

**POKHARA UNIVERSITY**

Level: Bachelor

Semester: Fall

Year : 2015

Programme: BE

Full Marks: 100

Course: Electronic Devices and Circuits

Pass Marks: 45

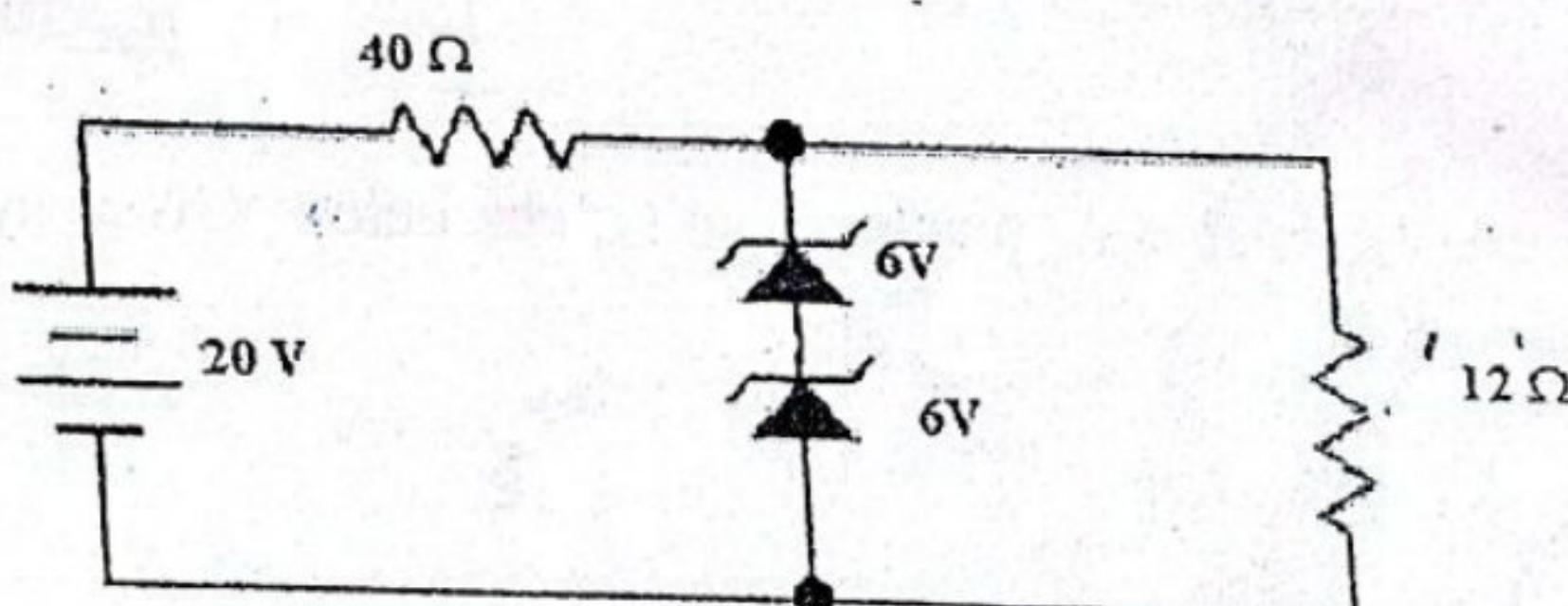
Time : 3hrs..

*Candidates are required to give their answers in their own words as far as practicable.*

