ROLL NO. ______________

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

AMIETE – ET/CS/IT

Time: 3 Hours **DECEMBER 2013** **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. For a certain BJT, β= 50; I_{CEO} = 3μA and I_C =1.2 mA. I_B will be:

(A) 2.5μA **(B)** 24 μA
(C) 30μA **(D)** 0.3μA

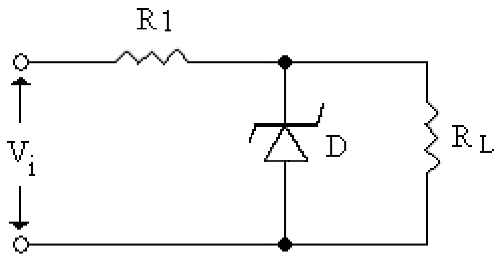
b. In a bridge-type full-wave rectifier, if V_m is voltage across the secondary, of the transformer, the maximum voltage coming across each reverse –biased diode is

(A) 2 V_m **(B)** V_m
(C) V_m /2 **(D)** 4 V_m

c. In a transistor whose α is 0.98 and I_{CO} is 5 μA and I_E = 3mA, the collector current is equal to ______.

(A) 2 mA **(B)** 0.03 mA
(C) 3mA **(D)** 0.2 mA

d. In the voltage regulator shown below, if the current through the load decreases,



(A) The current through R1 will increase
(B) The current through R1 will decrease
(C) Zener diode current will decrease
(D) Zener diode current will increase

e. An N-channel JFET has V_P = – 4V and given that V_{GS} = – 1V, then the minimum V_{DS} for the device to operate in the Pinch-off region will be

(A) +1V **(B)** +3V
(C) +4V **(D)** +5V

f. A radio frequency signal contains three frequency components, 870 KHz, 875 KHz and 880 KHz, which needs to be amplified. The amplifier used should be

(A) audio frequency amplifier **(B)** wide band amplifier
(C) tuned voltage amplifier **(D)** push-pull amplifier

g. Two stages of BJT amplifiers are cascaded by RC coupling. The voltage gain of the first stage is 10 and that of the second stage is 20. The overall gain of the coupled amplifier is

(A) 10x20 **(B)** 10+20
(C) (10+20)2 **(D)** (10x20)/2

h. Resistance of a wire is r ohms. The wire is stretched to double its length, then its resistance in ohms is

(A) 4r **(B)** r/2
(C) 2r **(D)** r/4

i. It is not possible to fabricate on an IC

(A) Resistor **(B)** Inductor
(C) Capacitor **(D)** Both **(A)** and **(B)**

j. A power amplifier is operated from a 12V dc supply. It gives an output of 3W.The maximum collector current will be

(A) 200mA **(B)** 250mA
(C) 2.5mA **(D)** 2A

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

Q.2 a. In the circuit of Fig. 1, V_A = 2V, I_A = 2A, R_1 = 4Ω and R_2 = 3Ω. Find the Thevenin equivalent voltage V_{th} and impedance Z_{th} for the network to the left of terminals 1, 2. **(2x3)**

