Department of Computer Science and Engineering
B.Sc. (Engg.) Part-I Odd Semester Examination- 2014
Course: APEE-1131 (Electrical Circuits and Electronics)

Full Marks: 52.5 **Time: 03 hours**

(Answer SIX questions taking any THREE from each group)

Part-A

1.(a) State and explain Thevenin's theorem. 4

(b) Calculate (i) the equivalent resistances across the terminals of the supply, (ii) total current supplied by the source and (iii) power delivered to 16 ohm resistor as shown in following Fig-1. 4.75

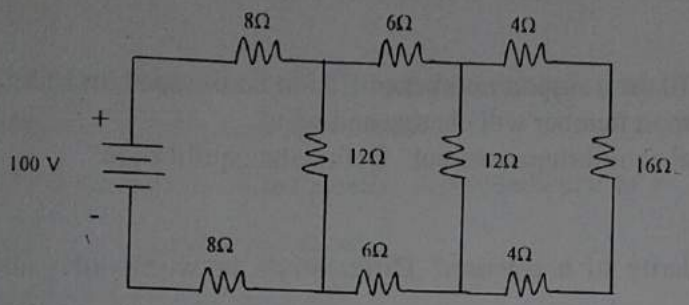


Fig-1.

2. (a) Define conductor and semiconductor in terms of energy band. 2

(b) Why do we mix impurity to intrinsic semiconductor? 1

(c) Differentiate between avalanche and zener breakdown. 3

(d) Find out the current supplied, if any by the battery in the circuit of Fig-2. 2.75

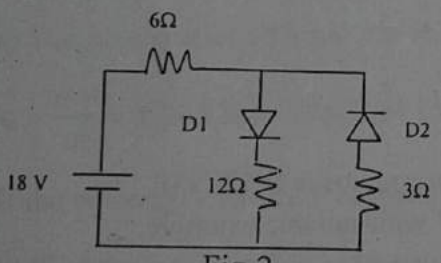


Fig-2.

3.(a) What is PN junction? How depletion layer is formed in PN junction? Explain. 4.75

(b) What is leakage current? 1

(c) The voltage of Fig-3(a) is applied to the circuit of Fig-3(b). Find the wave-shape of the output voltage. 3

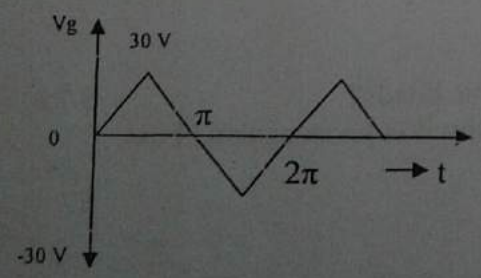


Fig-3(a)

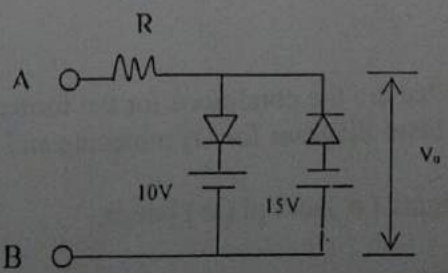


Fig-3(b)

4.(a) What is a rectifier? 1

(b) Draw the circuit diagram of a full wave rectifier and show its output wave-shape. What would be the effect if you connect a capacitor parallel to the load? 4.75

(c) Is the ideal Zener diode shown in Fig-4 properly biased? If not, explain why? 3

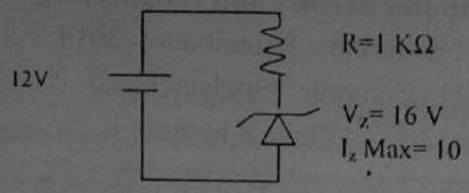


Fig-4.

