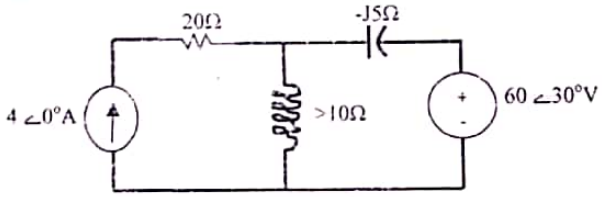
(b) Find the input impedance of the circuit shown below. Assume that the circuit operates at w = 50 rad/s. 3.0



(c) Find I_O for the circuit shown in figure below using mesh analysis. 3.0



Q.6 (a) Determine the power generated by each source and the average power absorbed by each passive element in the circuit shown in figure below. 6.0



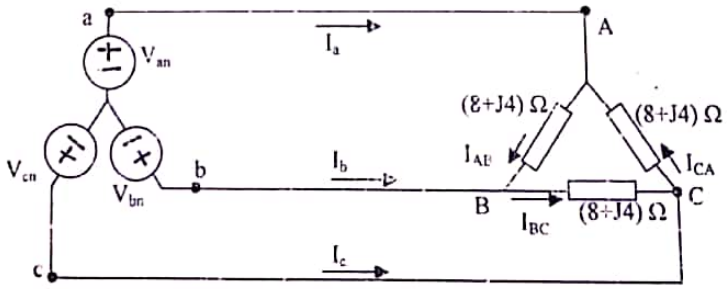
(b) When connected to a 230-V (rms) 50-Hz power line, a load absorbs 4 kW at a lagging power factor of 0 8. Find the reactive power of the system. 2.0

(c) Define phase sequence. Write down the condition of three phase balanced and unbalanced system. 4.0

Q.7 (a) Mention the possible connections of the three phase source and the three phase load 2.0

(b) Derive the relationship between phase voltages and line voltages, phase currents and line currents for a three phase Y-Y system. Assume positive phase sequence. 4.0

(c) A balanced abc-sequence Y-connected source with $V_{an} = 100\angle 10^{O}V$ is connected to a Δ–connected load (8+J4)Ω /phase. Calculate (i) phase voltages (ii) line voltages (iii) phase currents and (iv) line currents. The circuit is shown in Figure below. 6.0



Q.8(a) Explain an operating principle of a half wave and full wave rectifier circuit with a suitable circuit diagram and output wave shape. 4.0

(b) Define generator, motor and transformer. Classify D.C. generator. 4.0

(c) Explain how voltage is induced across a conductor. 4.0

Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc Engineering First Year Even Semester Examination, 2017

EEE- 1241

Basic Electrical Engineering

NAHID NELDY 16

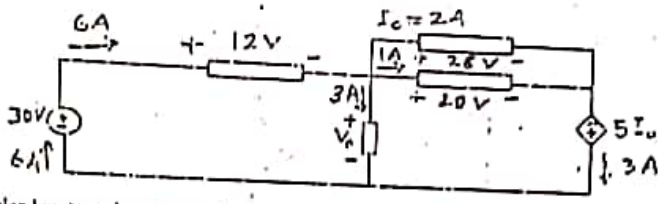
Full marks: 72 Time: 3 Hours

N.B:-
(i) Answer any SIX questions, taking THREE from each section.
(ii) Figures in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

Q.1(a) Define active elements and passive elements. Classify ideal dependent source with appropriate symbols. 2.00

(b) Compute the power absorbed or supplied by each component of the circuit in figure below. 4.00

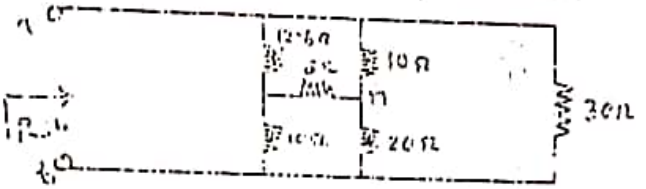


(c) Show that if a voltage divider has N resistors ($R_1, R_2, \ldots\ldots, R_n$) in series with the source voltage v, the nth resistor (R_n) will have a voltage drop of $v_n = \frac{R_n}{R_1 + R_2 + \ldots\ldots + R_n} v$ 4.00

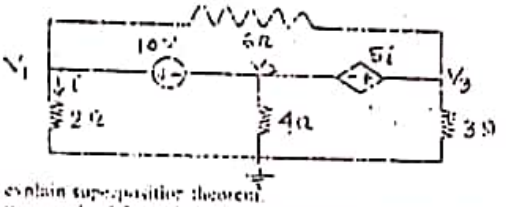
(d) Define the following terms: (i) Branch (ii) Node (iii) Loop (iv) Short circuit. 2.00

Q.2(a) State and explain KCL and KVL with examples 3.00

(b) Obtain the equivalent resistance R_{eq} for the circuit in figure below. 5.00

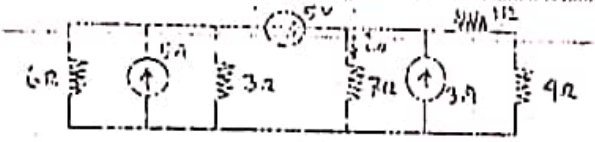


(c) Find v_1, v_2, and v_3 in the circuit in figure below using nodal analysis. 4.00

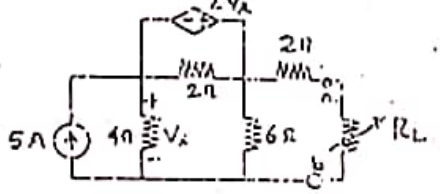


Q.3 (a) State and explain superposition theorem. 7.00

(b) Find I in the circuit of figure below using source transformation technique. 4.00



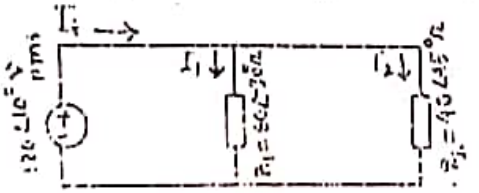
(c) Find the value of R_L for maximum power transfer in the circuit of the figure below. Find the maximum power. 4.00



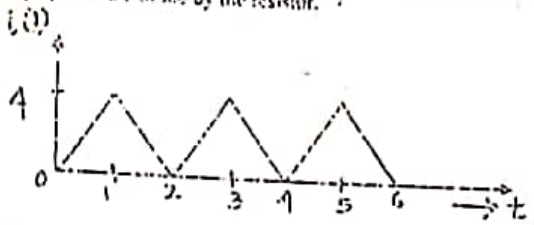
(d) State maximum power transfer theorem. 2.00

Q.4 (a) Define the following terms: (i) apparent power (ii) power factor angle (iii) complex power (iv) reactive power. 2.00

(b) In the circuit of the figure below. Calculate (i) apparent power, (ii) real power (iii) reactive power (iv) power factor. 4.00



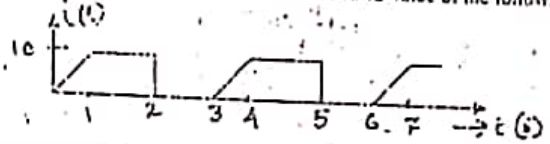
(c) Find the rms value of the current waveform of figure below. If the current flows through a 9- Ω resistor, calculate the average power absorbed by the resistor.



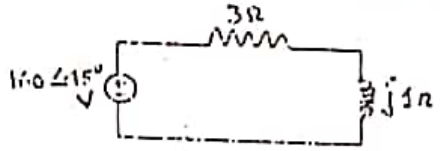
(d) Define power triangle. 1.00

SECTION-B

Q.5(a) Define RMS value of a periodic waveform. Determines the RMS value of the following waveform. 5.00



(b) For the following figure, find the average power supplied by source and power absorbed by inductor and resistor. 3.00



(c) Prove that, the line current is $\sqrt{3}$ times the magnitude of the phase current for Δ-connected load 4.00

Q.6(a) Write the advantages of three phase system. Determine the relation between line currents and phase currents of a three phase Δ-connected system. 4.00

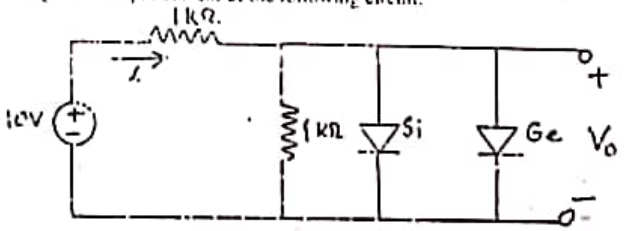
(b) Prove that, the instantaneous power of a balanced 3-phase system is constant. 4.00

(c) A positive sequence, balanced Δ-connected source supplies a balanced Δ-connected load. If the impedance per phase of the load is $18 + j12\ \Omega$ and $I_{an} = 19.702\angle 35°$ A, find line currents and line voltages. 4.00

