Code: AE103   **Subject: ELECTRONIC DEVICES & CIRCUITS**

AMIETE – ET {NEW SCHEME}

Time: 3 Hours   **DECEMBER 2014**   **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.
- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1   **Choose the correct or the best alternative in the following:**   **(2×10)**

   a. An n-type semiconductor material

   (A) is intrinsic
   (B) has trivalent impurity atoms added
   (C) has pentavalent impurity atoms added
   (D) requires no doping

   b. Reverse breakdown is a condition in which a diode

   (A) is subjected to a large reverse voltage
   (B) is reverse-biased and there is a small leakage current
   (C) has no current flowing at all
   (D) is heated up by large amounts of current in the forward direction
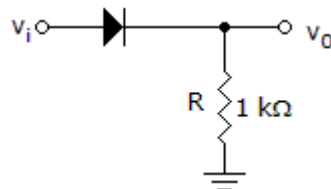
   c. What best describes the circuit?

Fig.1

   (A)   Full-wave rectifier   **(B)** Half-wave rectifier
   (C)   Clipper   **(D)** Clamper

   d. What is the most frequently encountered transistor configuration?

   (A) Common-base   **(B)** Common-collector
   (C) Common-emitter   **(D)** Emitter-collector

e. Determine the value of α when β= 100.

     (A) 1.01   **(B)** 101
     (C) 0.99   **(D)** Cannot be solved

f. For a JFET, the value of V_{DS} at which I_D becomes essentially constant is the

     (A) Pinch-off voltage   **(B)** Cutoff voltage
     (C) Breakdown voltage   **(D)** Ohmic voltage
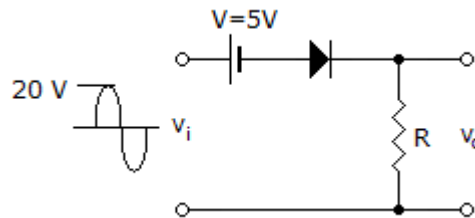
g. Determine the peak value of the output waveform.

Fig.2

     (A) 25 V   **(B)** 15 V
     (C) –25 V   **(D)** –15 V

h. In a monolithic-type IC

     (A) each transistor is diffused into a separate isolation region
     (B) all components are fabricated into a single crystal of silicon
     (C) resistors and capacitors of any value may be made
     (D) all isolation problems are eliminated

i. Which type of power amplifier is biased for operation at less than 180° of the cycle?

     (A) Class A   **(B)** Class B or AB
     (C) Class C   **(D)** Class D

j. Identify the type of oscillator whose oscillation frequency is $1/2\pi RC\sqrt{6}$

     (A) Phase-shift   **(B)** Wien bridge
     (C) Colpitts   **(D)** Hartley

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2   a.   State and explain the Reciprocity Theorem and Thevenins Theorem.   **(6)**

b. In the circuit shown below, determine the value of V_X.   **(6)**
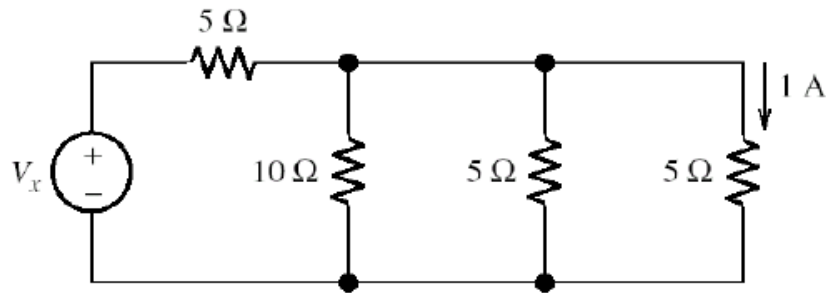

Fig.3

c. Define the term: electrical current, direct current and alternating current.   **(4)**

Q.3 a. Explain the different biasing of P-N junction diode. Also draw VI characteristics.   **(10)**

b. For the zener diode network shown in figure below determine V_L, V_R, I_Z, and I.   **(6)**
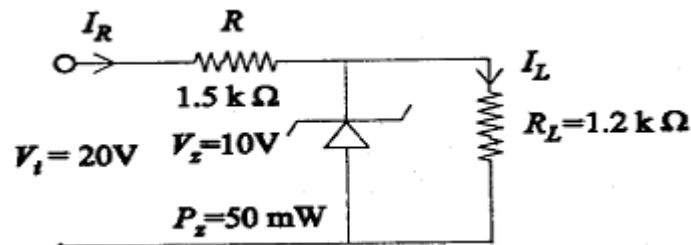

Fig.4

Q.4 a. A transistor used in CE arrangement has the following set of h parameters when the d.c. operating point is $V_{CE} = 10$ volts and $I_C = 1$ mA :
$h_{ie} = 2000\ \Omega$; $h_{oe} = 10^{-4}$ mho; $h_{re} = 10^{-3}$; $h_{fe} = 50$
Considering the a.c. load seen by the transistor is $r_L = 600\ \Omega$. Determine approximate values of the following using reasonable approximations:
(i) input impedance (ii) current gain and (iii) voltage gain   **(8)**

b. Explain the working of BJT as a switch..   **(8)**

Q.5 a. Draw and explain in brief the output characteristics (V_{DS} Vs I_D) and transfer characteristics of n-channel JFET. Also show that $\mu = rd \times gm$.   **(6)**

b. Assuming Si transistor with β= 100 Calculate V_{CE}, I_C for the following circuit
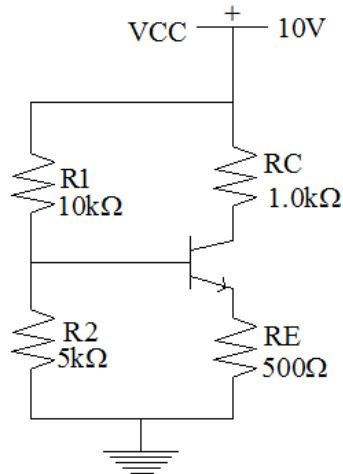
(4)

Fig.5

c. Define the following: Darin to source saturation current of JFET, Pinch off voltage of JFET, Voltage controlled resistance of JFET.   **(6)**

Q.6 a. Explain the working of Wein Bridge Oscillator.   **(8)**

b. What are the advantages and disadvantages of negative feedback in amplifier?

(8)

Q.7 a. Draw and explain the Transformer coupled Class A power amplifier. List the advantages and disadvantages also.   **(8)**

b. With the help of a neat diagram explain the functioning of Class-C power amplifier.   **(8)**

Q.8 a. A certain BJT transistor has r_π = 2 kΩ and β = 50 at 1 MHz and β = 2.5 at 20MHz. Determine the values of f_T, f_B and c_π.   **(8)**

b. With neat circuit diagram and frequency response, explain two stage RC coupled amplifier. What are its advantages and applications?   **(8)**

Q.9 a. What do you mean by Integrated Circuits? What are the advantages of ICs as compared to standard printed circuits?   **(8)**

b. Explain in brief, the various steps involved in fabrication of ICs.   **(8)**