Part-B

5. (a) What do you meant by transistor biasing? Why it is needed? 3
(b) Define stability factor. Derive an expression for the stability factor of voltage divider bias in CE amplifier. 4
(c) How thermal runway can be preventing? 1.75

6.(a) What do you mean by feedback? Explain positive feedback and negative feedback. 3.75
(b) Design an Astable multivibrator which will produce the output wave-shape as shown in Fig-6. 5

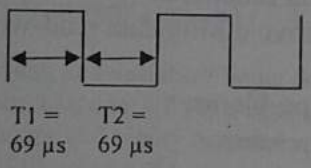


Fig-6.

7.(a) What are the characteristics of an ideal OP-Amp? 2
(b) How an OP-Amp can be used as a differentiator? Explain. 3.75
(c) The input to the differentiator circuit of Fig-7 is a sinusoidal voltage of peak value 5 mv and frequency 1 KHz. Find out the output if R=10 KΩ and C=1 μF. 3

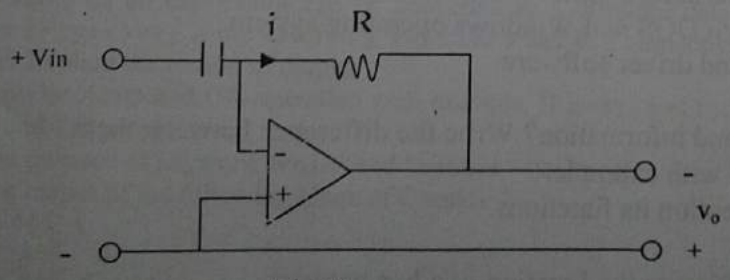


Fig-7.

8.(a) What is Oscillator circuit? What are the conditions for oscillation? 2.5
(b) Explain Hartley oscillator and derive the equation for oscillation. 3.75
(c) What are the desired characteristics of a photoconductive material? 2.5

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg. Part-I Odd Semester Examination 2015
Course No. :APEE1131 (Electrical Circuits and Electronics)
Marks: 52.5 Time: 3 Hours

Answer any three questions from each part.

Part A

1. (a) State and explain Norton's theorem. 3
   (b) State and explain Kirchoff's voltage law. 2.75
   (c) Find the current flowing through resistor 20 Ω shown in the following Fig.1. 3

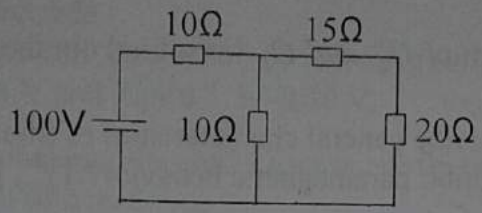


Fig.1

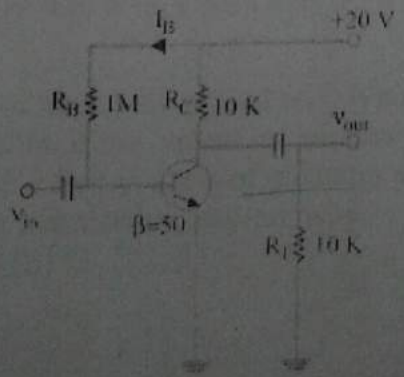
2. (a) What is semiconductor? Write the properties of semiconductor. 1.75
   (b) What is a P-N junction diode? 1
   (c) Explain the V-I characteristics of a P-N junction diode. 3
   (d) Show that a Zener diode can be used as a voltage regulator. 3

3. (a) What is a transistor? Discuss the structure of a transistor. 3
   (b) How a transistor can be used as switch? Explain. 4
   (c) Why is collector wider than emitter and base? 1.75

4. (a) What is a filter? 1
   (b) Deduce an expression for cut-off frequency of a high pass filter. 4
   (c) Design a low pass filter having cut-off frequency 1 KHz and characteristic impedance 500 ohms. 3.75

Part B

5. (a) What do you mean by DC load line of a transistor? What is Q point? 3
   (b) For a single-stage CE amplifier circuit shown in following figure. Calculate i) r_{in} ii) r_o iii) A_i iv) A_v v) G_p. Take transistor ß= 50. Neglect V_{BE} and take $r_e = 25mV/I_E$. 5