Q.7(a) Define electrons. Describe the importance of electrons 3.00

(b) Explain the operation of a full wave bride rectifier circuit. Also derive expression of output voltage. 5.00

(c) Determine the output voltage and output current of the following circuit. 4.00



Q.8(a) Explain the no load magnetization curve of a DC generator. 4.00

(b) The voltage induced in a DC shunt generator is 220 V when the armature rotates at 1100 r/min. What will the voltage be if the speed is increased to 1200 r/min? 4.00

(c) Explain the operating principle of a DC motor. 4.00

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2.67

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RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering FIRST Year EVEN Semester Examination, 2016

EEE 1241
Basic Electrical Engineering

Full marks: 72 Time: 3 Hours

N.B:- (i) Answer any SIX questions, taking THREE from each section.
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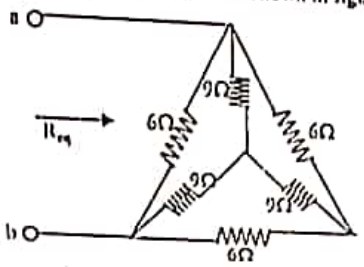
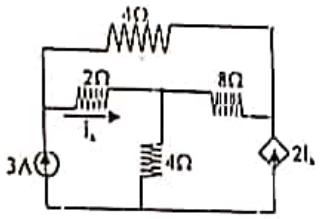
SECTION-A

Q.1(a) Define (i) active circuit element, (ii) passive circuit element, (iii) dependent source. 3.00

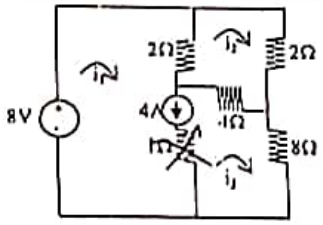
(b) Find R_{eq} at terminals a and b for the network shown in figure below. 4.00



(c) What do you mean by a linear circuit? Write nodal equations for the network shown in figure below. 5.00

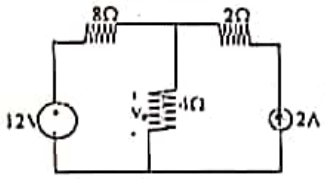


Q.2 (a) Write down the properties of a super mesh. Find i_1, i_2, and i_3 shown in figure below using mesh analysis. 5.00

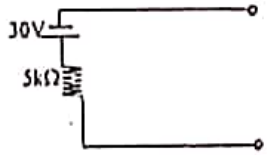


(b) State and explain Thevenin's theorem. 3.00

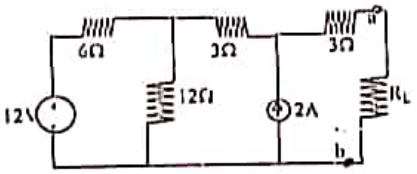
(c) Find V_o in the circuit of figure using superposition theorem. 4.00



Q.3 (a) Convert the voltage source shown in figure below into an equivalent current source. 2.00

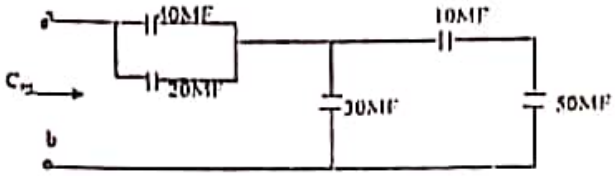


(b) Find the value of R_L for maximum power transfer in the circuit shown in figure. Find the maximum power. 4.00



(c) [illegible]

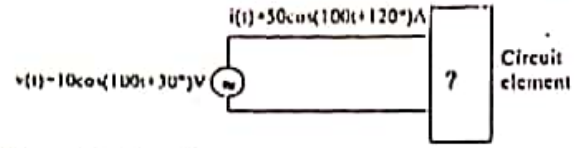
(d) Calculate the equivalent capacitance at the terminals of the circuit shown in figure below.



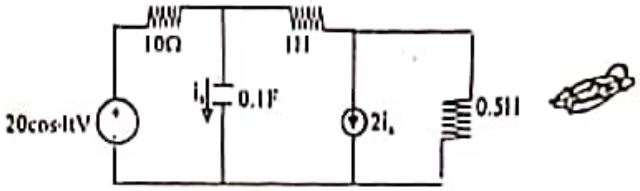
Q.2(a) What is phase sequence? Determine the phase sequence of the set of voltages 4.00

$v_{an} = 110\cos(\omega t + 150°)V$, $v_{bn} = 110\cos(\omega t + 30°)V$, $v_{cn} = 110\cos(\omega t - 90°)V$

(b) A voltage v(t) is applied across a circuit element in figure. If current i(t) flows through that element, determine the circuit element whether it is inductor or capacitor by drawing phasor diagram. 4.00



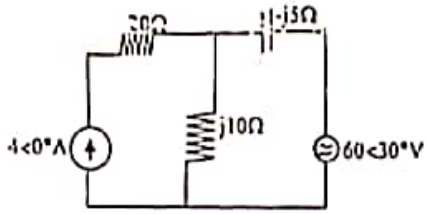
(c) Find i_x in the circuit of figure using nodal analysis. 4.00



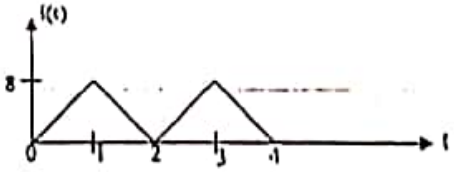
SECTION-B

Q.5(a) "A resistive load absorbs power at all time, while a reactive load (L or C) absorbs zero average power", justify the statement. 4.00

(b) Determine the average power generated by each source and the average power absorbed by each passive element in the circuit shown in figure. 4.00



(c) What is mean by r.m.s. value of a periodic signal? Find the r.m.s. value of the current waveform shown in figure. 4.00



Q.6(a) What are the advantages of 3-φ system over 1-φ system? Find the relationship between the line voltage and phase voltage of a y-y system. 4.00

(b) Prove that the total instantaneous power in a balanced 3-φ system is constant. 4.00

(c) One line voltage of a balanced Y-connected source is V_{AB}=240<-20°V. If the source is corrected to a Δ-corrected load of 20<40°Ω, find the phase and line currents. Assume the abc sequence. 4.00

Q.7(a) Define electronics. Discuss some importance of electronics. 4.00

(b) Prove that, PIV of a full-wave rectifier using center-tapped transformer is twice than the PIV of a full-wave bridge rectifier circuit. 4.00

(c) Draw the equivalent circuit of a transformer. What will happen, if dc voltage is applied across the primary of a transformer? 4.00

Q.8(a) Describe the working principle of a simple loop dc generator. 4.00

(b) What is the significance of back emf of a dc motor? Why field circuit of a dc motor never be opened? 4.00

(c) Why does the rotor of a induction motor rotate? 4.00

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DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering First Year Second Semester Examination, 2013

EEE 103

Basic Electrical Engineering

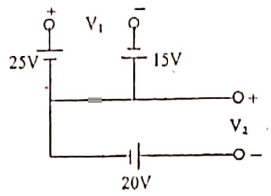
Full marks: 70 **Time: 3 Hours**

N.B:- (i) Answer any **SIX** questions, taking **THREE** from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.

SECTION-A

Q.1 (a) What is the main difference of maximum power transfer theorems in AC and DC circuits? Show that $P_{max} = \frac{E_{Th}^2}{4R_L}$ in both AC and DC cases. Where the symbols have their usual meanings. 5.67

(b) Find V_1 and V_2 for the following network. 4.00

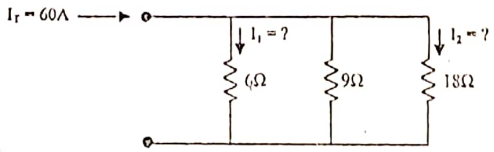


(c) Why ammeters are connected in series and voltmeters in parallel? 2.00

Q.2 (a) State and explain any one of the following theorems. 5.67

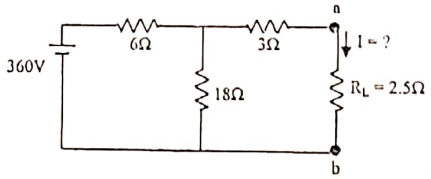
(i) Kirchhoff's Voltage law (ii) Kirchhoff's Current law (iii) Voltage divider rule.

