



VAVUNIYA CAMPUS OF THE UNIVERSITY OF JAFFNA

First Examination in Information and Communication

Technology – 2018 (Old Syllabus)

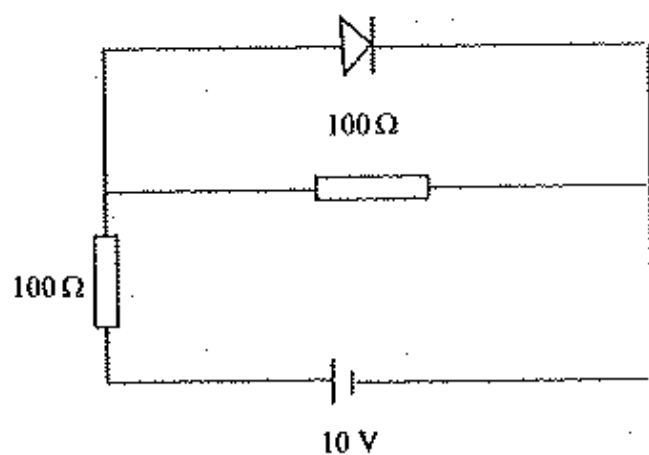
Second Semester – June / July 2020

ICT 1223 Basic Electronics and Digital Logic Design

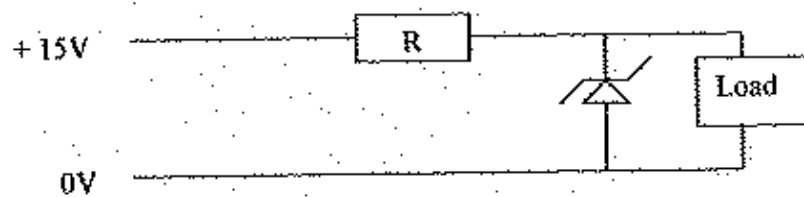
Answer Five Questions only

Time: Three hours

- Q1.** (a) Explain the difference between conductors, insulators and semiconductors on the basis of energy band? [20%]
- (b) Name three acceptor and three donor materials for doping of a semiconductor. [20%]
- (c) Explain the formation of depletion region and barrier potential of a p-n junction. Hence illustrate Electric field strength and Potential variation across the junction. [40%]
- (d) The intrinsic resistivity of germanium at 300K is $50 \Omega \text{ cm}$. Find the intrinsic carrier concentration in the semiconductor? The electron and hole mobilities are $\mu_e = 3600 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$ and $\mu_h = 1900 \text{ cm}^2 \text{ V}^{-1} \text{ s}^{-1}$ respectively. [20%]
- Q2.** (a) Sketch and explain the forward and reverse characteristic of a p-n junction. [30%]
- (b) Figure shows a circuit containing resistors of two 100Ω and one silicon diodes. The knee voltage of the silicon diodes is 0.7 V . Find the current through each component in the circuit. [30%]

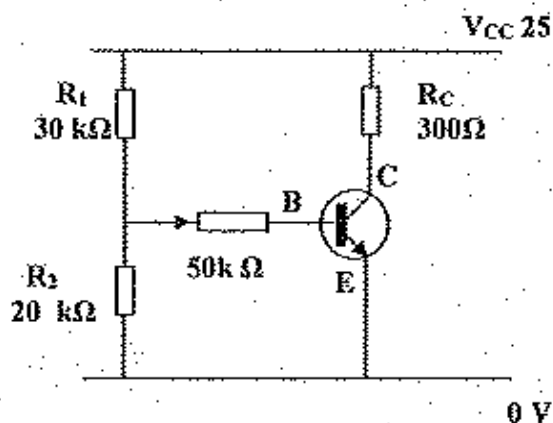


- (c) Draw a full – wave bridge rectifier circuit and explain the action briefly. [20%]
- (d) Discuss briefly the advantages and disadvantages of full wave rectifier and half wave rectifier. [20%]
- Q3. (a) Give three different types of special diodes and explain their applications. [20%]
- (b) Sketch and explain the $I - V$ characteristic of a Zener diode. [20%]
- (c) Compare normal diode and Zener diode in the followings: doping, Size of the depletion region and action when connected in reverse biased. [20%]
- (d) Figure shows a regulated voltage supply circuit. The input voltage varies from 10V to 15V. The required output voltage is 7V. The minimum diode current is 10mA and the required load current is 100mA. [40%]

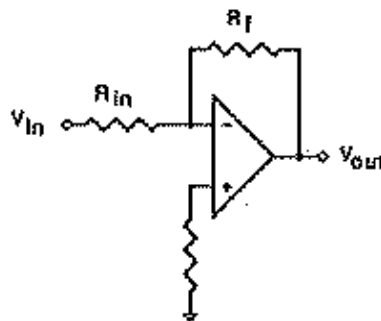


- (i) Calculate the followings when the input voltage is 10V
- Calculate the voltage across R.
 - Find the ideal value of the resistor R.
- (ii) Calculate the current passing through Zener diode when the input voltage is increased to 15V while using the above calculated value for R.

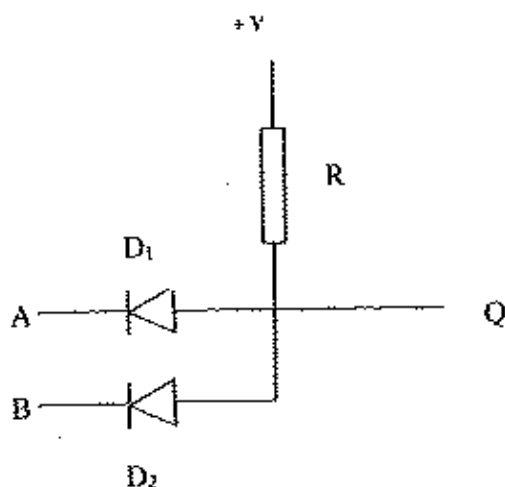
- Q4. (a) Explain the Transfer characteristics of a transistor in common emitter configuration. (Using I_c Vs I_B curve) [30%]
- (b) What do you mean by transistor biasing? Hence explain how transistor should be biased in the following circuits.
- (i) Transistor as an amplifier
- (ii) Transistor as a switch [30%]
- (c) Compute the base, emitter and collector voltages for the voltage divider bias npn transistor circuit shown in the following figure. Where $V_{BE} = 0.7V$ and $\beta = 200$ [40%]



- Q5. (a) List the advantages of using integrated circuits (ICs) compared to discrete circuits. [20%]
- (b) Show that the "closed loop gain" A and "open - loop gain" A_o of an operational amplifier can be related as $A = \frac{A_o}{1 + \beta A_o}$ where β is the feedback factor [30%]
- (c) Find the closed - loop gain of the inverting amplifier as shown in the figure. [50%]



- Q6. (a) A logic gate circuit diagram is given below. If A and B are the inputs and Q is the out put then complete the truth table.



A	B	Q
0	0	
0	1	
1	0	
1	1	

- (i) Name the type of the logic gate.
- (ii) Draw and label the symbol for this logic gate. [30%]
- (b) A machine operator controls red and green indicator lights by using four switches A, B, C and D. The sequence of operation is as follows: (a) Red light is ON when switch A is ON and switch B is OFF or switch C is ON. (b) Green light is ON when switches A and B are ON and switches C and D are OFF. Write down logical expression representing condition (a) and (b), and sketch logical circuits satisfying these conditions. [70%]

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