   (c) Define α for a transistor. 0.75

6. (a) Define OP-AMP. What are the basic characteristics of an ideal OP-AMP? 2

(b) Derive the expression of voltage gain for difference amplifier. 2

(c) A 5-mV, 1KHz sinusoidal signal is applied to the input of an OP-AMP integrator of Fig. 2 for which R_1= 100K and C_F= 1μF. Find the output voltage. 3

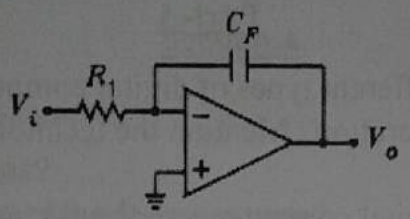


Fig. 2

(d) What do you mean by virtual ground of OP-AMP? 1.75

7. (a) What is an oscillator? What are the conditions for oscillation? 3

(b) Design an Astable Multivibrator whose frequency of oscillation is 7.25 KHz. Consider $R_1 = R_2$ and $C_1 = C_2$. 4.75

(c) What is feedback? 1

8. (a) What is meant by transistor biasing ? Mention various method used for transistor biasing. 2

(b) What is the advantage of potential divider biasing? 2

(c) Define cutoff point and saturation point. 2

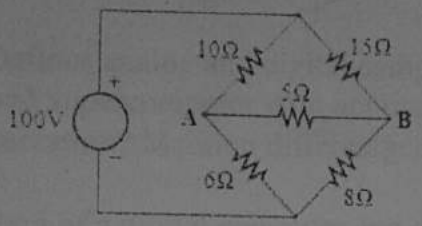
(d) What is stabilization of operating point? What is the utility of ac load line? 2.75

Part-I - Odd

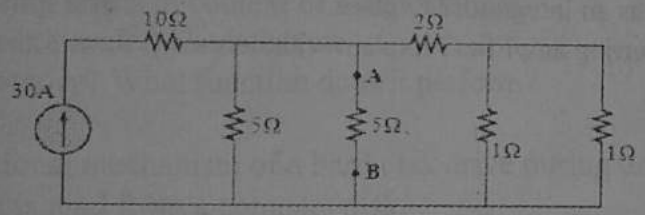
University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg. (CSE) 1st Year Odd Semester 2016
Course: APEE 1131 (Electrical Circuits and Electronics)
Time: 3 Hrs. Full Marks: 52.5
[N.B. Answer SIX questions taking at least THREE from each Section.]

Part A

1(a) State and explain maximum power transfer theorem. 4
(b) Apply Thevenin's theorem to calculate the current through the 5Ω resistor of the circuit below: 4.75



2(a) State and explain Kirchoff's current law with a suitable example. 3
(b) Distinguish between Thevenin's and Norton's theorem. 2
(c) Apply Norton's theorem to calculate current flowing through the terminal AB of the figure below: 3.75



3(a) What are the different kinds of Filter? Explain each type with frequency response curve. 3
(b) Find out the characteristics impedance of a symmetrical T-section network. 2.75
(c) Draw and discuss the circuit diagram of a T-section low pass filter and find out its cut off frequency. 3

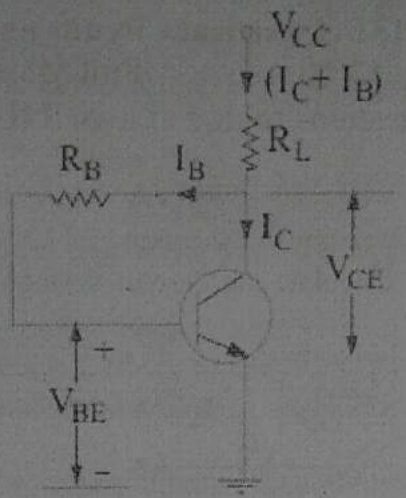
4(a) What is a rectifier? How can you use a junction diode as a rectifier? 2.75
(b) Briefly discuss the operation of a full wave bridge rectifier. Show the effect of a shunt capacitor in the rectifier. 3
(c) Explain the V-I characteristics of a zener diode. 3