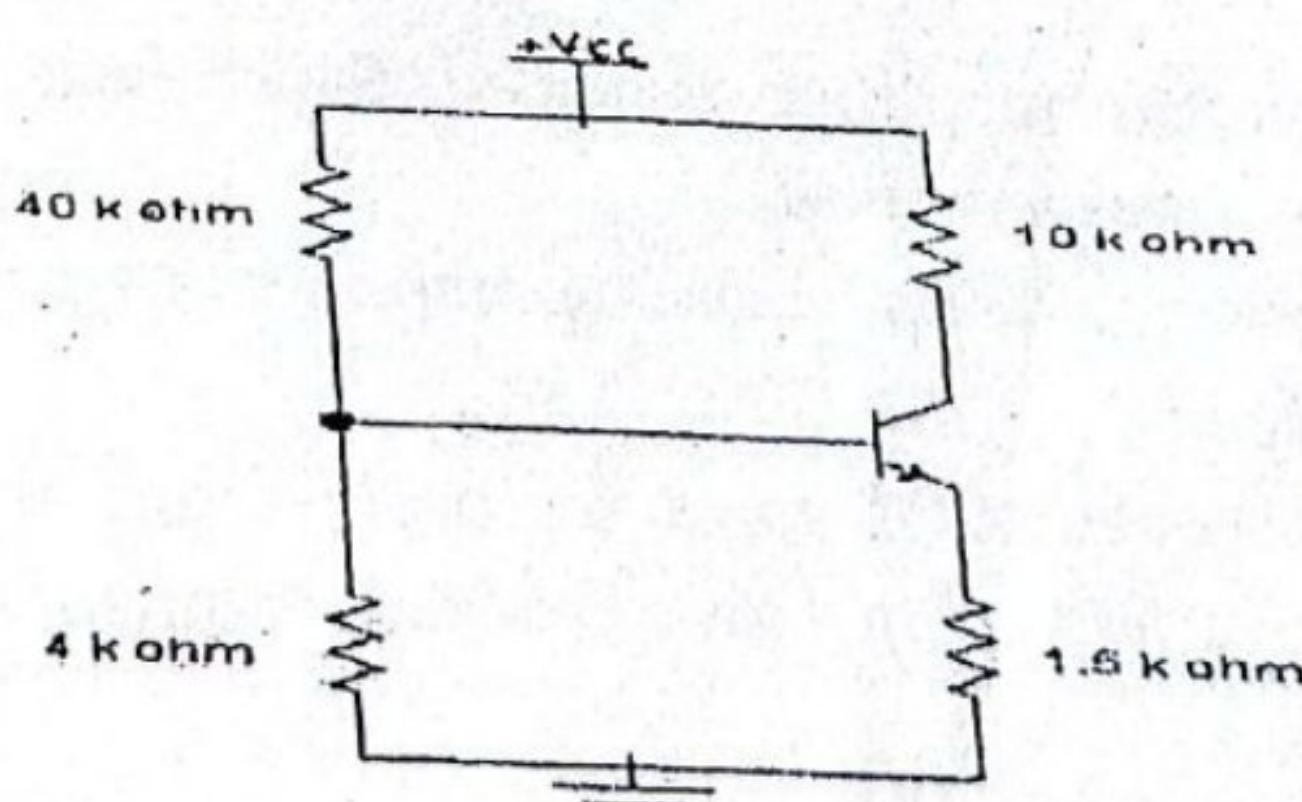
*The figures in the margin indicate full marks.*

*Attempt all the questions.*

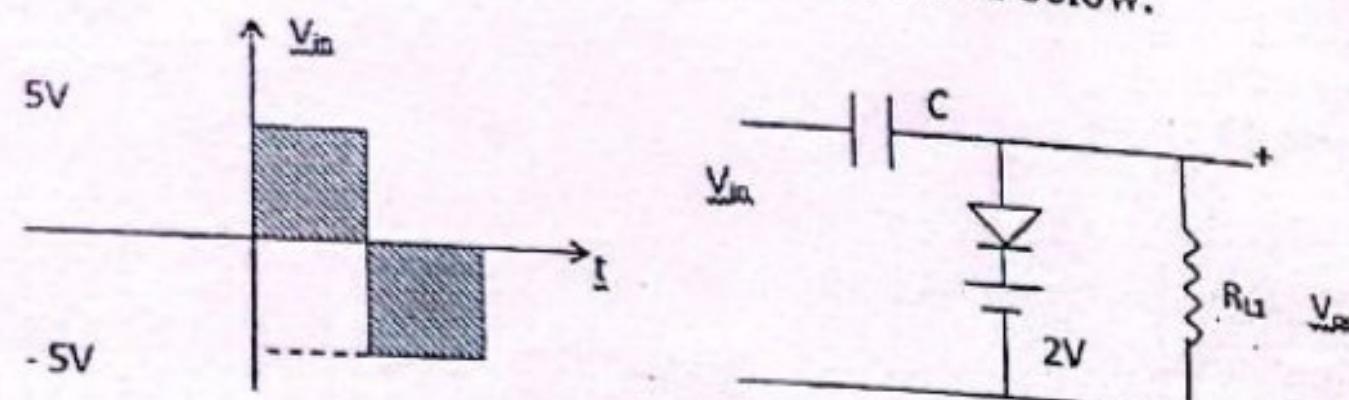
- a) Draw V-I characteristics curve of pn junction diode, Distinguish between a zener breakdown and avalanche breakdown. 8
- b) Differentiate between intrinsic and extrinsic semiconductor. A silicon diode has saturation current of 5 nanoampere at room temperature. What is the saturation current at 100 degree centigrade. 7
- a) Calculate the current through load resistor and zener diode. 7