(b) Calculate the currents I_1 and I_2 in the following circuit. 6.00



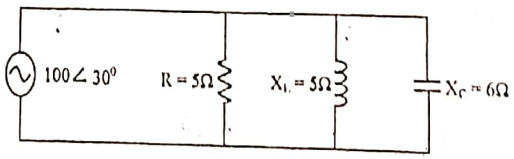
Q.3 (a) State and explain Thevenin's theorem. 5.67

(b) Calculate the current in load resistor R_L in the following circuit, by applying Thevenin's theorem. 6.00



Q.4 (a) For ac circuit, prove that power P = VI cosθ, where the symbols has their usual significance. 3.67

(b) A single phase ac parallel circuit is shown below. 8.00



(i) Calculate the individual currents drawn by each load elements.

(ii) Calculate the total current supplied by the source.

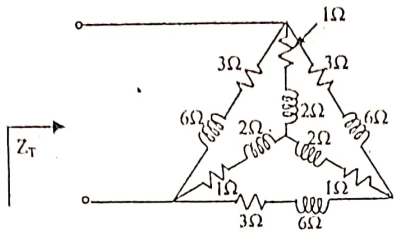
(iii) Calculate the power consumed/supplied by each elements.

SECTION-B

Q.5 (a) Discuss possible sources conversion process. 2.67

(b) Draw an electrical network which contains three nodes. Find the node voltages using nodal analysis. Assume suitable values of active and passive circuit elements. 4.00

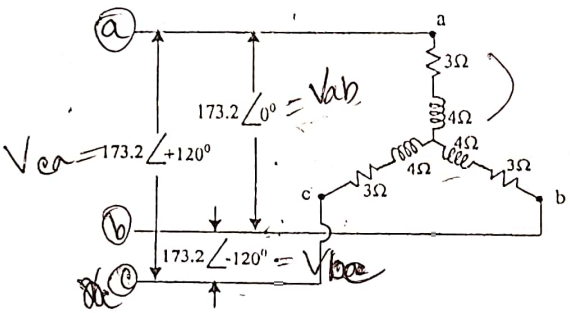
(c) Find the total impedance Z_T for the following network using both Δ-Y and Y- Δ conversion processes. 5.00



Q.6 (a) Define (i) phase sequence, (ii) balanced circuit, and (iii) unbalanced circuit. 2.67

(b) Show that in a Y-connected system $E_L = \sqrt{3}E_\phi$; where the symbols have their usual meanings. 4.00

(c) Find real power, reactive power, apparent power, and power factor from the following network. 5.00



Q.7 (a) Discuss the relative advantages and disadvantages of DC generators and alternators. 2.67

(b) Define back emf in a dc motor. Derive the condition formaximum power developed by a dc motor. 4.00

(c) What are the losses in a transformer? How can we estimate these losses? Derive the condition for maximum efficiency of a transformer. 5.00

Q.8 (a) Explain how a P-N junction is made. Draw the circuit diagram and explain the operation of a half wave rectifier using P-N junction diode. 5.67

(b) Draw neat sketch and explain how a d' Arsonval basic instrument is made. Explain how a ammeter can be made using it. 6.00

***

Inscription: Light in Our Minds

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

B.Sc. Engineering FIRST year SECOND Examination, 2012

11

EEE 103

Basic Electrical Engineering

Full Marks: 70 Time: 3 Hours

N.B.:- (i) Answer SIX questions, taking THREE from each section.
(ii) Figure in the margin indicates full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data not given.

SECTION – A

Q.1 (a) Draw the equivalent circuit of a transformer. What do you mean by energizing current of a transformer? 3.00

(b) Define – (i) *p-type* semiconductor, (ii) *n-type* semiconductor, (iii) intrinsic semi-conductor, (iv) extrinsic semi-conductor, (v) depletion layer. 5.00

(c) What are the difference between BJT and FET? 3.67

Q.2 (a) Find V_o and i_o in the circuit of Fig. 3. 3.00

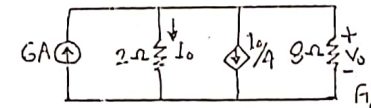


Fig: 3

(b) For the conditions specified in Fig. 4 determine unknown resistance. 3.00

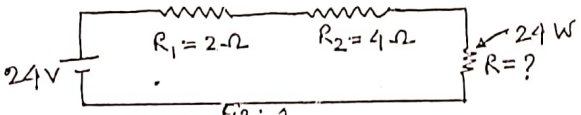


Fig : 4

(c) What do you mean by short circuit and open circuit? What should be done to inactive a voltage source and a current source? 3.67

(d) Find the current I in the circuit of Fig. 5 2.00

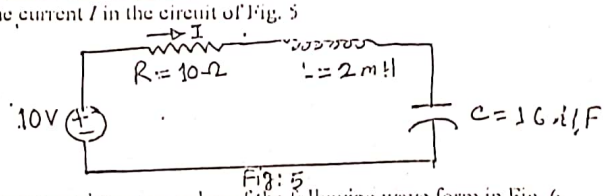


Fig: 5

Q.3(a) Find the *rms* and average value of the following wave form in Fig. 6 3.67

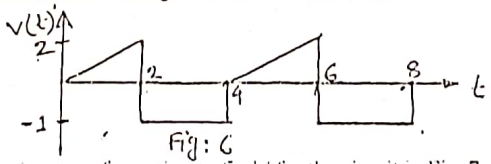


Fig: 6

(b) Use source transformation to find i for the circuit in Fig. 7. 3.00

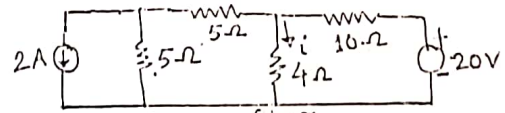


Fig: 7

(c) Find the Thevenin equivalent circuit for the following network and from this thevenin equivalent circuit find Norton's equivalent circuit. 5.00

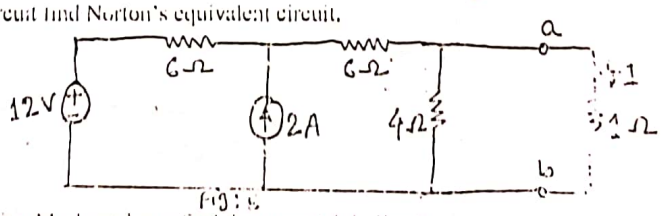
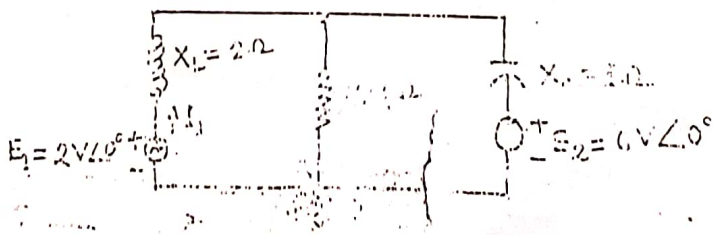


Fig: 8

Q. 4 (a) Using Mesh analysis, find the current I_1 in Fig. 9. 5.00



(b) What is super node? For the circuit in Fig. 10, Find V and i by using node method.

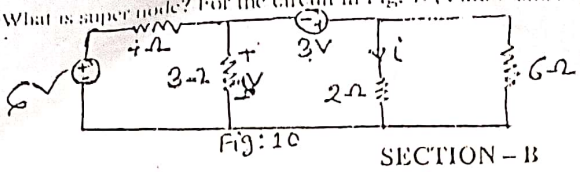


Fig: 10

SECTION – B

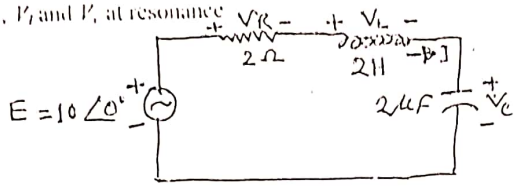
Q.5 (a) For the following series, R-L-C circuit determine – 4.00

(i) the resonance frequency

(ii) the quality factor Q at resonance

(iii) the current I at resonance

(iv) V_R, V_L and V_C at resonance



3.00

(b) Write the advantages of 3-phase system. 4.67

(c) Prove that 3-phase system is more economical than equivalent single phase system. 3.00

Q.6 (a) Determine the power factor of resistor, inductor and capacitor. 4.67

(b) What is Faraday's law? Briefly describe the operating principle of dc generator. 4.00

(c) What is armature reaction? Discuss any one method that can minimize armature reaction. 3.00

Q.7 (a) Determine the phase relations between the signals of the following sets: 4.00

(i) $V = 2\cos(wt + 20^0)$, $i = 1\ Sin(wt + 10^0)$

(ii) $V = -3\ Sin(wt + 10^0)$, $i = 2\cos(wt + 10^0)$

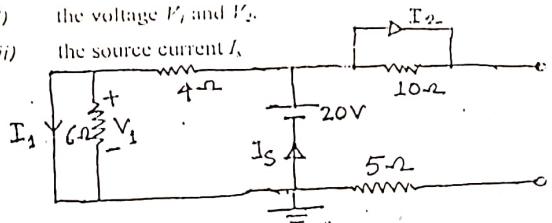
(iii) $V = 3\ Sin(wt + 20^0)$, $i = -2\cos(wt + 10^0)$

(b) For the following network determine – 4.67

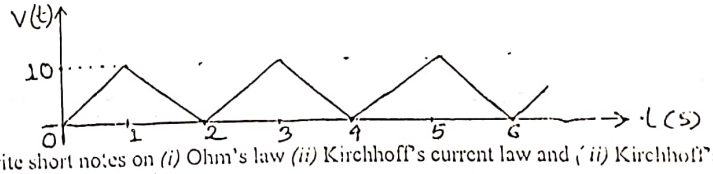
(i) the short circuit currents I_1 and I_2

(ii) the voltage V_1 and V_2.