Part B

5(a) Draw the circuit diagram of an npn transistor in CE configuration and discuss its input and output characteristics. 3.75
(b) What is load line? Show the importance of load line with proper diagram. 2
(c) Show the relationship between α and β. 1
(d) What is thermal Runaway? Define stability factor. 2

6(a) What do you understand by transistor biasing? Why is it needed? 2
(b) Draw the diagram of a base bias with emitter feedback circuit and explain its operation. 4

(c) In figure V_{CC}=12V, V_{BE}=0.7V, R_L=1K ohm, R_B=100K ohm and β=100. Now Find I_C, V_{CE}, I_B and stability factor. 2.75



7(a) What is feedback? Discuss the principle of a feedback amplifier. 3

(b) What is an oscillator? Define damped and undamped oscillations. 2

(c) Design a bistable multivibrator and discuss its operation. 3.75

8(a) What is CMRR? Write down some characteristics of an ideal Op-Amp. 1.75

(b) How an Op-Amp can be used as an integrator? Explain. 4

(c) What is inverting and non-inverting amplifier? Explain with necessary figures. 3

University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg. Part-I Odd Semester, Examination-2017
Course: APEE 1131 (Electrical Circuit and Electronics)
Time: 3 Hrs. Full Marks: 52.5
[Answer **SIX (06)** questions taking at least **THREE (03)** from each Section.]

Section A

1. (a) Write the steps of branch current analysis method. 3
   (b) What is passive sign convention? What do you mean by linear and bilateral components? 2
   (c) Find the current through each resistor and voltage drop across each resistor of the circuit using branch current analysis method in figure-1. 3.75

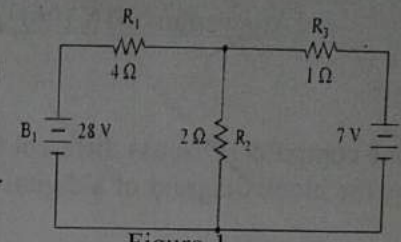


Figure-1

2. (a) What is a PN junction diode? 1
   (b) Define conductor, semiconductor and insulator with energy band diagram. 1.75
   (c) Explain the I-V characteristic of PN junction diode in forward and reverse bias with proper diagram. 3
   (d) How is depletion layer formed in a PN junction diode? Explain with energy band diagram. 3

3. (a) State and explain Thevenin's theorem. 4
   (b) With reference to the network of figure-2, by applying Thevenin's theorem find: 4.75
      i) The equivalent e.m.f. of the network when viewed from terminals A and B.
      ii) The equivalent resistance of the network when looked from terminals A and B.
      iii) Current in the load resistance R_L of 15Ω.

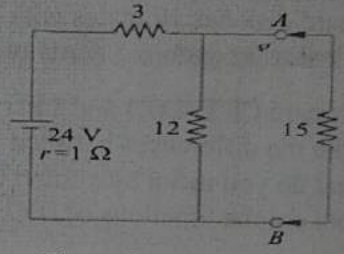


Figure-2

4. (a) What are the different kinds of filters? 1.75
   (b) Deduce an expression for cut-off frequency of a high pass filter. 3
   (c) A filter section is to have a characteristic impedance at zero frequency of 600 Ω and a cut-off frequency at 5 MHz Design (i) a low-pass T section filter, and (ii) a low-pass π section filter to meet these requirements. 4

Section B

5. (a) Draw the circuit diagram of an astable multivibrator and discuss its operation. 3
   (b) Explain the principle of operation of a photodiode. 2
   (c) Write short notes on LED and LCD. 3.75