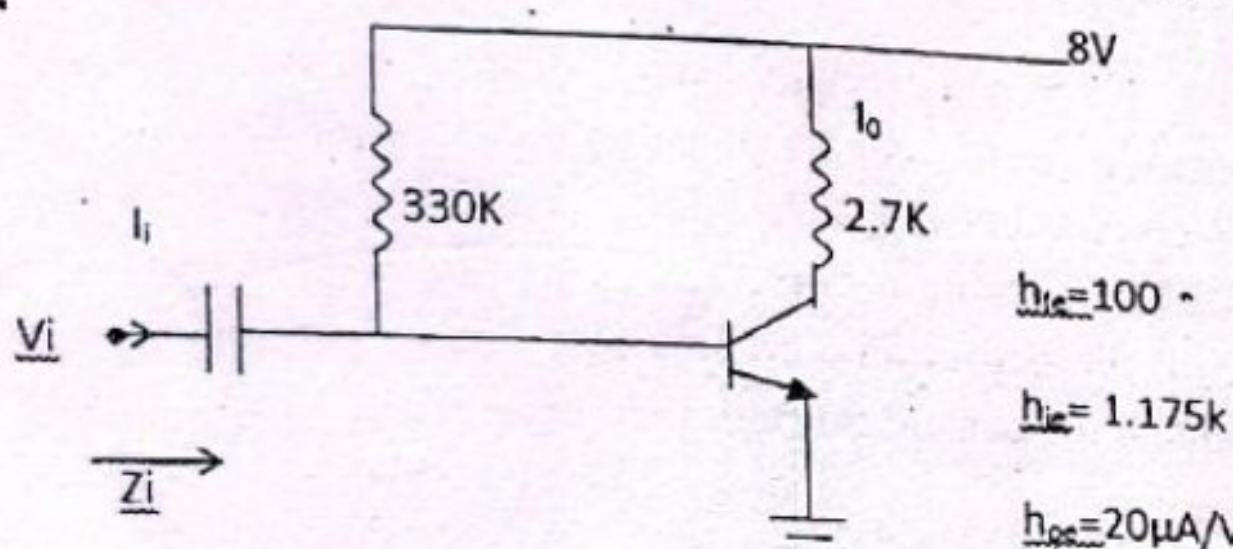
- b) For the transistor amplifier shown below given that  $V_{cc}=22$  V. 8
  - i. Draw dc load line.
  - ii. Operating point.



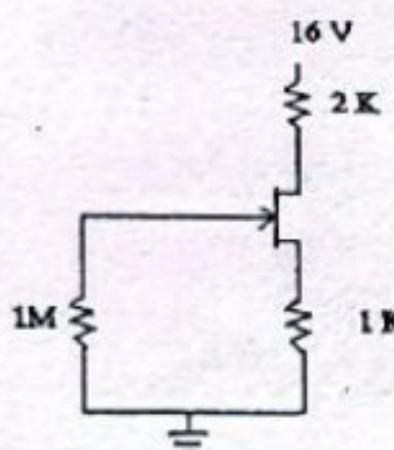
3. a) Explain the input characteristics of Common emitter transistor. Also derive the relationship between  $\alpha$ ,  $\beta$ , and  $\gamma$ .  
 b) Sketch the output waveform for the circuit shown below.



4. a) Find  $A_{vs}$ ,  $A_v$ ,  $Z_0$ ,  $Z_{in}$  of following Ckt. Diagram using h-parameter.



- b) Determine  $I_{DQ}$  and  $V_{DSQ}$  for the circuit given below. Given  $I_{DSS} = 8$  mA,  $V_p = -8$  V.



5. a) Darlington-pair amplifier is called Super beta why? Derive the necessary expression for it.  
 b) Draw transformer coupled class A amplifier and derive the expression of its efficiency.  
 6. a) Derive the equation of gains for positive and negative feedback. Explain the effect of negative feedback configuration in amplifier characteristics.

- b) For the op-amp based wein bridge oscillator if the component values are:  $R=5.1\text{k}\Omega$ ,  $C=1\text{nF}$ ,  $R_3=12\text{k}\Omega$  and  $R_4=5.1\text{k}\Omega$   
 i. Determine whether the circuit will oscillate or not.  
 ii. Obtain the output frequency.  
 Write short notes on: (Any two)  
 a) Crystal Oscillator.  
 b) Emitter Follower.  
 c) Input impedance.