(iii) the source current I_s



(c) Find crest factor for the following wave form. 3.00



Q.8 (a) Write short notes on *(i)* Ohm's law *(ii)* Kirchhoff's current law and *(ii)* Kirchhoff's voltage law. 5.67

(b) Using Kirchhoff's current law, determine the unknown currents for the following network of Fig.1. 3.00

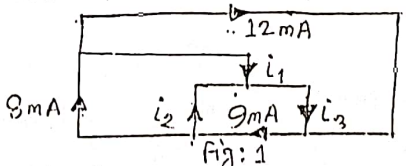


Fig: 1

(c) Find V_x in the circuit of Fig. 2. 3.00

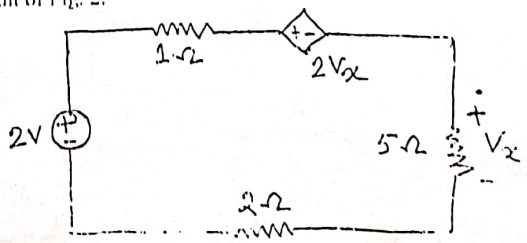


Fig: 2

DEPARTMENT OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering FIRST year SECOND SEMESTER Examination, 2011

10

EEE 103
Basic Electrical Engineering

Time: 3 Hours

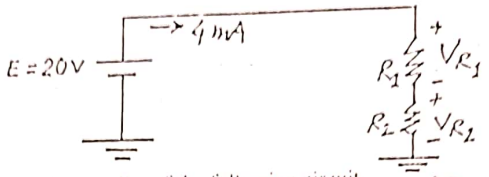
Full Marks: 70

N.B.:- (i) Answer SIX questions, taking THREE from each section.
(ii) Figure in the margin indicates full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

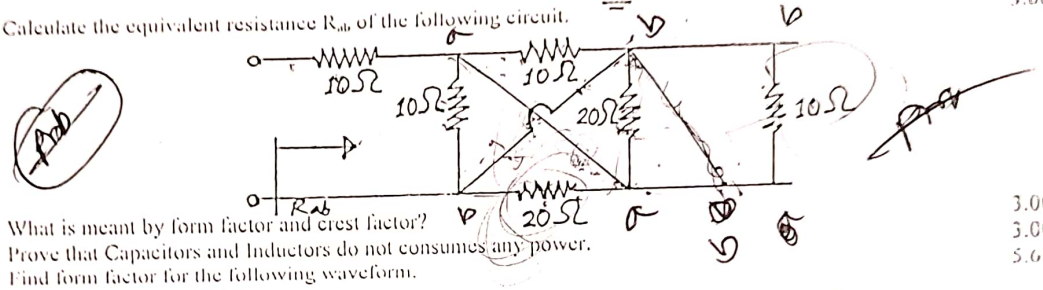
SECTION-A

Q.1(a) Define: (i) Ideal voltage source, (ii) Ideal current source, (iii) Dependent source, (iv) Active circuit element, and (v) Passive circuit element. 5.00

(b) Design the voltage divider such that $V_{R1} = 4\ V_{R2}$ 3.67



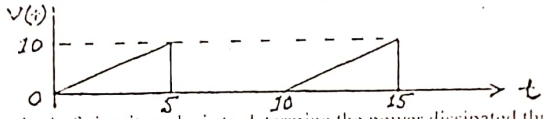
(c) Calculate the equivalent resistance R_{ab} of the following circuit. 3.00



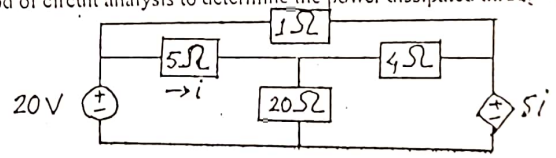
Q.2(a) What is meant by form factor and crest factor? 3.00

(b) Prove that Capacitors and Inductors do not consumes any power. 3.00

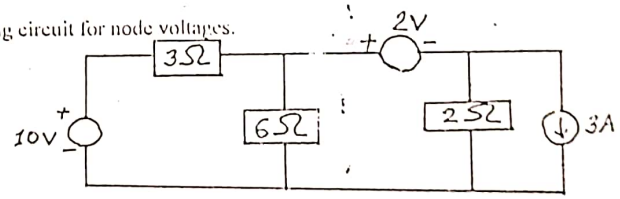
(c) Find form factor for the following waveform. 5.67



Q.3(a) Use mesh current method of circuit analysis to determine the power dissipated through the 4Ω resistor. 6.67



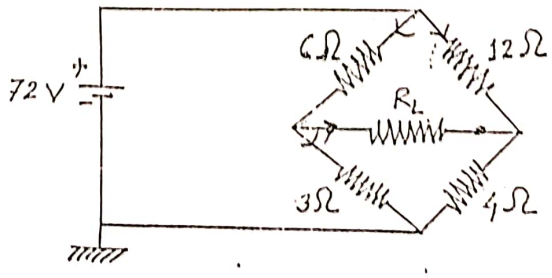
(b) Solve the following circuit for node voltages. 5.00



Q.4(a) "The superposition principle is not applicable to power effects" – Justify the statement. 5.00

(b) Prove that $P_{max} = \frac{E_{Th}^2}{4R_{Th}}$, where symbols have their usual meaning. 5.00

(c) Find the maximum power delivered to the load R_L of the following network. 5.67



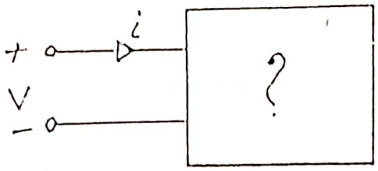
SECTION-B

Q.5(a) Determine whether the circuit element is R, L or C for the following waveforms.

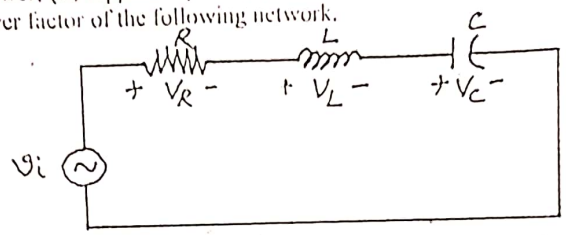
(i) v = 100 sin (wt + 10°)
i = 20 sin (wt − 80°)

(ii) v = 50 cos (wt + 30°)
i = 20 sin (wt + 120°)

(i) v = 10 sin (wt + 50°)
i = 5 sin (wt + 50°)



(b) Calculate (i) Real power, (ii) Apparent power, (iii) Reactive power, (iv) Voltage drop across each circuit element, and (v) Power factor of the following network. 6

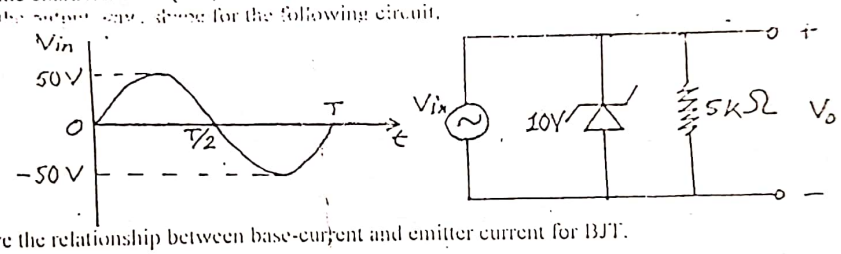


Given:
$v_i = 100\sin(314t - 10^\circ)$
$R = 10\,\Omega$
$L = 0.1$ henry
$C = 100\,\mu F$

Q.6(a) Show that at dc inductor acts as short circuit and capacitor acts as open circuit.
(b) Derive the E.M.F. equation of transformer.
(c) Derive the condition for which transformer efficiency is maximum.

Q.7(a) What is counter E.M.F? Why the counter E.M.F can never be equal to the applied voltage?
(b) What do you mean by balanced system? Derive the relationship between line voltage and phase voltage for a Y connected balanced 3-φ system.
(c) Show that balanced 3-φ power can be measured by using two wattmeter.