6. (a) What is Bipolar Junction Transistor? Explain the architecture of a Bipolar Junction Transistor. 4
   (b) Determine the value of I_{CQ} and V_{CEQ} for the amplifier shownin figure-3. 2
   (c) What is meant by transistor biasing? Why is it needed? 2.75

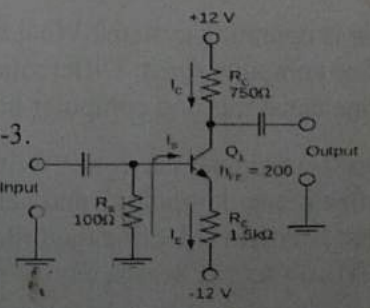


Figure-3

7. (a) Define OP-AMP. What are the characteristics of an ideal OP-AMP? 2
   (b) How can an OP-AMP be used as a differentiator? Explain. 3.75
   (c) What is inverting and non-inverting amplifiers? Explain with necessary figures. 3

8. (a) What is an oscillator? What are the conditions for oscillation? 3
   (b) Draw the circuit diagram of Hartley oscillator and describe its principle of operation. Derive the equation for oscillation. 3.75
   (c) Explain positive feedback and negative feedback. 2

University of Rajshahi
Department of Computer Science of Engineering
B. Sc. (Engg.) Part-1,Odd Semester, Exam - 2018
Course Title: APEE1131 (Electrical Circuit and Electronics)

Total marks: 52.5 **Time: 3 Hours**

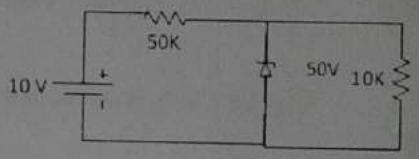
[Answer three questions from each section]

Section-A

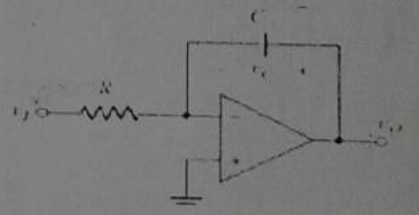
1. a) What is LCD? Describe the working principle of LCD. 3.75
   b) Compare between LED and LCD. 2
   c) What is P-N photodiode? Why it works in reverse biased condition? 3

2. a) Define conductor, semiconductor and insulator in terms of energy band diagram. 3
   b) Discuss the formation process of P-type and N-type extrinsic semiconductor with proper diagram. 3
   c) Consider a specimen of Silicon of length 1.5 cm and area 1 mm2. Calculate the i) conductivity ii) resistivity and iii) resistance of the specimen. (Assume $n_i = 1.5 \times 10^{16}, \mu_e = 0.13\ m^2/v-s, \mu_h = 0.05\ m^2/v-s$) 2.75

3. a) What is a PN junction diode? Show the V-I characteristics of a PN junction diode. 3
   b) Differentiate between Zener breakdown and avalanche breakdown. 2.75
   c) For the circuit shown below, find: 3
      i. Output voltage
      ii. Voltage drop across 50 K-Ohm resistor and
      iii. Voltage across the diode.

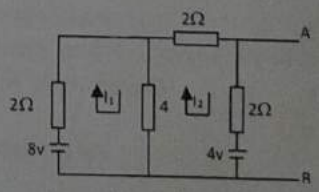


4. a) What is an Op Amp? What are the basic characteristics of an ideal OP-AMP? 3
   b) What do you mean by virtual ground of an op-amp? Explain. 1.75
   c) A 10mV, 5 KHz sinusoidal signal is applied to the input of an OP-AMP integrator as shown below for which R= 100K and C= 1μF. Find the output voltage. 4



Section-B

5. a) State and prove maximum power transfer theorem. 4.75
   b) Use Thevenin's theorem to find the current in a 20Ω load connected between the terminals A and B of the network shown in the figure- 4