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2x5



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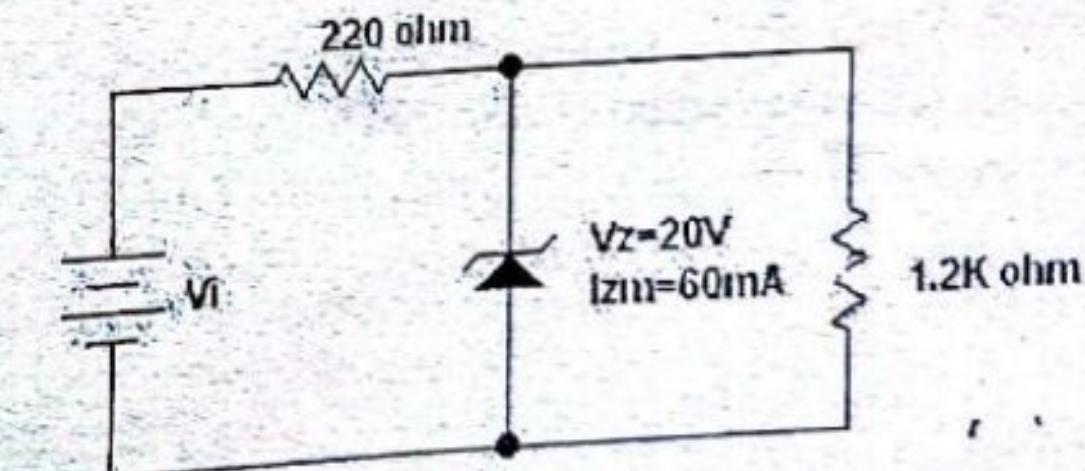
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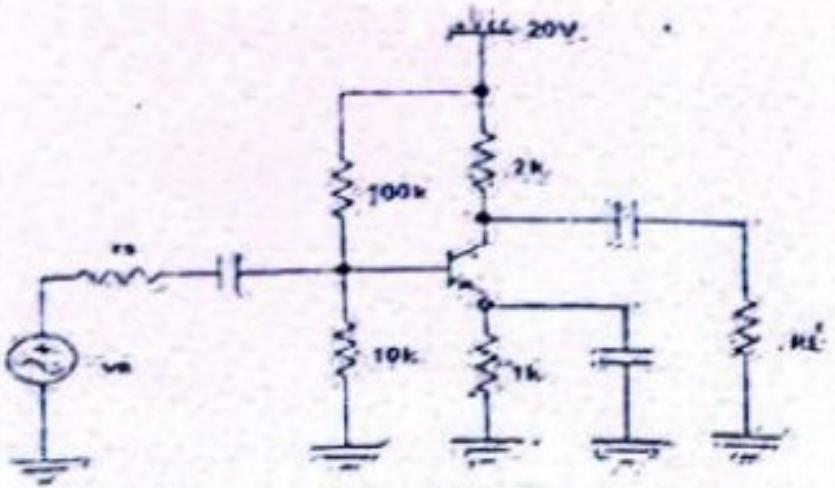
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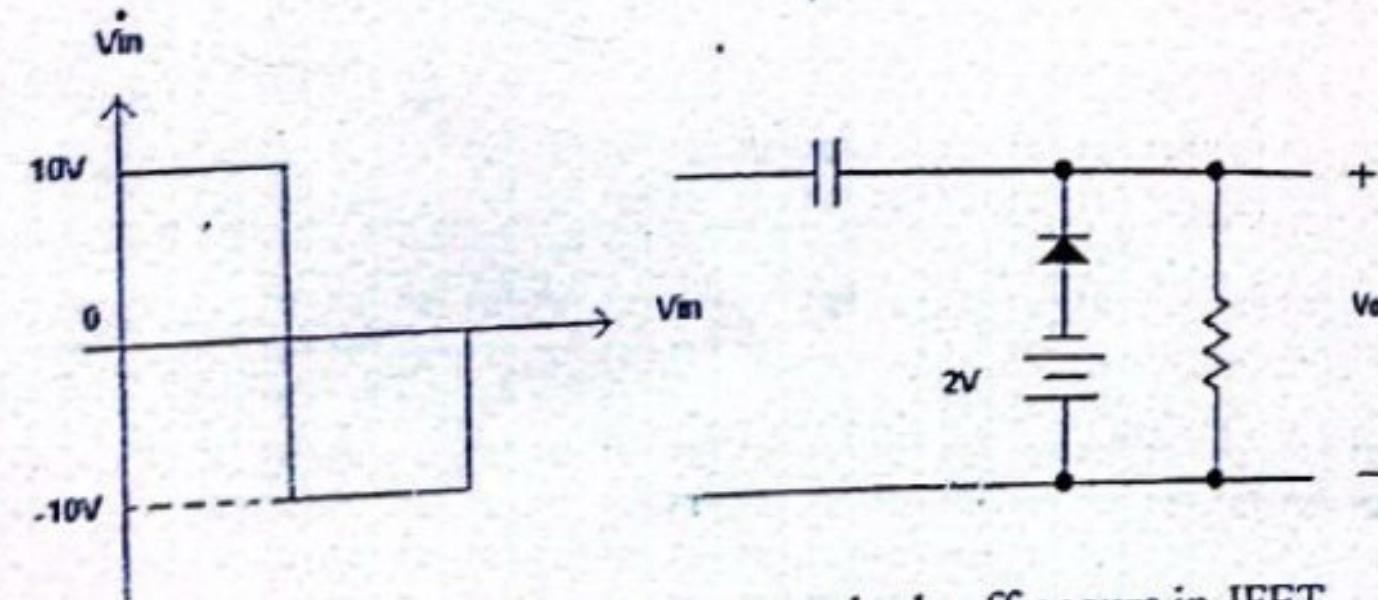
1. a) What happens when a forward biased diode is suddenly reverse biased? Explain with necessary diagrams. 5
- b) What do you mean by dynamic resistance of diode? Show that dynamic resistance of diode  $r_D = \eta V_T / I$ . 5
- c) Determine the range of values of  $V_{in}$  that will maintain the zener diode in the "ON" state. Also find the maximum power that can be dissipated to the diode. 5