Q.8(a) Draw the characteristics (V-I) curve for ideal and practical diode.
(b) Draw the output wave form for the following circuit.



(c) Derive the relationship between base-current and emitter current for BJT.

Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

Rajshahi University of Engineering & Technology

B.Sc. Engineering FIRST year SECOND Semester Examination, 2009

EEE 103

Basic Electrical Engineering

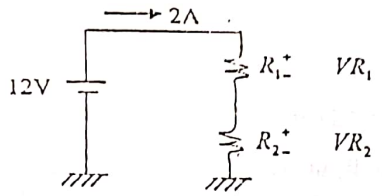
Full Marks: 70 Time: 3 Hours

N.B.: (i) Answer SIX questions, taking THREE from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.
(iv) Assume reasonable value for any data missing.

SECTION-A

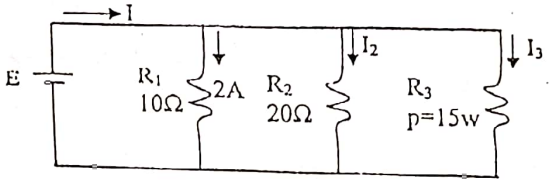
Q.1.(a) Define: (i) Linear circuit (ii) Bilateral circuit (iii) Ideal voltage source (iv) Short circuit. 4.00

(b) State voltage divider rule. Design the following voltage divider circuit such that $VR_1 = 5VR_2$. 3.67

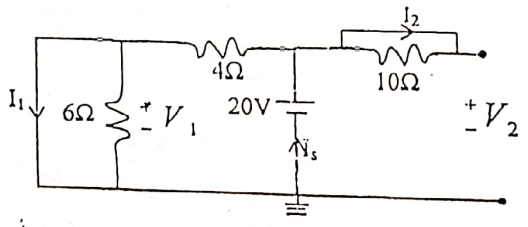


(c) Define efficiency. What is the total cost of using the following at 10 Tk. per unit. 4.00
(i) A 800w dish washer for 60 min (ii) A 1000w heater for 30 min (iii) Five 100w fan for 45 min.

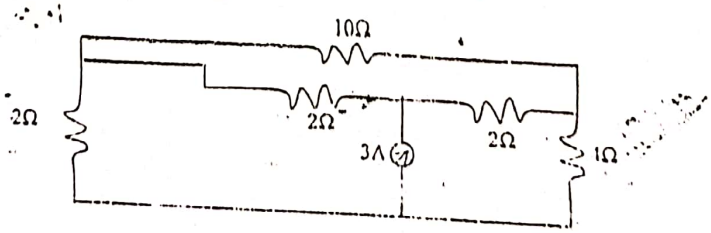
Q.2.(a) Find the unknown quantities of the following circuit. 3.00



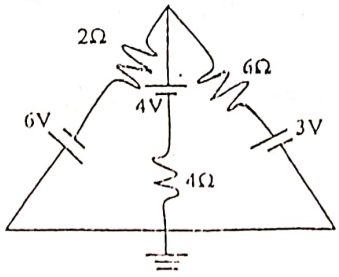
(b) For the following network find I_s, I_1, I_2, V_1 and V_2. 4.00



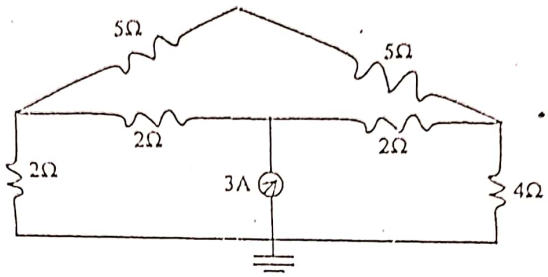
(c) Define node. Write down the node equations and also determine the voltage across the 10Ω resistor. 4.67



Q.3.(a) Using mesh analysis find the branch currents in the following circuit:

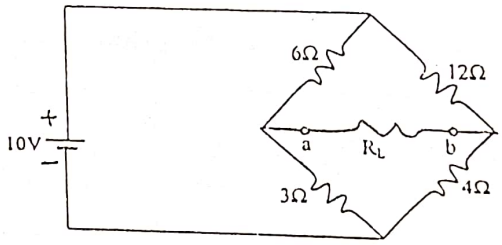


(b) Using nodal analysis find the potential across 4Ω resistor: 6.00

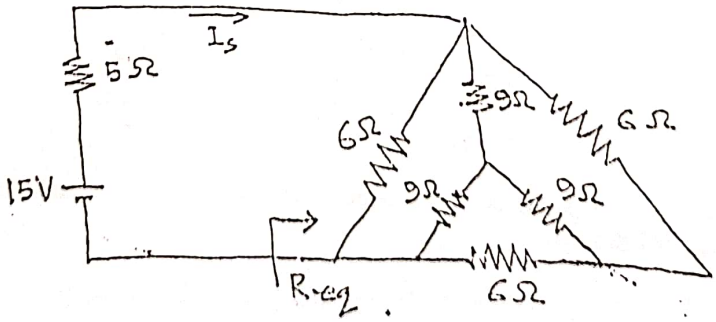


Q.4.(a) State super position theorem. Write down the limitation of this theorem. Prove that power delivered to R_L under maximum condition is $P_{max} = E_{th}^2 / 4R_{th}$. 4.00

(b) Determine the load resistance, R_L and maximum power delivered to the load under maximum power for the following network. 4.67



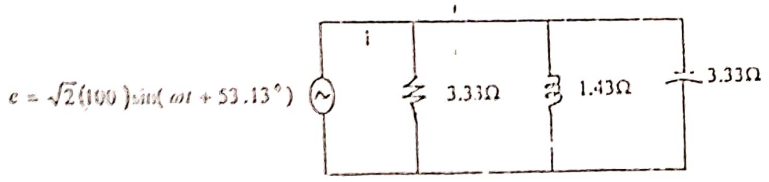
(c) Find $R_{eq.}$ and I_s for the following network. 3.00



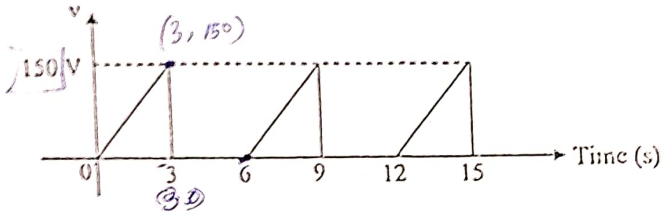
SECTION-B

Q.5.(a) Find the average power when $v = V_m \sin(\omega t + \theta_v)$, $i = I_m \sin(\omega t + \theta_i)$. Show that power dissipated by ideal inductor is zero. 3.67

(b) For the following circuit, find (i) Z_T (ii) I (iii) I_R, I_L, I_C (iv) P_R, P_L, P_C, P (v) Pf. 8.00

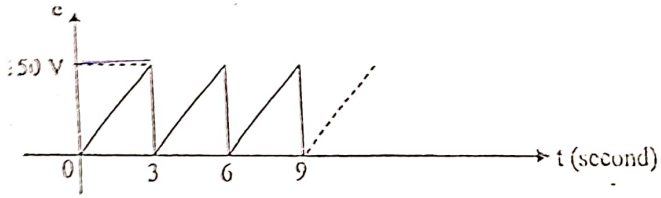


Q.6.(a) Define (i) Form factor (ii) Crest factor. Find the form factor of the wave form shown in figure below. 4.67



(b) Define RMS. Show that only resis or consumes power but inductor and capacitor do not consume any power. 4.00

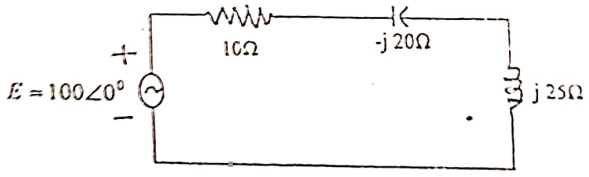
(c) Find the rms value of the following wave form. 3.00



Q.7.(a) Why starters are necessary for motors? 2.00

(b) Define (i) Mutual inductance (ii) coefficient of coupling. 2.00

(c) Find the (i) Real power (ii) Apparent power (iii) Reactive power (iv) Power factor, F_P 4.67 for the following network.



(d) What is counter emf? Why the counter emf can never be equal to the applied voltage? 3.00

Q.8.(a) Define transformer. Determine the condition for maximum efficiency of a transformer. 3.67

(b) Show how a diode can be used as rectifier. Find the expression of PIV for a half wave diode rectifier. 4.00

(c) What are differences between BJT and FET? Show how BJT can be used as a switch. 4.00

-: The End:-

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering First Year Second Semester Examination, 2008
EEE 103
Basic Electrical Engineering

Full marks: 70 Time: 3 Hours

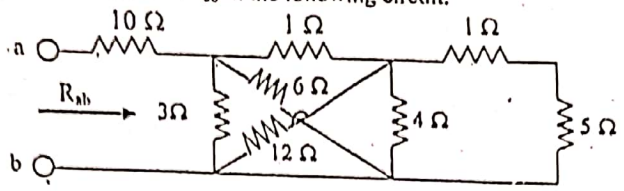
67

N.B:- (i) Answer any SIX questions, taking THREE from each section.
(ii) Figure in the margin indicate full marks.
(iii) Use separate answer script for each section.

