ROLL NO. _____

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

AMIETE – ET/CS/IT (NEW SCHEME)

Time: 3 Hours **DECEMBER 2011** **Max. Marks: 100**

NOTE: There are 9 Questions in all.

- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **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. A reverse biased p-n junction has 5 V across it with a current of 1 μA, flowing through it, and then the reverse resistance of the diode is

(A) 1 MΩ **(B)** 2 MΩ
(C) 4 MΩ **(D)** 5 MΩ

b. The output of a half wave rectifier contains.

(A) More ripples than DC **(B)** Less ripple than DC
(C) AC and DC in equal amounts **(D)** None of these

c. A BJT has $\alpha_{dc} = 0.98$ and I_{CBO}=5 μA. If the base current is 100 μA, the collector current is

(A) 5.15 mA **(B)** 15.5mA
(C) 15.15 A **(D)** 15.5 A

d. The base current and collector current of a transistor are 50 μA and 5 mA, the corresponding h_{FE} is

(A) 10 **(B)** 100
(C) 20 **(D)** 200

e. The common collector circuit is also known as

(A) Emitter follower **(B)** Collector follower
(C) Base follower **(D)** None of these

f. If the base is more lightly doped than the collector, the C-B junction will penetrate into the base until it touches the EB depletion region. This condition is known as

(A) Punch through **(B)** Break down
(C) See through **(D)** None of these.

g. In the circuit shown in Fig.1 below V_{CC}=10 V, R_C=1 KΩ and I_C=9 mA, then V_{CE} is

(A) 1 V
(B) 0.2 V
(C) 0.3 V
(D) 0.4 V

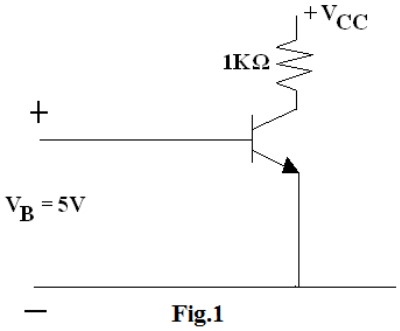

Fig.1

h. The equivalent circuit shown in Fig.2 below is obtained by applying

(A) Norton's
(B) Thevenin's
(C) Miller's
(D) None of these

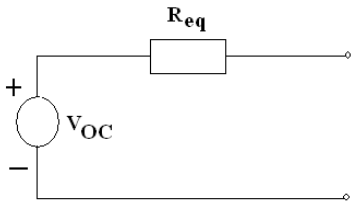

Fig.2

i. If all the components of an I_C are fabricated on a single silicon chip, then it is called as

(A) Monolithic **(B)** ASIC
(C) SOC **(D)** None of these

j. The output of an amplifier is measured as 1 V at 5 KHz and 0.707 V at 20 kHz. The change in output power is

(A) 1 dB **(B)** – 2 dB
(C) – 3 dB **(D)** – 4 dB

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

Q.2 a. What is meant by majority charge carriers and minority charge carriers? Which are majority carriers and why in:
(i) donor-doped material
(ii) acceptor-doped material. **(8)**

b. Draw the dc load line for the circuit as shown in Fig.3 **(8)**

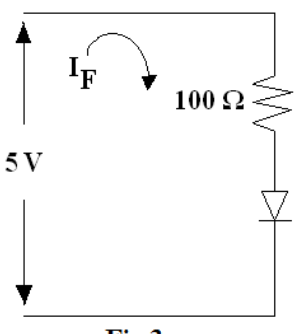

Fig.3

Q.3 a. State and explain Maximum Power Transfer theorem. **(8)**

b. For the circuit shown below, calculate the current through each register, the voltage across each register and the voltage at each node of the circuit (Fig.4). **(8)**

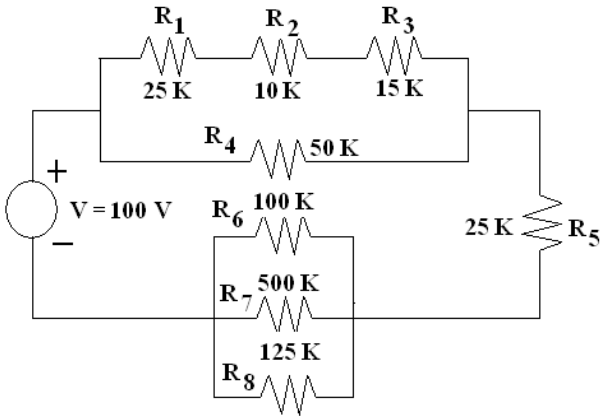

Fig.4

Q.4 a. Explain the switching action of SCR with the help of two transistor model. Also explain the characteristics & applications of the SCR. **(8)**

b. Compare BJT and JFET. Also explain the operation of an n-channel JFET. **(8)**

Q.5 a. Determine the operating point (V_{CEQ}, I_{CQ}) of the silicon transistor in the Fig.5. Also calculate the voltage gain V_O/V_i and the input impedance of the amplifier. **(8)**

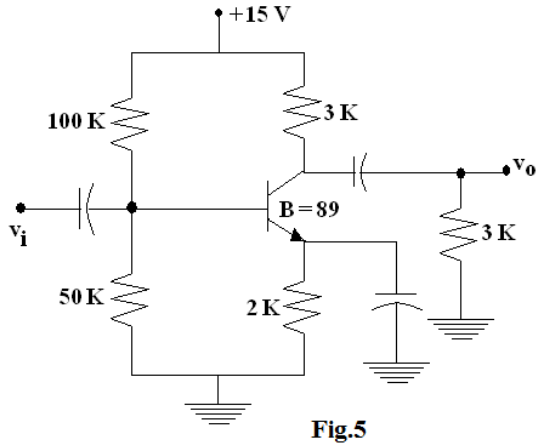

Fig.5

b. Design an emitter current bias with the following specifications: V_{CC}=15 V, V_{CE}=5 V, I_C=5 mA, h_{FE} = 100. **(8)**

Q.6 a. With neat sketches, explain the operation of a single stage RC coupled amplifier. **(8)**

b. Explain Tuned amplifier. Derive an expression for quality factor Q_{ckt} of a Tuned Amplifier. **(8)**

Q.7 a. Explain why Barkhausen criteria must be fulfilled to sustain oscillation. Discuss the operation of a Wein's bridge oscillator. **(8)**

b. An amplifier requires an input of 30 mV to obtain a certain output. To get the same output with negative feedback, the required input signal is 0.9 V. The voltage gain with feedback in 54 dB. Find the open loop gain of the amplifier and the feedback factor. **(8)**

Q.8 a. Briefly explain various steps of IC fabrication. **(8)**

b. Calculate the chip area needed for a 250 pF MOS capacitor, if the thickness of SiO_2 layer is $500A^{\circ}$ and its relative dielectric constant is 3.5. **(8)**

Q.9 a. Discuss the principles of push pull amplifiers. Give the merits and demerits of push pull amplifiers. **(8)**

b. Design a class B power amplifier to deliver 30 W to a load resistor $R_L=4\,\Omega$ using a transformer coupling $V_{in}=30$ V$=V_{CC.}$ Suitably assume missing data, if any. **(8)**