**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   4.75
below:
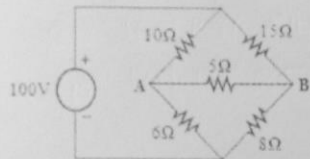
2(a) State and explain Kirchoff's current law with a suitable example.   3

(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   3.75
below:
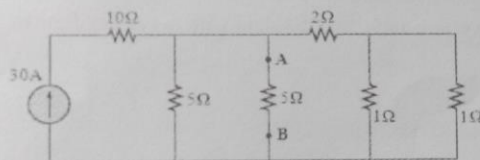
3(a) What are the different kinds of Filter? Explain each type with frequency response curve.   3

(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   3
frequency.

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   3
capacitor in the rectifier.

(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   3.75
output characteristics.

(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 $\beta=100$. Now Find I_C, V_{CE}, 2.75
     I_B and stability factor.
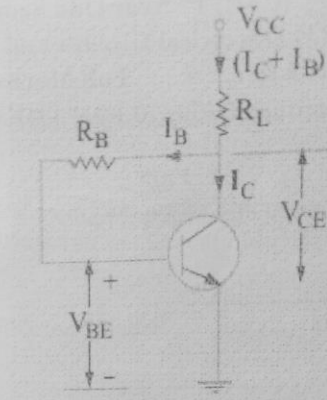
7(a) What is feedback? Discuss the principle of a feedback amplifier.   3
 (b) What is an oscillator? Define damped and undamped oscillations.   2
 (c) Design a bistable multivibrator and discuss its operation.   3.75

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 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
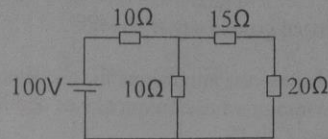   (c) Find the current flowing through resistor $20\,\Omega$ shown in the following Fig.1. 3

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 $\beta = 50$. Neglect V_{BE} and take $r_e = 25mV/I_E$. 5
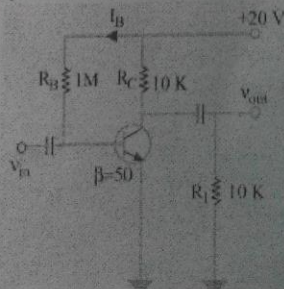
   (c) Define α for a transistor. 0.75

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
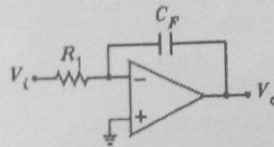

Fig. 2

(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

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 4.75 supplied by the source and (iii) power delivered to 16 ohm resistor as shown in following Fig-1.
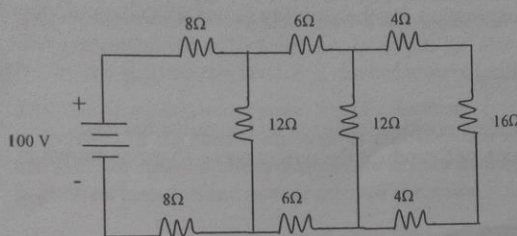

Fig-1.

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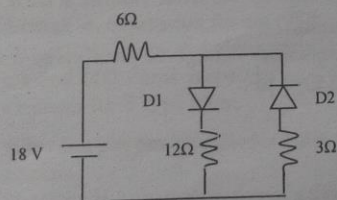(d) Find out the current supplied, if any by the battery in the circuit of Fig-2. 2.75

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 3 voltage.
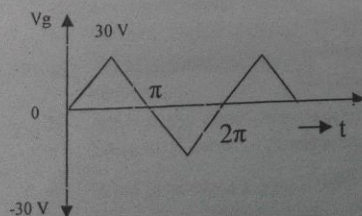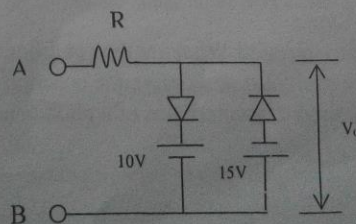

Fig-3(a)

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 4.75 be the effect if you connect a capacitor parallel to the load?

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

R=1 KΩ

12V

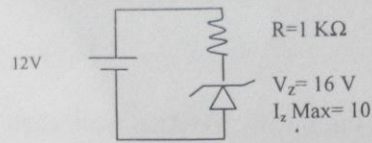V_z= 16 V
I_z Max= 10

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   4
          CE amplifier.   1.75
   (c)   How thermal runway can be preventing?

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

T1 =   T2 =
69 µs   69 µs

Fig-6.

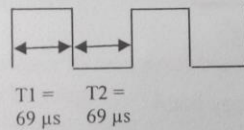7. (a)   What are the characteristics of an ideal OP-Amp?   2
   (b)   How an OP-Amp can be used as a differentiator? Explain.   3.75
   (c)   The input to the differentiator circuit of Fig-7 is a sinusoidal voltage of peak value 5 mv and   3
          frequency 1 KHz. Find out the output if R=10 KΩ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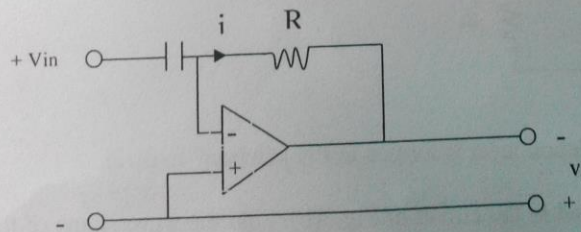
i   R

+ Vin

Vo

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

Department of Computer Science and Engineering
B.Sc. (Engg.) Part-1 Sem.-1, Examination-2013
Course: APEE-1131 (Electrical Circuits and Electronics)
Full Marks: 52.5 Time: 4 Hours
(Answer *three* questions from each section)

Section- A

1. a) What is stability factor? Show that stability factor 2.75

$$S = \frac{\beta + 1}{1 - \beta(\frac{dI_B}{dI_C})}$$

   b) Show the relationship between α and β for a transistor. 2
   c) How will you draw the load line? Why it is so important? 2
   d) For a certain transistor, I_c= 5.505 mA, I_B=50 μA, I_{co}= 5μA. Determine i) value 2
   of α, β and I_E. ii) the new level of I_B required to make I_c = 10mA.

