ROLL NO. _____

Code: AE53/AC53/AT53/AE103 Subject: ELECTRONIC DEVICES & CIRCUITS

AMIETE – ET/CS/IT (Current & New Scheme)

Time: 3 Hours **JUNE 2015** **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. If $\alpha = 0.98, I_{CO} = 6\,\mu A$ and $I_B = 100\,\mu A$ for a transistor then the value of I_C will be

(A) 2.3 mA **(B)** 3.1 mA
(C) 4.6 mA **(D)** 5.2 mA

b. If Vm is the peak AC voltage of one-half of transformer secondary then PIV of full wave rectifier with centre-tapped transformer is

(A) V_m **(B)** $3V_m$
(C) $2V_m$ **(D)** $1.11\ V_m$

c. The amplification factor (μ) of JFET is equal

(A) g_m/r_d **(B)** $g_m r_d$
(C) $\sqrt{g_m r_d}$ **(D)** $\sqrt{r_d/g_m}$

d. Emitter follower has

(A) high input impedance and high output impedance
(B) high input impedance and low output impedance
(C) low input impedance and high output impedance
(D) low input impedance and low output impedance

e. The most popularly used transistor biasing circuit is

(A) Fixed Bias **(B)** Feedback Bias
(C) Potential Divider Bias **(D)** 2 Battery Bias

f. The current i_X in the network shown in fig.1 is:

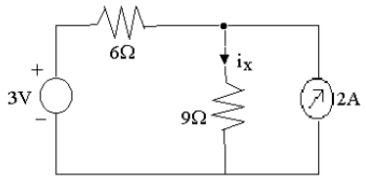

Fig.1

(A) 1A **(B)** 1/2 A
(C) 1/3 A **(D)** 4/5 A

g. The regulated output of a zener voltage regulator mainly depends on

(A) Zener voltage V_Z **(B)** Series resistance Rs
(C) Load resistance R_L **(D)** None of these

h. For proper amplification in transistor circuit, the base-emitter junction should be _____ biased and the base-collector junction should be _____biased.

(A) Forward, Forward **(B)** Forward, Reverse
(C) Reverse, Forward **(D)** Reverse, Reverse

i. A transistor switch will be biased to work in its _____ region of operation.

(A) cut-off and saturation **(B)** cut-off and active
(C) active and saturation **(D)** none of these

j. The _____configuration of a transistor offers a phase reversal between I/P and O/P.

(A) common emitter **(B)** common base
(C) common collector **(D)** none of these

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

Q.2 a. Derive & Explain Maximum Power Transform theorem. **(8)**

b. Find i_o in the circuit in Fig. 2 using superposition theorem. **(8)**

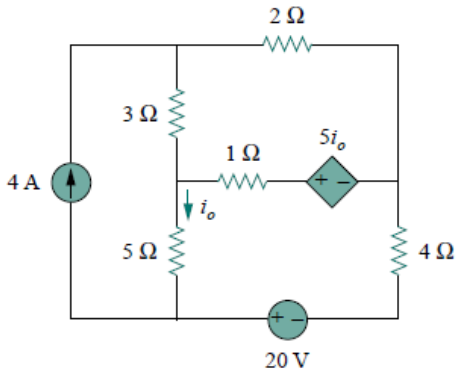

Fig.2

Q.3 a. Explain Zener diode as a voltage regulator. **(8)**

b. A Bridge rectifier uses four identical diodes of forward resistance of 5 Ω each. It is supplied from a transformer with output voltage of 20 volt (rms) and secondary winding resistance of 10 Ω. Calculate

(i) Output dc voltage at a dc load current of 100 m Amp.
(ii) Percentage regulation for a full load dc current of 200 m Amp.
(iii) RMS value of output voltage at a dc load current of 200 m Amp.
(iv) RMS value of ac component of voltage in part (iii). **(8)**

Q.4 a. Explain the need of biasing in transistor circuit and describe self bias technique. **(8)**

b. For the Darlington pair circuit of fig. 3, $\beta_1 = \beta_2 = 30$. Find the value of R_1. If $R_1 = R_2$. **(8)**

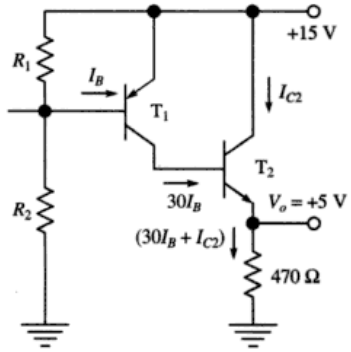

Fig.3

Q.5 a. For the emitter follower circuit of fig.4 the BJT has the following parameters: g_m=35ms, β=125, **(10)**

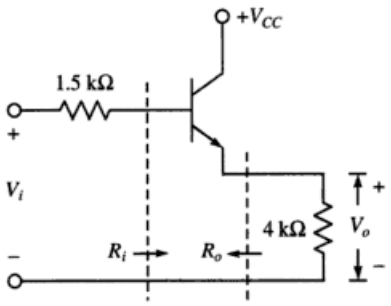

Fig.4

(i) Draw the low frequency small signal model of this circuit.
(ii) Determine R_i & R_o.
(iii) Evaluate the transfer function V_O/V_i.

b. Draw and explain Common Emitter configuration **(6)**

Q.6 a. Write down the effect of coupling capacitor in low frequency analysis. **(8)**

b. Explain the frequency response and linear circuit model of single stage RC Coupled amplifier. **(8)**

Q.7 a. Derive the expression for the frequency of Wein Bridge Oscillators. **(10)**

b. Deduce the Barkausen Criterion for the generation of sustained oscillations. How are the oscillations initiated? **(6)**

Q.8 a. Explain the circuit operation & transfer characteristics of Class B Amplifier. **(8)**

b. Design a class B output stage to deliver an average power of 20 W to an 8-Q load. The power supply is to be selected such that *Vcc* is about 5 V greater than the peak output voltage. This avoids transistor saturation and the associated nonlinear distortion, and allows for including short-circuit protection circuitry. Determine the supply voltage required, the peak current drawn from each supply, the total supply power, and the power-conversion efficiency. Also determine the maximum power that each transistor must be able to dissipate safely. **(8)**

Q.9 a. Briefly explain various steps of IC fabrication. **(8)**

b. Write short note on Integrated Resistors and Integrated Capacitors. **(8)**