

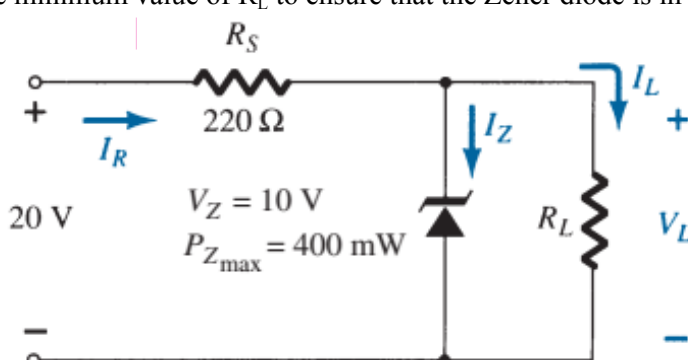
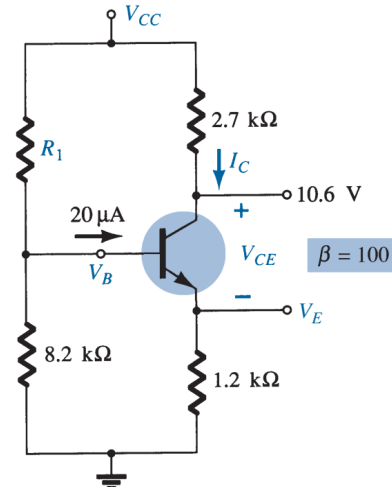
**AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY****Department: Electrical and Electronic Engineering****Program: Bachelor of Science in Computer Science & Engineering****Semester Final Examination: Fall 2020****Year: 2nd****Semester: 1st****Course Number: EEE 2141****Course Name: Electronic Devices and Circuits****Time: 2:00 Hours [Excluding the 1:00 hour time for uploading]****Full Marks: 50**

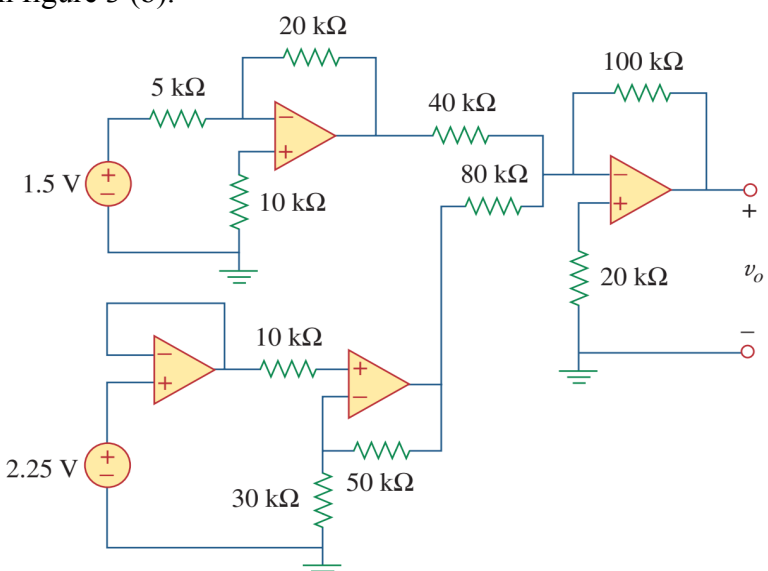
<b>Instructions</b>	
i.	Answer script should be handwritten and should be written on A4 white paper. You must submit the hard copy of this answer script to the Department when the university reopens.
ii.	You must write the following information on the top page of each answer script:  <div style="display: flex; justify-content: space-between;"> <div> <b>Department:</b>  <b>Course no:</b>  <b>Examination:</b>  <b>Student ID:</b> </div> <div> <b>Program:</b>  <b>Course Title:</b>  <b>Semester (Session):</b>  <b>Signature and Date:</b> </div> </div>
iii.	Write down your Student ID, Course number, and put your signature on top of every single page of the answer script.
iv.	Write down the page number at the bottom of every page of the answer script.
v.	Upload the scan copy of your answer script in PDF format through provided <b>google form</b> at the respective course site (i.e., <b>google classroom</b> ) using institutional email within the allocated time. Uploading a clear and readable scan copy (uncorrupted) is your responsibility and must cover the full page of your answer script. However, for a clear and readable scan copy of the answer script, students should use only one side of a page for answering the questions.
vi.	You must avoid <b>plagiarism</b> , maintain <b>academic integrity, and ethics</b> . You are not allowed to take any help from another individual and if taken so can result in stern disciplinary actions from the university authority.
vii.	Marks allotted are indicated in the <b>right margin</b> .
viii.	Necessary <b>charts/tables</b> are attached at the end of the question paper. You may use graph papers where necessary.
ix.	Assume any reasonable data if needed.
x.	Symbols and characters have their usual meaning.
xi.	Before uploading rename the PDF file as <b>CourseNo_StudentID.pdf</b> e.g., EEE2141_180103001.pdf