2. a) State and prove maximum power transfer theorem. 4.75
   b) In figure-1, let the battery e.m.fs be 6v and 12v, their internal resistance 0.5Ω 4
   and 1Ω. The values of the resistances are as indicated. Find the current flowing
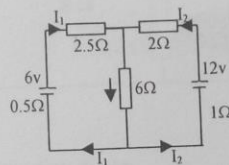   in different branches and voltage across 6 Ω resistor.

Figure-1

3. a) What is a filter? What are the different kinds of filters? 2
   b) Deduce an expression for cut off frequency of a low pass filter. 3.75
   c) Cut off frequency and characteristic impedance of a high pass filter are 20000 3
   c/s and 600 ohms respectively. Compute the value of the shunt and series
   elements for T type filter.

4. a) What is a p-n junction diode? How can you use a junction diode as a rectifier? 3
   Explain.
   b) Draw the V-I characteristics of a diode? 1.75
   c) Briefly discuss the operation of a half wave rectifier. Show the effect of a 4
   shunt capacitor in the rectifier.

Section- B

5. a) What is an operational amplifier? What do you know about input bias current 4
   and input offset voltage?
   b) Draw a circuit diagram of an inverting amplifier and find out its voltage gain. 4.75

6. a) What is an amplifier? What do you mean by class A, class B and Class C 2
   amplifier?
   b) Discuss the characteristics of a CB amplifier. 2.75
   c) Show that there is phase reversal between input and output of a CE amplifier. 4

7. a) What is feedback amplifier? Write the principles of a feedback amplifier? 6
   b) What is oscillator? Draw the circuit diagram of a stable and a monostable 2.75
   multivibrator.

8. a) What is LCD? Describe the working principle of LCD. 3.75
   b) What are the advantages of LCD? 2
   c) What is P-N photodiode? Why it works in reverse biased condition? 3

...ity of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg.(CSE) 1st Year Odd Semester 2012
Course: APEE 1131 (Electrical Circuits and Electronics)
Time: 4 Hrs.   Full Marks: 52.5
[N.B. Answer SIX questions taking at least THREE from each Section.]

Section A

1(a) State and explain Kirchhoff's current law.
(b) State and explain Thevenin's theorem. 2.75
(c) Apply Thevenin's theorem to calculate the current through the 4Ω resistor of the circuit 3
below. 3
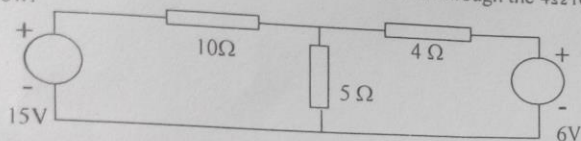
2(a) State maximum power transfer theorem. Show that maximum power transferred to a load is 3
50%.
(b) Distinguish between Thevenin's and Norton's theorem. 2.75
(c) Apply Norton's theorem to calculate current flowing through the 5Ω resistor of the figure 3
below.
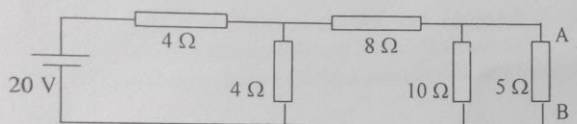
3(a) What is a PN junction diode? 2
(b) Explain the V-I characteristic of PN junction diode. 2.75
(c) How depletion layer is formed in a PN junction diode? Explain. 4

Section B

4(a) What is the function of a rectifier circuit? Discuss the advantages of bridge rectifier over a 2
half-wave rectifier?
(b) Derive the equation of dc power, ac power and efficiency of half-wave rectifier. 3
(c) What is ripple factor? What is its value for a half-wave and full-wave rectifier? 1.75
(d) What is the need of filter circuit? Discuss the operation of Π-filter with diagram. 2

5(a) Draw the circuit diagram of a CE connection and discuss its input and output 2.75
characteristics.
(b) What is load line? What are the importances of load line? 2
(c) Derive the equation of current amplification factor γ and find the relationship between γ and 3
α.
(d) Write the application of common collector amplifier. 1

6(a) List the characteristics of an ideal op-amp. 1.75
(b) What are CMRR and slew rate? Write some importance of these terms. 2
(c) Draw the basic circuit of a differential amplifier and briefly explain its operation. 3
(d) An op-amp can be operated at a much higher frequency when being used as a small signal 2
amplifier – how? Discuss with example.

7(a) What do you understand by transistor biasing? Why is it needed? 2.75
(b) Mention the various method used for transistor biasing. 4
(c) What do you mean by stabilization of operating point? 2

8 Write short notes on any three: 8.75
(a) Varactor diode (b) Tunnel Diode (c) Photo diode (d) LED