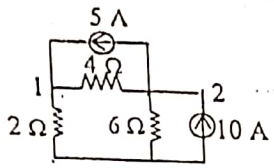
SECTION-A

Q.1 (a) Define (i) Practical voltage source (ii) Practical current source (iii) Linear circuit. 3.00

(b) Calculate the equivalent resistance R_{ab} in the following circuit. 4.00

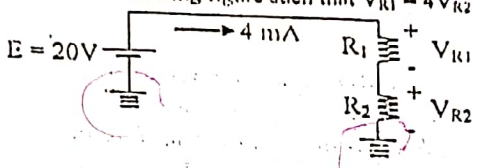


(c) Using Nodal analysis, determine the node voltage in the following circuit. 4.67

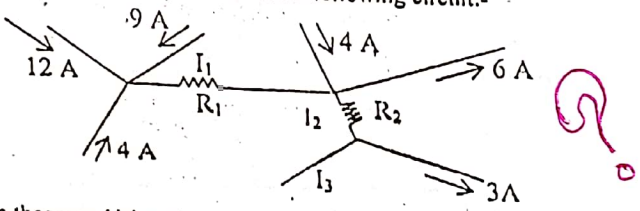


Q.2 (a) State and explain the following terms:- (i) KVL (ii) KCL (iii) VDR (iv) CDR 6.00

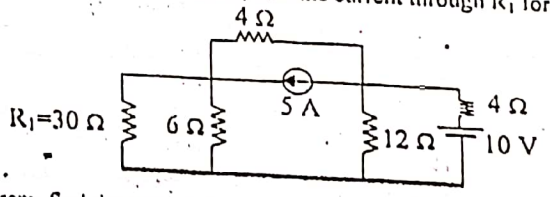
(b) Design the voltage divider of the following figure such that $V_{R1} = 4V_{R2}$ 3.00



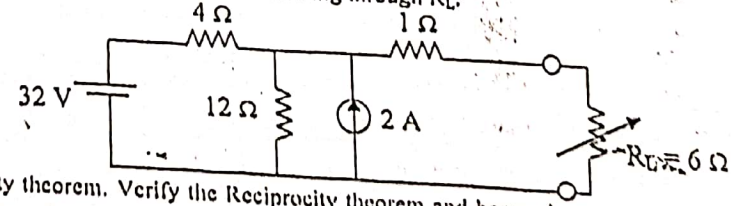
(c) Find all unknown currents and their direction in the following circuit:- 2.67



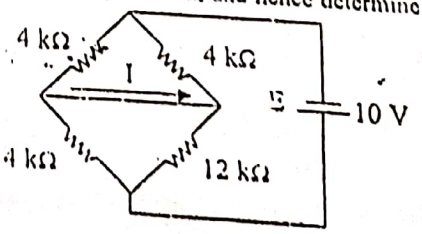
Q.3 (a) State Superposition theorem. Using this theorem, find the current through R_1 for the network. 4.67

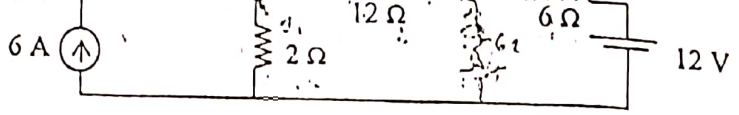


(b) Using Thevenin's theorem, find the current flowing through R_L. 3.00

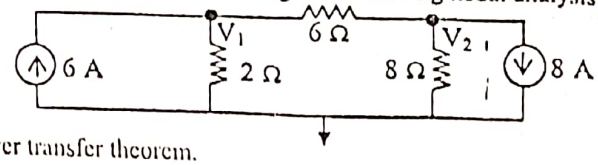


(c) State Reciprocity theorem. Verify the Reciprocity theorem and hence determine the current I for the following network. 4.00





(b) Determine the voltage V_1 and V_2 of the following network using nodal analysis: 6.00



(c) State maximum power transfer theorem. 1.67

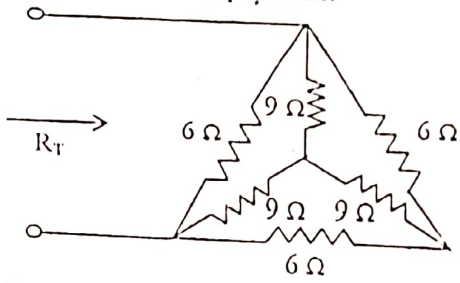
SECTION-B

Q.5 (a) Define: (i) Oscillating current (ii) Periodic current (iii) Alternating current (iv) Phase sequence. 4.00

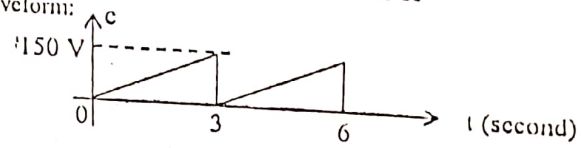
(b) Find the real power and reactive power when $v = V_m \sin(wt + 0)$ and $i = I_m \sin wt$. 3.67

(c) For a particular circuit, the supply voltage $v = 100\sin(157t - 150°)$ and the supply current $i = 10\cos(157t + 30°)$. Find the nature and the magnitude of the circuit parameter. 4.00

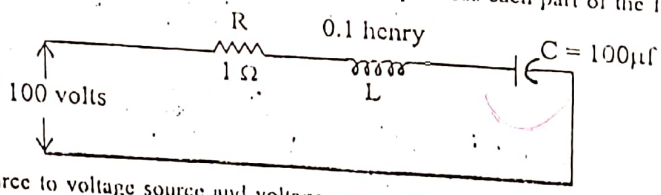
Q.6 (a) Find the total resistance of the following network: 2.67



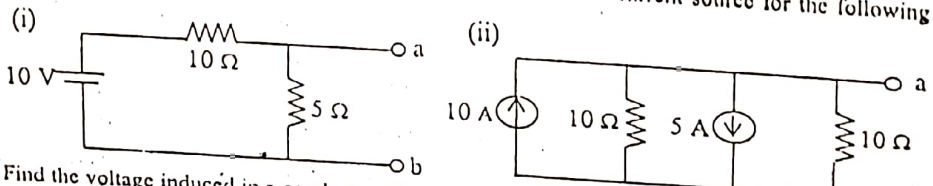
(b) Find the form factor of the following waveform: 4.00



(c) Calculate the frequency, power factor, power and voltage drop across each part of the following circuit at resonance. 5.00



Q.7 (a) Convert current source to voltage source and voltage source to current source for the following networks. 3.00

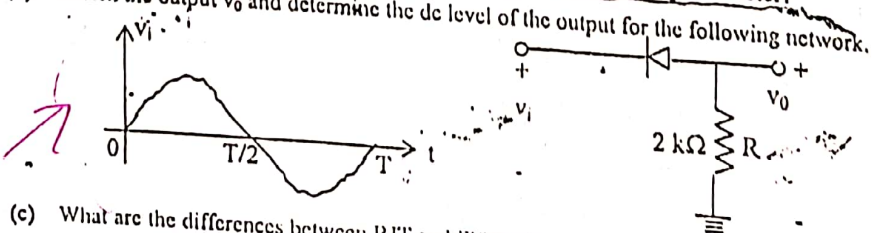


(b) Find the voltage induced in a conductor 12 inch long that is moving at 60° to the lines of flux in a uniform magnetic field of 30,000 lines per sq. inch. The length of the conductor in the magnetic field is 10 inch and the velocity of the conductor is 50 ft/sec. 4.00

(c) What is counter emf? Why the counter emf can never be equal to the applied voltage? 4.67

Q.8 (a) What is Zener diode? What are the necessities of starter for starting of a motor? 3.67

(b) Sketch the output v_o and determine the dc level of the output for the following network. 4.00



(c) What are the differences between BJT and FET? What do you mean by primary and secondary of a transformer? 4.00

Heavens Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING

RAJSHAHI UNIVERSITY OF ENGINEERING & TECNNOLOGY

B.Sc. Engineering FIRST Year SECOND SEMESTER, Examination 2007

06

EEE 103

BASIC ELECTRICAL ENGINEERING

Full Marks: 70 **Time: 3 Hours**

N.B.: Answer SIX questions, taking THREE from each section.
Figure in the margin indicate full marks.
Use separate answer script for each section.
Assume reasonable value for any data missing.