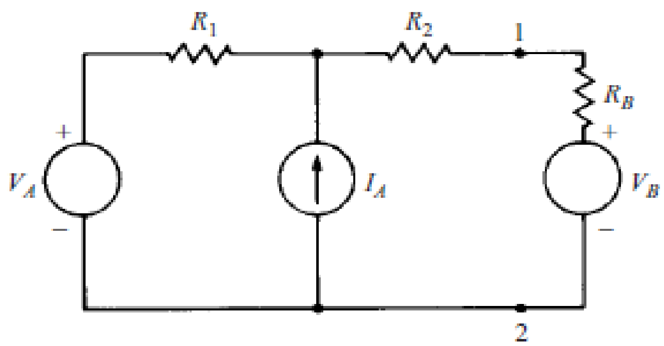


Fig.1

b. Explain Duality. Obtain dual network for the circuit shown in fig.2. (

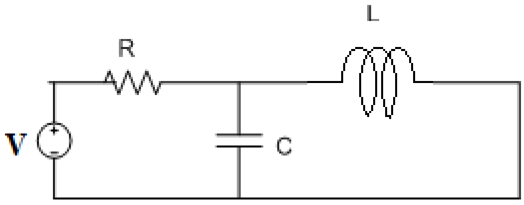


Fig.2

c. State and explain Miller's theorem with the help of one example. **(4)**

Q.3 a. Draw and explain switching characteristics of a diode. **(4)**

b. Plot the output voltage V_0 **(4)**

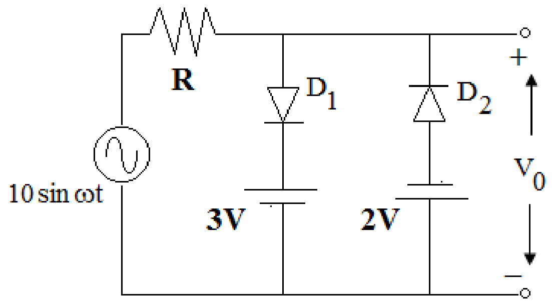


Fig.3

c. Write short note on:
(i) Transition and Diffusion capacitance
(ii) Zener diode as voltage regulator **(8)**

Q.4 a. Explain the construction and operation of a n-channel E-MOSFET with suitable diagram and characteristics. **(6)**

b. The transistor of Fig.4 is provided with the fixed and self biased emitter resistance with $R_c = 4\ k\ \Omega$, $R_E = 2\ k\Omega$, $V_{cc} = 32$ V and $I_c = 4$ mA.
(i) Calculate the value of R_B if $\beta = 100$
(ii) What will be the percentage change in I_C if actual β=40? **(2x4)**

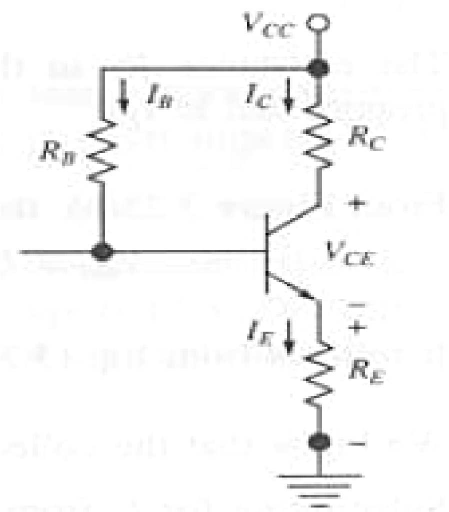


Fig. 4

c. Draw V-I characteristics of an SCR. **([illegible])**

Q.5 a. Draw the small-signal model of Emitter follower and obtain the expression of voltage gain, current gain, input impedance and output impedance. **(8)**

b. Explain working of a Darlington pair amplifier in detail. **(6)**

c. Write short note on CMOS. **(2)**

Q.6 a. Explain working of tuned amplifier. Also state its merit and application. **(6)**

b. A certain BJT transistor has r_π = 2 kΩ and β= 50 at 1MHz and β = 2.5 at 20MHz. Determine f_T, f_β and C_π. **(2x3)**

c. Write short note on cascaded amplifiers. **(4)**

Q.7 a. Compare Class A, Class B, Class AB and Class C power amplifiers. **(8)**

b. State performance parameters of power amplifier. **(3)**

c. A transistor supplies 2W for a 5 kΩ load. The zero-signal dc collector current is 35 mA and rises to 40 mA when signal is applied. Determine the percent second- harmonic distortion. **(5)**

Q.8 a. Define feedback. Which type of feedback is used for oscillator circuit? Discuss feedback's effect on input and output impedance. **(8)**

b. A voltage series feedback amplifier has the following data: A = -500, R_i = 1.5 kΩ , R_o = 50 kΩ and β = (1/10). Calculate amplifier gain, input and output resistances. Also draw topology for the same **(2x4)**

Q.9 a. Write short notes:
(i) Integrated resistors
(ii) Integrated capacitors **(2x4)**

b. State characteristics of IC components. **(4)**

c. State levels of integration of IC fabrication. **(4)**