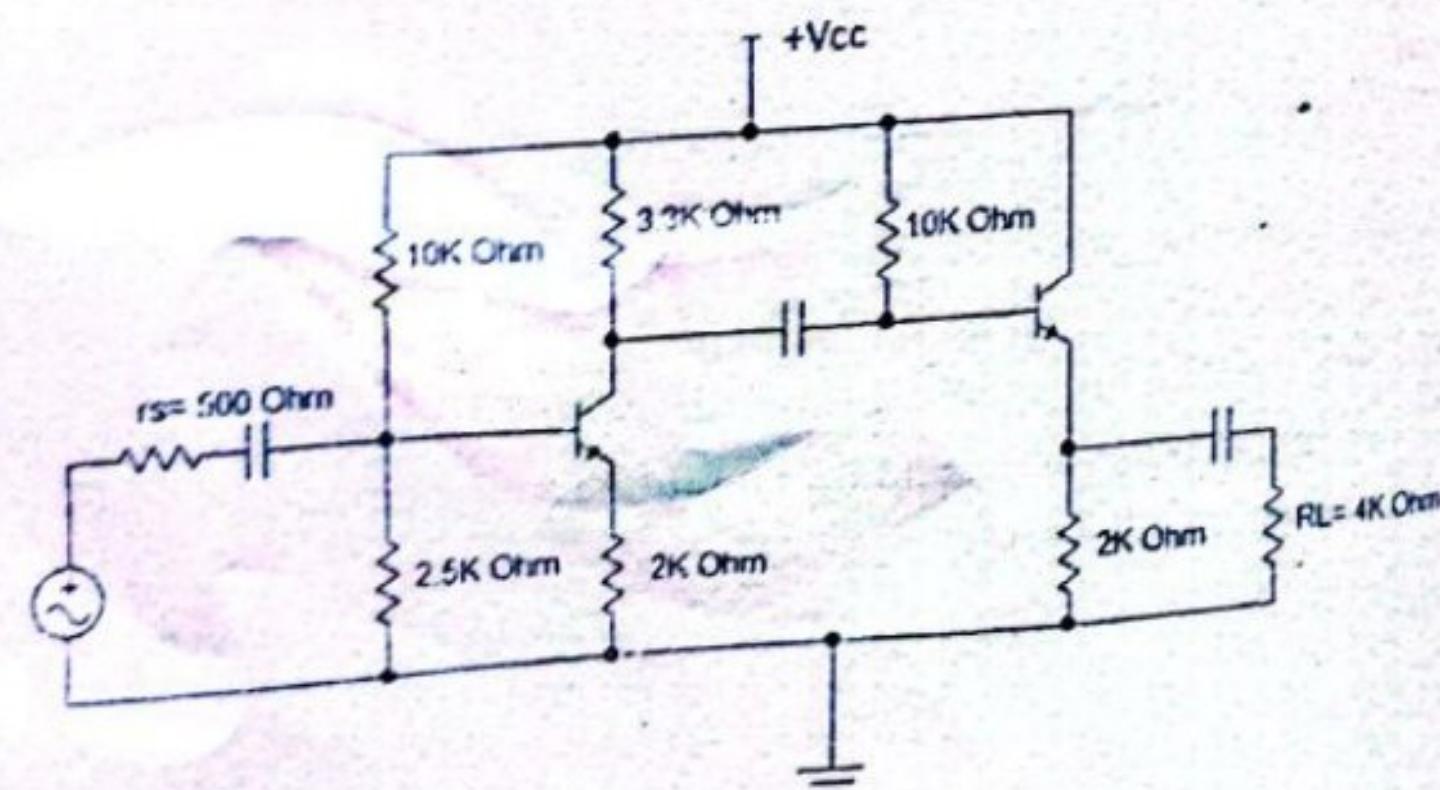
2. a) Explain the working principle of NPN transistor with necessary diagram. Show that  $I_C = \beta I_B + (\beta + 1) I_{CBO}$ . 8
- b) For the circuits shown below, draw the dc load line and find the operating point. Also find the stability S of the circuit. (Assume silicon transistor with  $\beta = 100$ ) 7



3. a) Explain the operation of Centre-Tap full wave rectifier. Find its efficiency, ripple factor and PIV.  
b) Draw the output waveform (assume silicon diode).