SECTION – A

Q.1.(a) Define resistance. Discuss the temperature effect on resistance of copper. 3.67

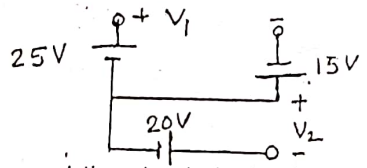
(b) Find the range in which a resistor having the following color bands must exist to satisfy the manufacturer tolerance: 3.00

1st band	2nd band	3rd band	4th band	5th band
Gray	Red	Black	Gold	Brown

What is the significance of the 5th band?

(c) What is the total cost of using the following at 7 Tk. per unit?
- (i) a 860-W air conditioner for 24 hr.
- (ii) a 4800-W clothes dryer for 30 min.
- (iii) a 60-W tape recorder for 2 hr.
- (iv) a 1200-W dishwasher for 45 min.

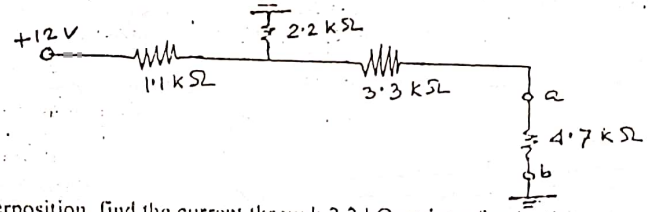
(d) Find V_1 and V_2 for the following network.



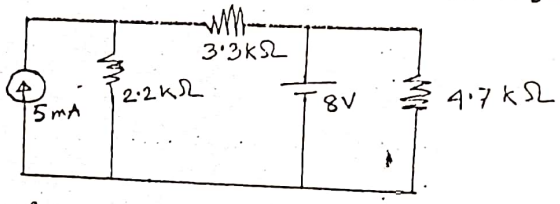
Q.2.(a) Prove that the power delivered to the load resistance R_L under maximum condition is 3.67

$$P_{L\max} = \frac{E_{th}^2}{4R_{th}}$$

(b) Using Thevenin theorem determine the voltage and current through 4.7 kΩ resistor connected across 'ab' 4.00

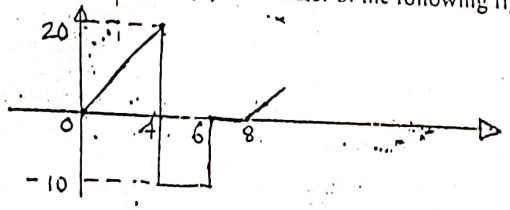


(c) Using superposition, find the current through 2.2 kΩ resistor for the following network. 4.00

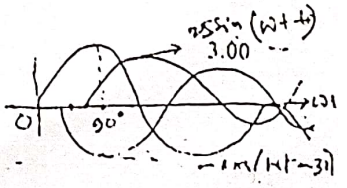


Q.3.(a) What is meant by form factor and peak factor?

(b) Find the (i) Crest factor and (ii) form factor of the following figure. 3.00 5.67



(c) Sketch the following signal and find the phase relationship between them 3.00
$i = -5 \cos(\omega t - 30^\circ)$
$v = 25 \sin(\omega t - 60^\circ)$



Q.4.(a) What is the basic difference between series and parallel resonance? Mention some practical applications of series resonance circuit. 4.0

(b) "Capacitor and inductor do not consume any power" – Explain. 4.0

(c) For a balanced 3-ϕ, Y system, proof the relation between line voltage and phase voltage. 3.6

SECTION - B

Q.5.(a) Draw the characteristic (V – I) curves of ideal and practical diode. 3.67

(b) What is meant by (i) PIV (ii) Breakdown voltage & (iii) Knee voltage? 3.00

(c) Prove that the maximum efficiency of a half wave rectifier is 40.6%. 5.00

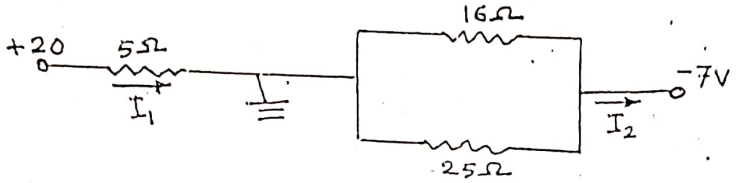
Q.6.(a) Define real, reactive and apparent power. 2.67

(b) What is meant by quality factor of a series resonant circuit? Draw the Z_T versus frequency curve of series resonant circuit (Both magnitude & phase plot). 6.00

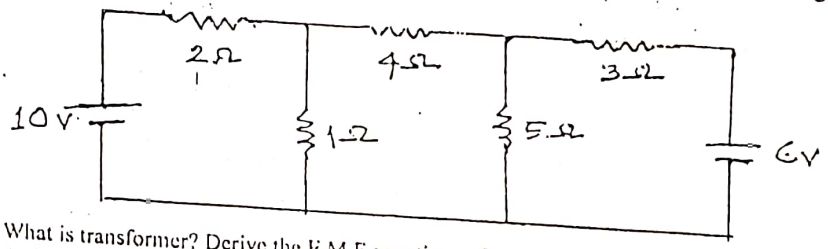
(c) Discuss selectivity & half power point of a series resonant circuit. 3.00

Q.7.(a) State Superposition theorem. What are the limitations of this Theorem? 3.67

(b) Determine the currents I_1 and I_2 for the following circuit. 4.00



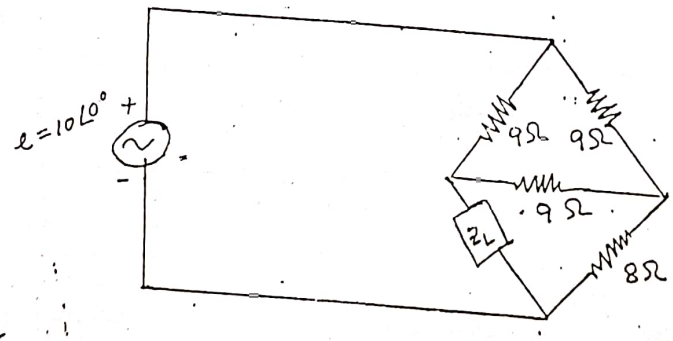
(c) Using mesh analysis, determine the current through the 6-volt battery for the following network. 4.00



Q.8.(a) What is transformer? Derive the E.M.F equations of a transformer. 5.00

(b) A shunt motor takes the total line current of 5 amp. Under full load condition, the field current is 1.5 amp. If the terminal voltage of the motor is 230 V. then determine the back emf of the motor under full load condition. Consider armature resistance is 0.2 Ω. 3.67

(c) Find the load impedance in the following figure for maximum power to the load and also find the maximum power. 4.00



(b) Define rms value and average value of sinusoidal voltage wave. 3.67

(b) "Capacitor and inductor do not consume any power" – Explain. 4.00

(c) The current and voltage of a certain network are given, respectively as:

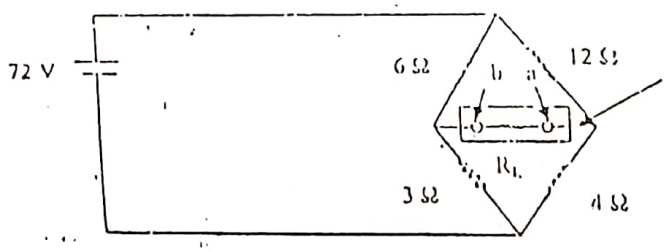
$v(t) = 300 \cos(\omega t + 30^{\circ})$

$i(t) = 50 \sin(\omega t + 30^{\circ})$

Calculate the real power consumed by the network.