6. a) What are the classification of circuit components? Define active components and passive components with examples. 2.75
   b) State and explain Kirchhoff's current law. 3
   c) Write the current division formula when only two resistance is connect in parallel. Two resistor of 4 Ω and 6Ω are connected in parallel. If the total current is 30A, find the individual current through each resistor. 3

7. a) What is an oscillator? What are the conditions for oscillation? 3
   b) What is feedback? 1
   c) Design an Astable Multivibrator whose frequency of oscillation is 5 KHz. Consider $R_1 = R_2$ and $C_1 = C_2$. 4.75

8. a) What is a rectifier? Show the circuit diagram of a full wave rectifier. 4
   b) Define voltage regulation (VR) and Peak Inverse Voltage (PIV). 2
   c) A half wave rectifier using Ge diode has secondary emf of 20 V_{p-p}. Diode forward resistance is 0.25 Ohm and load resistance is 100 Ohm. Find (i) Maximum load voltage (ii) DC load voltage and (iii) efficiency. 2.75

University of Rajshahi

Department of Computer Science and Engineering

B.Sc. in Engineering 1st Year 1st Semester Examination-2019

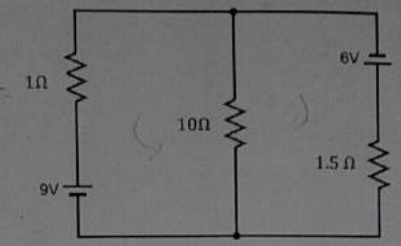
Course: **EEE 1131/APEE 1131 [Electrical Circuit and Electronics]**

Marks: 52½ [Answer any six (06) questions taking three (03) from each section.] Time: 3 Hours

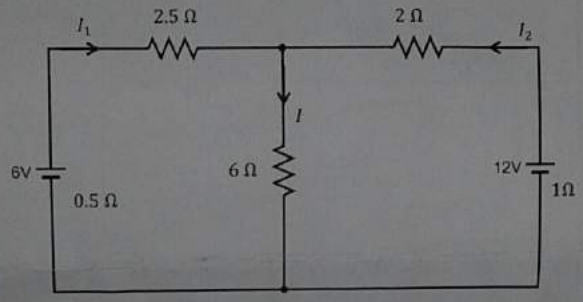
Section-A

1.a) Show that in any electrical network the incoming current is equal to outgoing current. 3

b) From the circuit shown below determine the current through 10 Ohm resistor using i) Thevenin's theorem and ii) Norton's theorem. 5¾

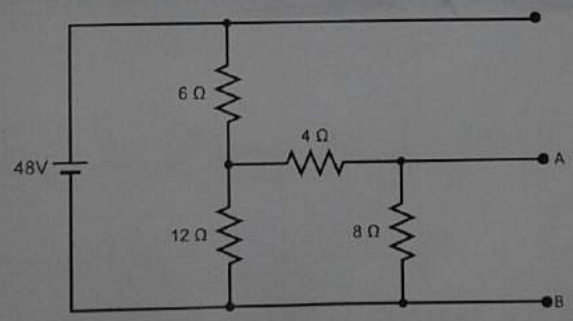


2.a) Determine the number of branches and nodes in the figure given below. Find out the current I_1 and I_2. 2



b) Define Thevenin's voltage and Thevenin's resistance with an example. 3

c) Calculate the value of V_{TH} and R_{TH} between terminal A and B of the following figure: 3¾



3.a) Why *Si* or *Ge* is not used to fabricate LEDs? 2¾

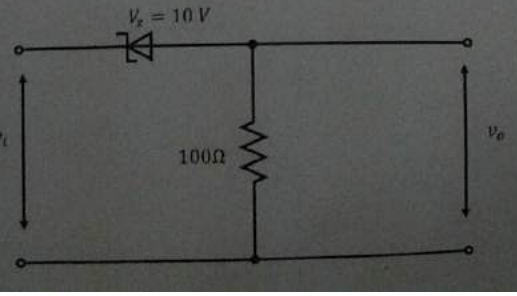
b) What is LCD? Why does it require extremely low power to operate LCDs? 3

c) Why P-N photodiode is known as one of the fastest photo-detector? What are the other uses of P-N photodiode except photo-detector? 3

