

University of Rajshahi
Department of Computer Science and Engineering

B. Sc. (Engg.) Part-I, Odd Semester, Exam - 2018

Course Title: APEE1131 (Electrical Circuit and Electronics)

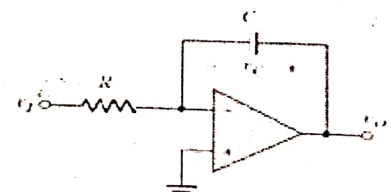
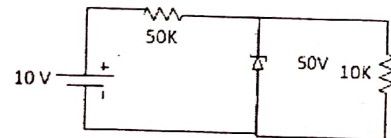
Total marks: 52.5

Time: 3 Hours

[Answer three questions from each section]

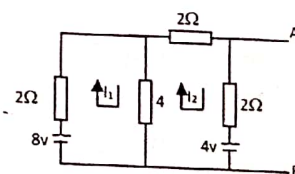
Section-A

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 $n_i = 1.5 \times 10^{16}$, $\mu_c = 0.13 \text{ m}^2/\text{v-s}$, $\mu_h = 0.05 \text{ m}^2/\text{v-s}$) 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:
 i. Output voltage 3
 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

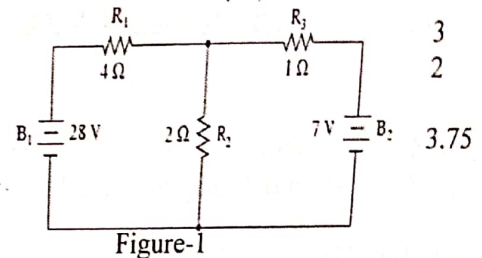


University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg. Part-I Odd Semester, Examination-2017
Course: APEE 1131 (Electrical Circuit and Electronics)
Time: 3 Hrs. Full Marks: 52.5

[Answer SIX (06) questions taking at least THREE (03) from each Section.]

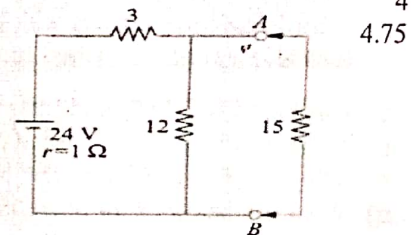
Section A

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



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

3. (a) State and explain Thevenin's theorem.
- (b) With reference to the network of figure-2, by applying Thevenin's theorem find:
 - 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.

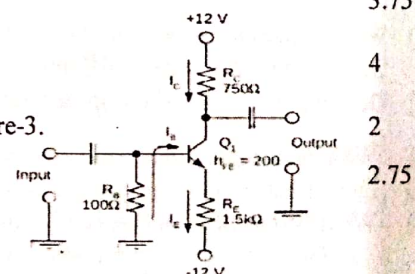


4. (a) What are the different kinds of filters?
- (b) Deduce an expression for cut-off frequency of a high pass filter.
- (c) A filter section is to have a characteristic impedance at zero frequency of 600 Ω and a cut-off frequency at 5 MHz Design (i) a low-pass T section filter, and (ii) a low-pass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

Section B

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

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



7. (a) Define OP-AMP. What are the characteristics of an ideal OP-AMP?
- (b) How can an OP-AMP be used as a differentiator? Explain.
- (c) What is inverting and non-inverting amplifiers? Explain with necessary figures.
8. (a) What is an oscillator? What are the conditions for oscillation?
- (b) Draw the circuit diagram of Hartley oscillator and describe its principle of operation. Derive the equation for oscillation.
- (c) Explain positive feedback and negative feedback.

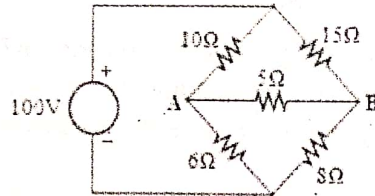
University of Rajshahi
Department of Computer Science and Engineering
B.Sc. Engg. (CSE) 1st Year Odd Semester 2016
Course: APEE 1131 (Electrical Circuits and Electronics)

Time: 3 Hrs. Full Marks: 52.5

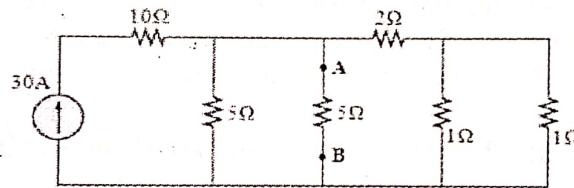
[N.B. Answer SIX questions taking at least THREE from each Section.]

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

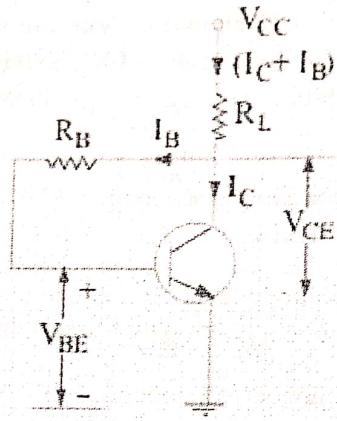


- 3(a) What are the different kinds of Filter? Explain each type with frequency response curve. 3
 (b) Find out the characteristics impedance of a symmetrical T-section network. 2.75
 (c) Draw and discuss the circuit diagram of a T-section low pass filter and find out its cut off frequency. 3
- 4(a) 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 $V_{CC}=12V$, $V_{BE}=0.7V$, $R_L=1K\text{ ohm}$, $R_B=100K\text{ ohm}$ and $\beta=100$. 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 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 20Ω shown in the following Fig.1. 3

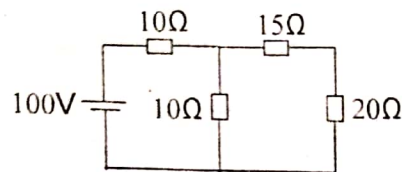
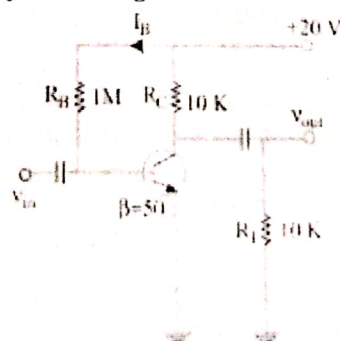


Fig.1

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 $r_c = 25mV/I_E$. 5



- (c) Define α for a transistor. 0.75