4. a) Compare BJT and FET. Explain how pinch-off occurs in JFET.  
b) Find the overall voltage gain of cascaded transistor amplifier as shown in figure below. Given  $r_{e1}=r_{e2}=25\Omega$  and  $\beta_1=\beta_2=110$ .



2

- a) What do you mean by class A amplifier. Find the maximum efficiency of class A amplifier with resistive load. 2+6  
b) What do you mean by feedback amplifier? Show that negative feedback improves the stability of an amplifier. 2+5  
c) a) What are the conditions for oscillations? Draw a Wien-bridge Oscillator and explain its operation. 5  
b) What do you mean by Operational Amplifier? Compare the characteristics of Ideal and practical Operational Amplifiers. 5  
c) Design an Operational Amplifier circuit to produce the following Output.  $V_o = 3V_1 + 2V_2 - 0.5V_3$ . Where  $V_1, V_2, V_3$  are inputs and  $V_o$  is an output. 5  
7. Write short notes on: (Any two)  
a) Effect of Bypass Capacitor on voltage gain of CE amplifier  
b) Darlington Pair  
c) Cross over Distortion



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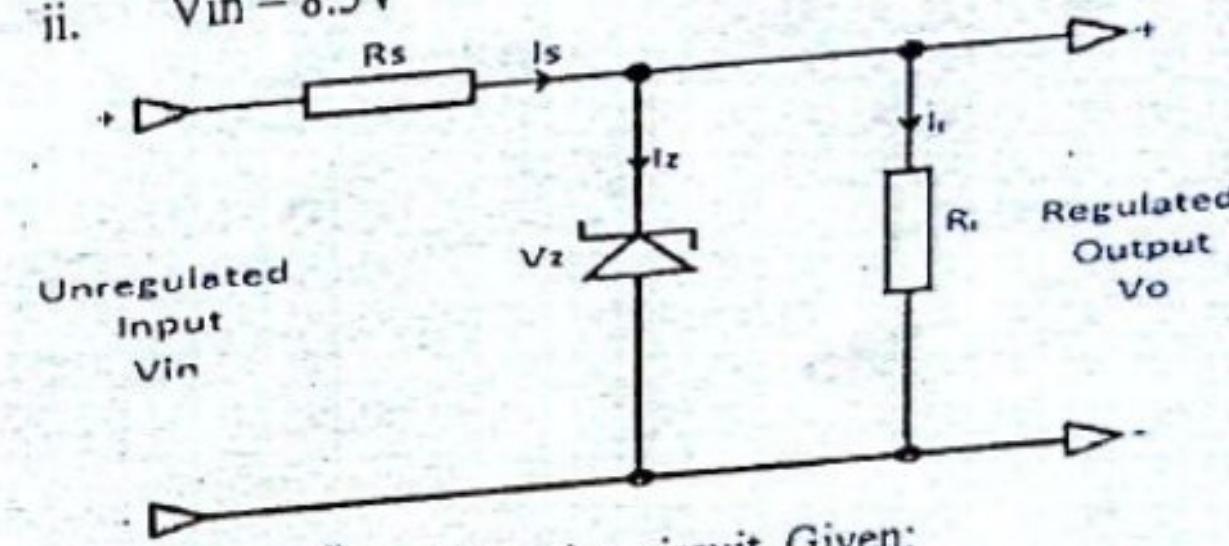
The figures in the margin indicate full marks. सुनाम स्टेशनरी राज्यवार्षी एवं प्रैटोकपी सर्विस  
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Attempt all the questions.