4.a) What is a Zener diode? 1

b) Show the V-I characteristics of a Zener diode. 2¾

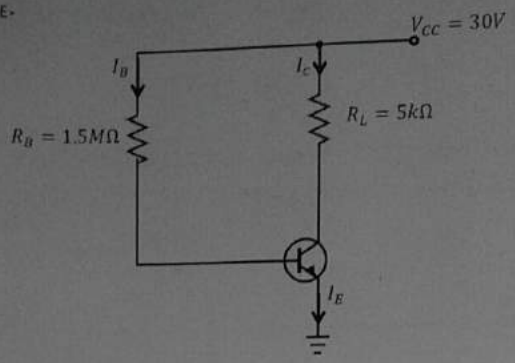
c) Calculate the value of v_0 for the given circuit for i) $v_i = 5V$ ii) $v_i = 10\ V$ and iii) $v_i = 15\ V$ 5



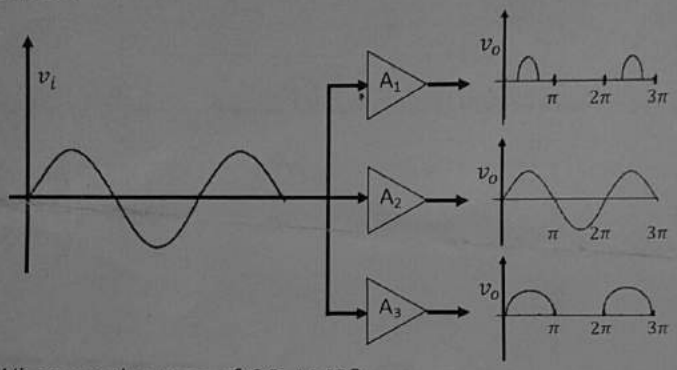
Section-B

5.a) What will happen if a transistor is not biased properly? 2

b) For the amplifier drawn below i) draw the load line and ii) mark the Q point. Assume ß=100 and neglect V_{BE}. 5



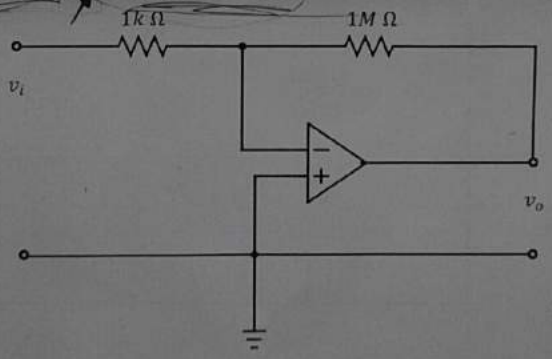
c) The inputs and outputs of three amplifiers A_1, A_2 and A_3 are shown below. Classify the amplifiers depending on their outputs. 1¾



6.a) What is an OP-AMP? What are the uses of OP-AMP? 2

b) Discuss the basic characteristics of an ideal OP-AMP. 1¾

c) For the following amplifier (assume the OP-AMP is ideal) determine the following - i) voltage gain ii) input resistance iii) output resistance 5



7.a) What is an oscillator? 1

b) Discuss the conditions for oscillation. 2

c) Design a Hartley oscillator which has to be tunable over 500 kHz to 1000 kHz. The values of the two inductors are 50 μH each. Neglect the effect of mutual inductance. 5¾

8.a) What do you mean by Zener breakdown and avalanche breakdown? 2

b) Draw the circuit diagram of a full-wave bridge rectifier. 2¾

c) Consider R_L is the load resistance in the half-wave rectifier shown below, determine i) rms value of load voltage ii) power absorbed by the load and iii) efficiency of the rectifier. 4