Q.3(a) State (i) Superposition theorem (ii) Thevenin's theorem and (iii) Maximum Power Transfer theorem. 3.00

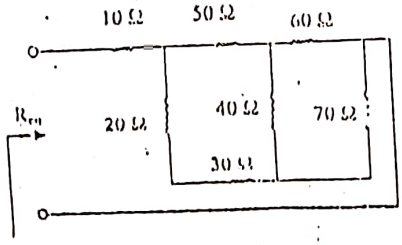
(b) Find the Thevenin equivalent circuit for the network in the indicated area of the following bridge network 4.33



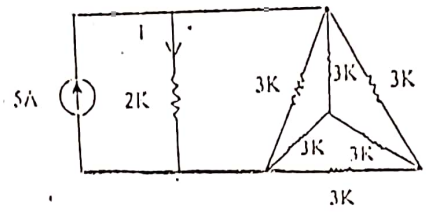
(c) State Kirchhoff's Voltage Law. Design the following voltage divider circuit such that $V_{R1} = 4V_{R2}$ 4.67

SECTION – B

Q.5(a) Draw the R_{eq} of the following combination 4.00



(b) Determine the current I of the following network 5.00

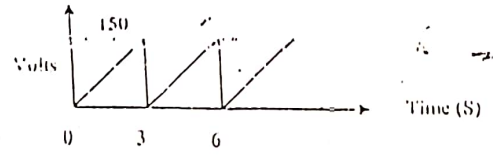


(c) Define an ideal voltage source and ideal current source. 2.67

Q.6(a) Define (i) Oscillating current (ii) Periodic current and (iii) Alternating current 3.00

(b) Prove that the effective value of a sinusoidal wave is equal to 0.707 times the maximum value. 3.67

(c) Find (i) the form factor and (ii) the crest factor of the saw tooth wave form as shown in Figure below 5.00



Q.7(a) State maximum power transfer theorem in a.c circuit . 1.67

(b) Compare series and parallel resonance. 3.00

(c) A series circuit with resistance of 10 Ω, inductance of 0.2 H and capacitance of 40 μF is supplied with a 100 V supply at variable frequency. Find the frequency at which resonance will take place. At resonance find the current, power and power factor. Also find the voltage across resistance, inductance and capacitance at that time. 7.00

Q.8(a) "DC motor starts with a series resistance" – Explain. 3.00

(b) What is transformer? Derive the emf equation of a single phase transformer. 4.00

(c) A shunt motor takes the total line current of 5 amp. Under full load condition, the field current is 1.5 amp. If the terminal voltage of the motor is 230 V, then determine the back emf of the motor under full load condition. Consider armature resistance is 0.2 Ω. 7.67

DEPARTMENT OF CIVIL ENGINEERING
Rajshahi University of Engineering & Technology
B. Sc. Engineering FIRST Year SECOND Semester Examination, 2005

EEE 103
Basic Electrical Engineering

Full Marks: 70 Time: Three Hours

N. B.: (i) Answer SIX questions, taking THREE from each section
(ii) Figures in the margin indicate full marks
(iii) Use separate answer script for each section
(iv) Assume reasonable value for any data missing

SECTION - A

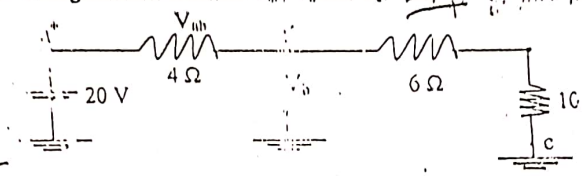
Q. 1.(a) Explain Ohm's law. The resistance of a copper wire is 0.76 Ω at 30 °C. What is its resistance at -40 °C? 3.00

(b) State and explain Kirchoff's voltage law. 2.00

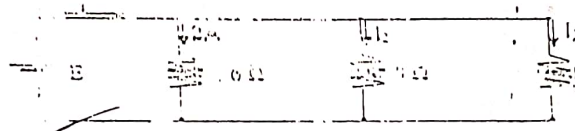
(c) Define efficiency. A 2 hp motor operates at an efficiency of 75 %. What is the power input in watts? If the input current is 9.05 A, what is the input voltage? 4.00

(d) Define voltage and current. What is meant by DC and AC? 2.67

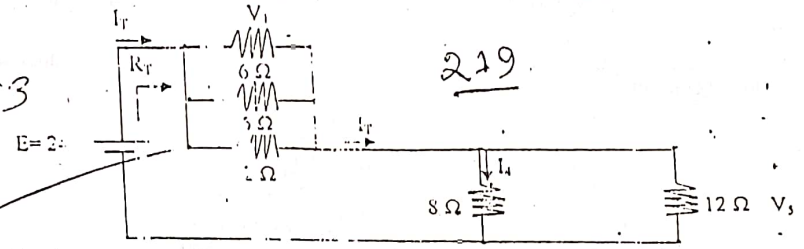
Q. 2.(a) For the following network calculate V_{ab}, V_b and V_c. 4.00



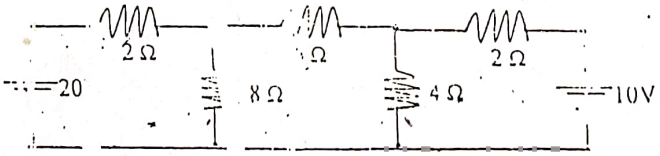
(b) Find the unknown quantities for the following circuit. 4.00



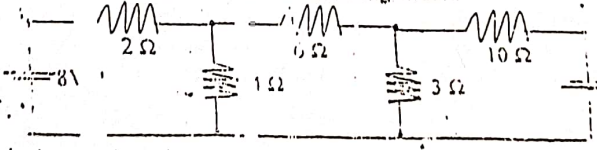
(c) Find the unknown currents and voltages for the network. Find R_T, I_1, V_1 and V_3. 3.67



Q. 3.(a) Using mesh analysis determine the current through the 10 V battery for the network. 5.00



(b) Write down the nodal equations for the following circuit. 3.00



(c) Explain Superposition theorem with an example. 3.67

Q. 4.(a) Describe Lenz's law. Show that the voltage induced in the armature of a generator is $E_g = \frac{P\phi Z N}{60 a}$. 3.67

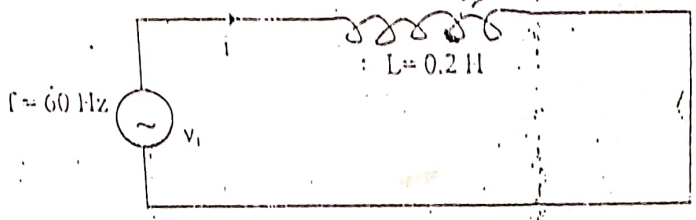
(b) Draw the circuit diagram of a three-point starter and explain its operation. How does a four-point starter overcome the drawbacks of a three-point starter? 4.00

(c) How is continuous rotation obtained in the coil of DC motor? 2.00

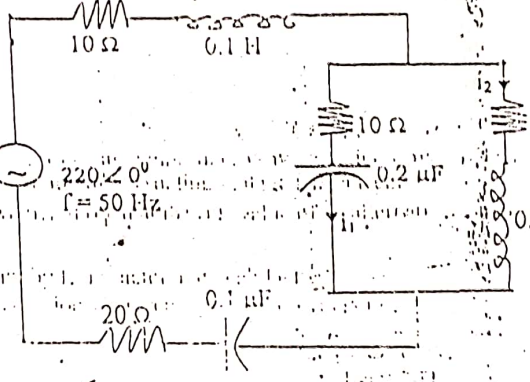
SECTION - B

Q. 5.(a) Defi... phase, leading and amplitud... Why does sine wave in electrical power system? 3.67
(b) Dedu... the equation of alternati... oltage and current. 4.00
(c) Defi... rms value. Show that the ... value of an alternating quantity is $\frac{1}{\sqrt{2}}$. 4.00

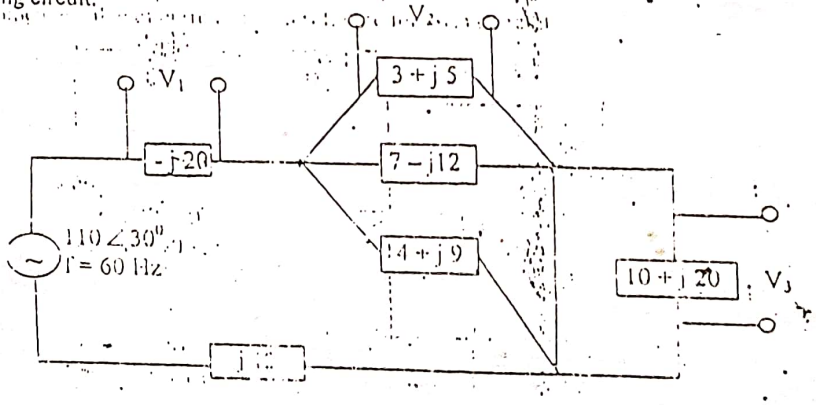
Q. 6.(a) What ... meant by form factor and p... ak factor? 2.00
(b) Dedu... the equation of current for ... he following circuit. 3.67



(c) Determine the value of currents i_1 and i_2 for the following circuit. 6.00



Q. 7.(a) What is phasor? Show that a pure capacitor does not consume any power. 2.67
(b) What is meant by balanced system? Show that in a balanced Y connection system $V_L = \sqrt{3}V_p$. 4.00
(c) Determine the voltage V_1, V_2 and V_3 and also calculate the total power loss in the following circuit. 5.00



Q. 8.(a) Defi... the term transformer. Write the principle of operation of a single-phase transformer. 3.67
(b) Dedu... the equation of torque of a three phase induction motor under running conditions and ... o determine the condition f... maximum running torque. 5.00
(c) Wh... transformer rating in KVA. 2.00
(d) De... primary and secondary of a ... ansformer. 1.00

The End