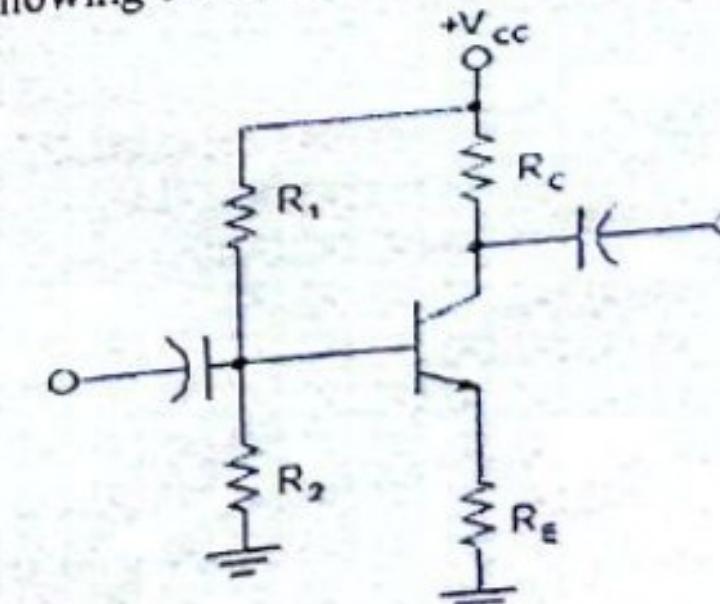
- a) What is semiconductor material? Explain the importance of 8 semiconductor material on electronic Device with examples. 7
- b) If  $V_Z = 8V$ ,  $R_S = 100\Omega$ ,  $R_L = 990\Omega$ . Find  $V_O$ ,  $I_L$ ,  $I_Z$ , if,

- i.  $V_{in} = 12V$   
ii.  $V_{in} = 8.5V$



2. a) Find Q point for the following circuit. Given:

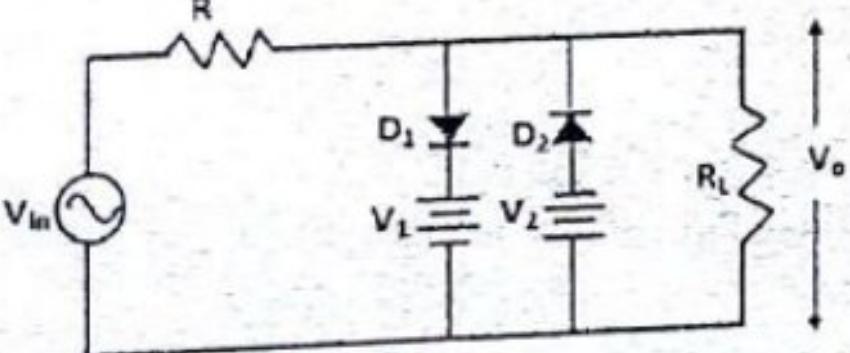
$V_{cc} = 16V$   
 $R_1 = 62K$   
 $R_2 = 9.1K$   
 $R_C = 3.9K$   
 $R_E = 1K$   
 $\beta = 80$



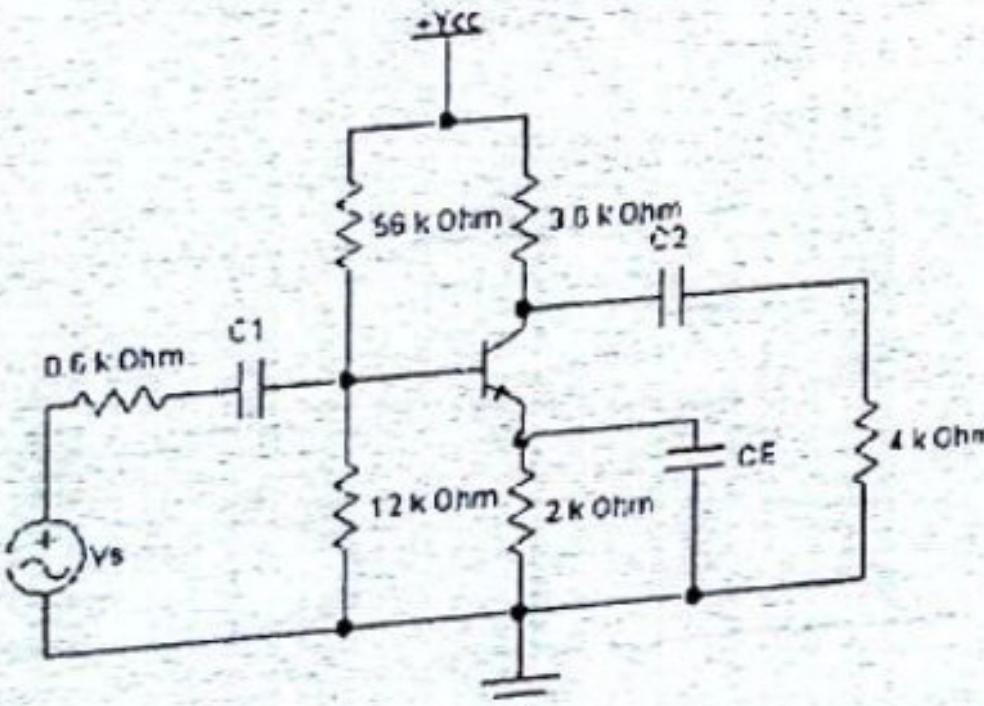
- b) Explain BJT as an amplifier.  
c) Compare CB, CE and CC configurations.  
a) Define rectification. Explain that the efficiency of full wave rectifier is

4  
4  
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- b) double of the half wave rectifier.  
 Draw the wave form of voltage across  $R_L$ . Assume  $V_{in} = 10 \sin \omega t$  Volts. 7  
 Also explain the operation to support your waveform.