The answer script (**one single pdf file**) must be uploaded at a designated location in the provided **google form link** available in the google classroom.

**There are 5 (Five) questions. Answer any 4 (Four) questions.**

**Question-5 is compulsory.**

Question 1. [Marks: 12.5]		
a)	Discuss different regions of SCR's characteristics curve. Also, briefly describe the steps required for IC fabrication.	[6]
b)	<p>For the network in figure 1 (b), if <math>R_L = 180\Omega</math></p> <ul style="list-style-type: none"> <li>Determine <math>V_L</math>, <math>I_L</math>, <math>I_Z</math>, and <math>I_R</math>.</li> <li>Calculate again if <math>R_L = 470\Omega</math>.</li> <li>Determine the value of <math>R_L</math> that will establish maximum power conditions for the Zener diode.</li> <li>Determine the minimum value of <math>R_L</math> to ensure that the Zener diode is in the "on" state.</li> </ul>  <p style="text-align: center;">Figure 1 (b)</p>	[6.5]
Question 2. [Marks: 12.5]		
a)	Discuss the construction and working principle of a BJT.	[6]
b)	<p>Given the information appearing in figure 2 (b), determine:</p> <p>a. <math>I_C</math>   b. <math>V_E</math>   c. <math>V_{CC}</math>   d. <math>V_{CE}</math>   e. <math>V_B</math>   f. <math>R_1</math></p>  <p style="text-align: center;">Figure 2 (b)</p>	[6.5]

<b>Question 3. [Marks: 12.5]</b>		
<b>a)</b>	Describe the construction, operating principle of junction field-effect transistors, and illustrate its characteristics curve and transfer function.	<b>[6]</b>
<b>b)</b>	<p>Determine <math>v_o</math> in figure 3 (b).</p>  <p style="text-align: center;">Figure 3 (b)</p>	<b>[6.5]</b>
<b>Question 4. [Marks: 12.5]</b>		
<b>a)</b>	Formulate the equation of a subtractor using a difference amplifier.	<b>[6]</b>
<b>b)</b>	<p>Use difference amplifier with inputs <math>V_1</math>, <math>V_2</math>, and <math>V_3</math> such that</p> $V_o = -10V_1 + 12V_2 + 25V_3$	<b>[6.5]</b>
<b>Question 5. [Marks: 12.5]</b>		
<b>a)</b>	Build a 4V level crossing detector using op-amp and a triangular input voltage having a peak value of 10V and frequency of 50Hz. Illustrate your answer with necessary diagrams and waveshapes, and compute the duty cycle of the output voltage.	<b>[6]</b>
<b>b)</b>	<p>Build a logic circuit with CMOS that gives output based on the following equation. Also, sketch the timing diagram.</p> $Y = (AB + D)\overline{AC}$	<b>[6.5]</b>