

F. Y. B. Tech Academic Year 2021-22
ECE1022A: Basics of Electrical and Electronics Engineering
Trimester: II , Sem 1
Assignment 1

Date: 10 Jan 2022 Max. Marks: 25 Submission Date: 17 Jan2022

Course Outcomes (COs) Covered:

1. Predict the behaviour and characteristics of basic electrical and magnetic circuits. (CLII) 2. Identify components/equipment required for any particular application related to electrical and electronics engineering. (CL-II)

Instructions:

- 1. Q I is a set of 10 MCQs. Each MCQ carries one mark.**
 - 2. Q II, Q III, Q IV each carry 5 marks.**
 - 3. Pls note in Q II, Q III, Q IV, the component values are to be selected based on your division and roll number.**
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Q. I Select the answer of the following MCQs.

- 1) When transistor is used as an amplifier, it operates in the
 - A. active region
 - B. breakdown region
 - C. saturation and cutoff regions
 - D. linear region
- 2) Select which statement is incorrect.
 - A. In a diode, the forward bias narrows the depletion region and produces the voltage drop across a pn junction equal to the barrier potential.
 - B. If the external reverse-bias voltage is increased to a value called the breakdown voltage, the reverse current will drastically decrease.
 - C. The extremely small reverse current in a reverse-biased diode is due to the minority carriers from thermally generated electron-hole pairs.
 - D. The voltage drop across pn junction for a silicon transistor is 0.7 V and for germanium transistor it is 0.3 V

3) If $V_{CC} = +15\text{ V}$, then in the voltage-divider circuit with resistor R_1 is $4.7\text{ k}\Omega$, and R_2 is 1500Ω , what is the base bias voltage for a transistor in CE configuration?

- A 8.70 V
- B 4.35 V
- C 3.62 V
- D 0.7 V

4) Select the correct statement from the following:

- A In PNP BJT, a collector is heavily doped and base is lightly doped
- B In NPN BJT, a collector is lightly doped and base is moderately doped
- C In PNP BJT, an emitter is heavily doped and base is lightly doped
- D In NPN BJT, an emitter is heavily doped and collector is lightly doped

5) When the collector junction in transistors is reverse biased and the emitter junction is reverse biased, the transistor is said to be operating in the

- A. Cut off region
- B. Active region
- C. Switching mode
- D. Saturation region

6) In a BJT of type NPN, the largest current flows

- A. In the base
- B. In the collector
- C. In base and collector
- D. In the emitter

7) Select the incorrect statement.

- A. Ripple factor should be as small as possible and rectification efficiency should be as large as possible for a good rectifier.
- B. PN junction diodes are used in Voltage multipliers and reverse current protection circuits.
- C. Zener diodes are used in forward biased condition for an application of voltage regulator.
- D. The higher capacitor value in a capacitor filter, improves the ripple factor.

8) What is the current gain for a common-base configuration where $I_E = 4.2 \text{ mA}$ and $I_C = 4.0 \text{ mA}$?

- A. 16.80
- B. 1.05
- C. 0.20
- D. 0.95

9) Which of the following statements is incorrect?

- A. The process of giving off light by applying an electrical source of energy is called electroluminescence.
- B. The Energy difference between the electrons and the holes corresponds to the energy of visible light.
- C. A small exposed surface area on one layer of the semiconducting material permits the photons to be emitted as visible light in a LED.
- D. The emitted light tends to be monochromatic and that depends on the band gap and impurities added during the LED construction.

10) The parameter h_{ie} stands for input impedance in _____

- A. CB arrangement with output shorted
- B. CE arrangement with output shorted
- C. CC and CB arrangement with output shorted
- D. CC arrangement with output shorted

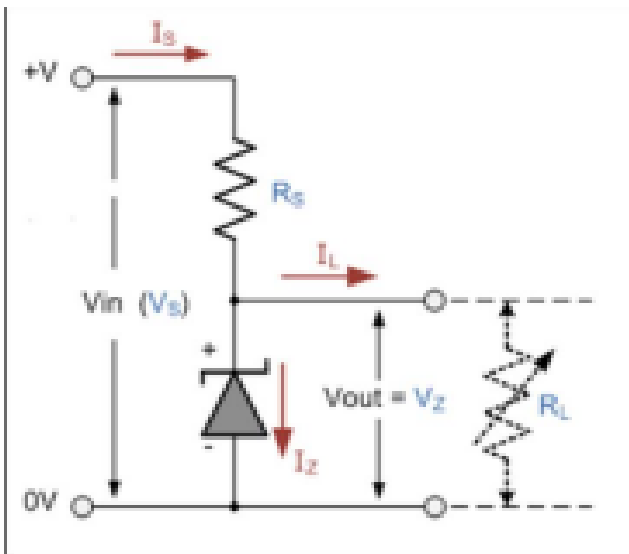
Q. II

A voltage $V(t) = 300 \cos 100\omega t$ is applied to a half wave rectifier with $R_L = 5K\Omega$. The rectifier is represented by an ideal diode in series with a resistance of a value equal to the last two digits of roll no. of a student (For example- $1K\Omega$, $2K\Omega$, $3K\Omega$ $65K\Omega$)

Find the following:

1. Load Current (I_m)
2. DC Power
3. AC Power
4. Rectifier efficiency
5. Ripple factor

Q.III



A stabilized power supply is required to produce a constant output voltage, V_Z

$V_Z =$ Addition of last two digits of your Roll number (in volts)

Input DC power supply source value, V_S

$V_S =$ Twice the V_Z Plus 2 (in volts).

The maximum power rating of the Zener diode is P_Z

$P_Z =$ Your Division number minus 5 (in watts) if your division number is greater than 10 otherwise take $P_Z = 10$ watts

(Example) Lets take Roll Number 111003 (for div 11)

$$V_Z = (0+3) = 3 \text{ volts}$$

$$V_S = (2*3)+2 = 8 \text{ Volts}$$

$$P_Z = \text{Division no. } 11 > 10 \text{ so } 11-5=6 \text{ Watts}$$

Using the Zener regulator circuit shown below, calculate:

- The maximum current flowing through the Zener diode.
- The value of the series resistor, R_s , with no load
- The load current I_L if a load resistor of $1\text{k}\Omega$ is connected across the Zener diode.
- The Zener current I_Z at full load.

Q IV.

A silicon transistor connected in CE configuration with voltage divider bias is shown in the following figure. $V_{CC}=15\text{V}$,

R_1 is equal to twice of the last two digits of your roll number in $\text{K}\Omega$ if those two digits are less than 35 (roll no.1- roll no. 34) (Ex: for 111012, $R_1=2*12=24\text{K}\Omega$) else the last two digits in $\text{K}\Omega$,

R_2 is equal to thrice of your division number for students with roll number less than 35 (roll no.1- roll no. 34) and twice of your div no. for students with roll no. greater than and equal to 35.

(Example for div 11: For roll no. 111012, $R_2=3*11=33\text{K}$ & for roll no. 111070,

$R_2=2*11=22\text{K}\Omega$). Find the Q-point of the amplifier circuit if $R_C=1.5\text{K}\Omega$ & $R_E=15\text{K}\Omega$ &

$$\beta = 160$$

Refer the following circuit diagram below for R_1, R_2, R_C, R_E and V_{CC} .