4. a) For the given CE amplifier, find the following using  $r_e$  model  
 i. input impedance  
 ii. output impedance  
 iii. voltage gain  
 (Assume  $\beta = 90$ ,  $V_{cc} = +19V$ )



- b) Darlington-pair amplifier is called Super beta why? Derive the necessary expression for it.

Derive efficiency of Transformer coupled Class A amplifier? Explain cross over distortion in class B push pull amplifier.

Derive the equation of gains for positive and negative feedback. Explain the effect of negative feedback configuration in amplifier characteristics.

State Ideal characteristics of op-amp? Derive closed loop gain of

inverting, non inverting and integrator amplifier?

Calculate the component values of Wein Bridge Oscillator to be used in

oscillator to vary frequency from 100 Hz to 10 kHz in two stages.

2x5

7. Write short notes on: (Any two)

a) Slew Rate and CMRR

b) Clamping and Clipping Circuit

Parameters

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 Attempt all the questions.

- a) Differentiate between Diffusion Capacitance and Transition Capacitance. "Transition capacitance is inversely proportional to the square root of the reverse voltage applied across it." Verify this statement.

- b) Explain the Zener diode as a voltage regulator with its I-V characteristics.

- a) Explain the BJT as a switch.

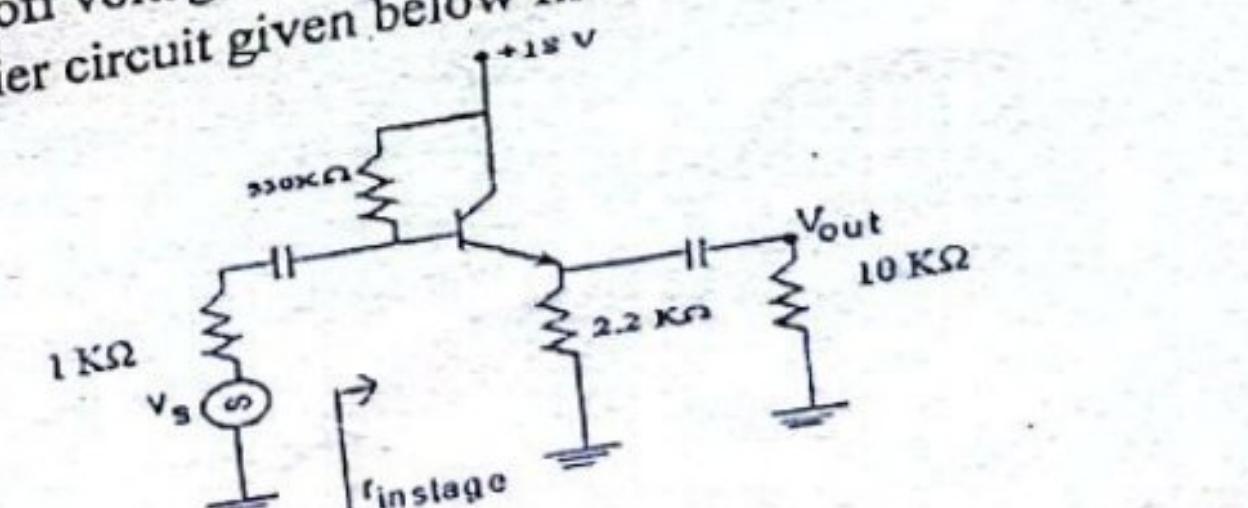
- b) What are the Delay time and Rise time? Briefly explain the Reach Through or Punch Through effect.

- c) An NPN silicon transistor having a nominal  $\beta$  of 100 is to be used in a CE configuration with  $V_{cc} = 15V$ . The Q point is to be  $I_c = 4mA$  and  $V_{ce} = 12V$ . Now design the circuit diagram.

- What do you mean by voltage regulation? Explain with the block diagram.

3. a) Explain what is pinch off voltage? Compare the JFET with BJT.

- b) For the amplifier circuit given below find:



- i.  $i_{in}$     ii.  $i_{out}$     iii.  $A_v$     iv.  $A_{vs}$

Where the symbols have their usual meanings. (Given  $\beta = 100$ ,  $r_e = 20\Omega$ ).

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