Code: AE53/AC53/AT53   **Subject: ELECTRONIC DEVICES & CIRCUITS**

AMIETE – ET/CS/IT

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. The total capacitance of three capacitors $C_1 = 0.2\text{pF}$, $C_2 = 0.6\text{pF}$ and $C_3 = 1\text{pF}$ is

(A) 8.1 pF   (B) 4 pF
(C) 1.8 pF   (D) 0.9Pf

b. A silicon diode operates at a forward voltage of 0.4V. The factor by which the current is to be multiplied when the temperature is increased from $25°C$ to $150°C$ is

(A) 638   (B) 836
(C) 1   (D) 319

c. A sinusoidal voltage of amplitude 20V and frequency 50Hz is applied to half wave rectifier. Given $R_L = 1\text{K}\Omega, V_\gamma = 0, R_f = 10\Omega, R_\gamma = \infty$. The output dc voltage and dc power are

(A) 1V, 1W   (B) 6.303V, 39.72mW
(C) 10V, 10W   (D) None of these

d. If a current of 5A flows in an inductance of 10H, the energy stored in the inductor is

(A) 62.5 J   (B) 6.25 J
(C) 125 J   (D) 12.5 J

e. If $X_L = 100\Omega, R_L = 10\Omega$ of a R-L circuit, it's quality factor is

(A) 100   (B) 10
(C) 33.3   (D) 1000

f. If time period of a signal is 40 μS, the signal frequency is

    (A) 25 KHz   **(B)** 40 MHz
    (C) 25 MHz   **(D)** 40 KHz

g. If $r_d = 10K\Omega, g_m = 2m$ mhos in a JFET, it's amplification factor is

    (A) 20   **(B)** 5
    (C) 200   **(D)** 0.5

h. A basic amplifier has voltage gain of 80 and its feedback ratio is 0.1%. The gain with negative feedback is

    (A) 74.07   **(B)** 70.74
    (C) 77.40   **(D)** 40.77

i. For a BJT, $h_{fe} = 50, h_{ie} = 0.83K\Omega$, then the corresponding h_{fb} & h_{ib} are

    (A) 98, 27.16Ω **(B)** 89, 16.27Ω
    (C) 10, 100Ω **(D)** $-0.98, 16.27\Omega$

j. A class B amplifier has a supply voltage of 22 Volts and drives a load of 4Ω with a peak voltage of 20 Volts. The efficiency of the amplifier is

    (A) 17.4%   **(B)** 41.7%
    (C) 71.4%   **(D)** None of these

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

Q.2   a. Briefly discuss:
        (i)   Superposition theorem
        (ii) Maximum power transfer theorem
        (iii) Duality of networks   **(2+2+3)**

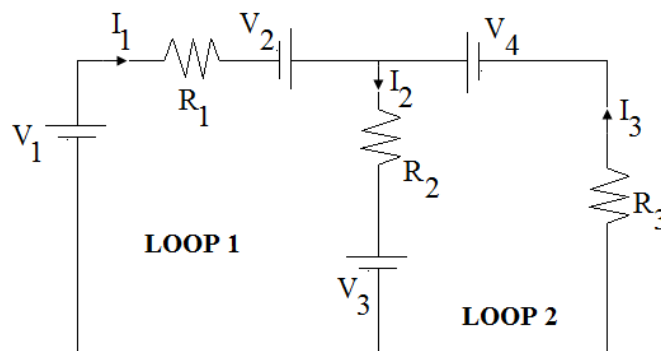   b. Write loop equations for the circuit shown in Fig.1.   **(3)**

Fig.1

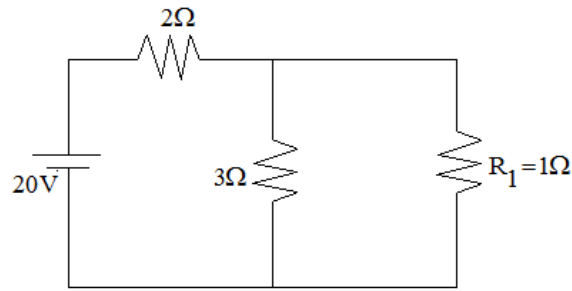   c. Find the current in the 1Ω resistance using Thevenin's theorem in fig.2.   **(6)**

Fig.2

Q.3 a. Give the symbol, V-I characteristics and one application for any four different types of diodes. **(4)**

b. Discuss the capacitances present in junction diodes. How do they affect the high frequency performance? **(6)**

c. In a rectifier circuit, $I_{dc} = 10mA, R_L = 1K\Omega, I_{rms} = 14mA$. Find dc power, ac power in the output and the conversion efficiency. **(6)**

Q.4 a. Draw the circuit of a BJT in CE configuration and the corresponding VI characteristics. Mark the different regions of operation and mention one application for each. **(6)(10)**

b. ~~For the following circuit, find I_B, R_B and R_C if $V_{CC} = 12V, V_{BB} = 3V$, $I_C = 12mA, V_{CE} = 5.5V, \beta = 100, V_{BE} = 0.7V$ and $R_E = 50\Omega$.~~ **(6)**

c. Define the following with respect to an SCR
(i) V_{FBO} (ii) Firing angle
(iii) Latching current   (iv) Holding current   **(4)(6)**

Q.5 a. What are the hybrid parameters in small signal BJT model? Give the units for each of them. **(4)**

b. Compare BJT and FETs. **(4)**

c. In a CE transistor amplifier circuit,
(i) for $V_{CE} = 0, I_C = 2mA, I_B = 30\mu A, V_{BE} = 50mV$
(ii) for $I_B = 0, V_{CE} = 1V, V_{BE} = 0.3V, I_C = 0.1mA$. Find h-parameters.
(iii) If $R_L = 8K\Omega$, find A_i and R_i **(8)**

Q.6 a. Draw the circuit diagram and frequency response of a single stage RC coupled amplifier. Mark the cut off frequencies and 3 db points. Define the figure of merit for an amplifier. **(6)**

b. The bandwidth of an amplifier extends from 20 Hz to 20 KHz. Find the frequency range over which the voltage gain is down less than 1dB from its mid band value. **(10)**

Q.7   a. With a circuit diagram, explain the working of a complementary symmetry power amplifier. What are its specific advantages? **(6)**

b. What is cross over distortion? How it could be reduced? Explain with waveforms. **(4)**

c. Calculate the peak power dissipated in each transistor of a class B push pull amplifier if $V_{CC} = 15V$ and $R_L' = 5\Omega$. **(6)**

Q.8   a. Discuss the importance, types and characteristics of feedback in amplifiers. **(6)**

b. An amplifier without feedback gives a fundamental output of 36V with 7% second harmonic distortion when the input voltage is 0.028V
(i) If 1.2% of the output is feedback into the input of a negative voltage series circuit, what is the output voltage?
(ii) If the fundamental output is maintained at 36V but the second harmonic distortion is reduced to 1%, what is the input voltage? **(10)**

Q.9   a. Discuss how IC's could be classified. **(4)**

b. Reason out why it is not feasible to integrate inductors. **(2)**

c. Why MOSFETs are preferred over BJTs for IC fabrication? **(2)**

d. With neat sketches, explain the steps involved in IC fabrication. **(8)**