

AMIETE – ET/CS/IT

Time: 3 Hours

DECEMBER 2012

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. Three resistors of value $1K\Omega$, $2K\Omega$ and $4K\Omega$ are connected in parallel. If supply voltage is 2V, the total current in the circuit is _____.

- (A) 3 mA (B) 3.25 mA
(C) 3.5 mA (D) 4 mA

b. The value of voltage equivalent of temperature at room temperature (27°k) is

- (A) 26 mV (B) 37 mV
(C) 100 mV (D) 200 mV

c. Ripple factor for Full wave Rectifier without filter is _____

- (A) 0.462 (B) 0.432
(C) 0.492 (D) 0.482

d. DC current of full wave rectifier is _____

- (A) $\frac{I_m}{\pi}$ (B) $\frac{I_m}{\sqrt{2}}$
(C) $\frac{2I_m}{\pi}$ (D) $\frac{2I_m}{\sqrt{2}}$

e. Current gain β in terms of α is expressed as

- (A) $\frac{\alpha}{1+\alpha}$ (B) $\frac{1+\alpha}{\alpha}$
(C) $\frac{\alpha}{1-\alpha}$ (D) $\frac{1-\alpha}{\alpha}$

f. A Four layer electronic device is _____

- (A) BJT (B) SCR
(C) UJT (D) FET

Code: AE53/AC53/AT53

Subject: ELECTRONIC DEVICES & CIRCUITS

- g. nMOS transistor with potential divider as biasing circuit having $R_1 = R_2 = 100K\Omega$ will have gate potential for $V_{DD} = 12V$ as _____
- (A) 8V (B) 6V
(C) 10V (D) 12V
- h. The elementary JFET amplifier has $g_m = 1600\mu\text{sec}$, $r_d = 50K\Omega$, $R_L = 5K\Omega$. The value of small signal voltage gain is _____
- (A) 8 (B) 0.8
(C) -8 (D) -0.8
- i. For class-B amplifier operation, the operating point Q is at _____ of the load line.
- (A) center (B) cut off end
(C) beginning (D) None
- j. The length required to fabricate $20K\Omega$ resistor whose width is $25\mu\text{m}$ and $R_s = 200\Omega/\text{square}$ is
- (A) $250\mu\text{m}$ (B) $1000\mu\text{m}$
(C) $25000\mu\text{m}$ (D) $2500\mu\text{m}$

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

- Q.2 a. State superposition and Thevinin's theorem. Give an example for each. (8)
- b. Find the value of R in Fig.1 such that the power supplied by 100V source to the network is same as the power supplied by 5A source. (6)

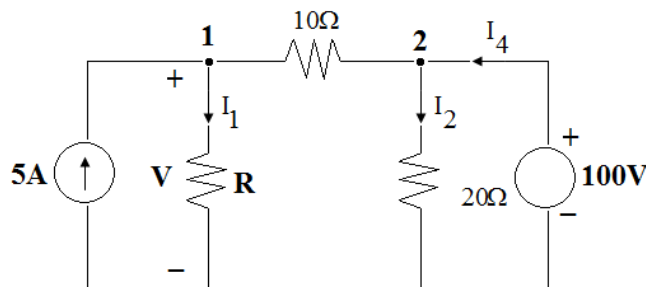
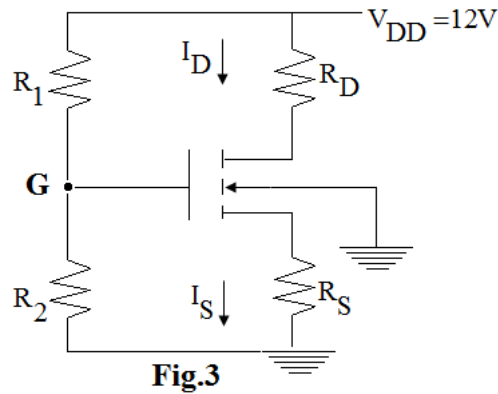
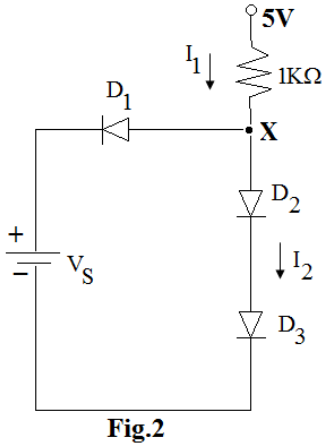


Fig.1

- c. Plot Z vs ω response of RLC parallel circuit indicating resonant frequency and half power points. (2)

Q.3 a. With neat diagram explain Zener diode I-V characteristics and how it works as voltage regulator. (10)

b. For the circuit shown in Fig.2, determine the current I_1 and I_2 for supply voltage $V_s < 0.7V$ and $V_s > 0.7V$. Assume $V_T = 0.7$ for all diodes. (6)

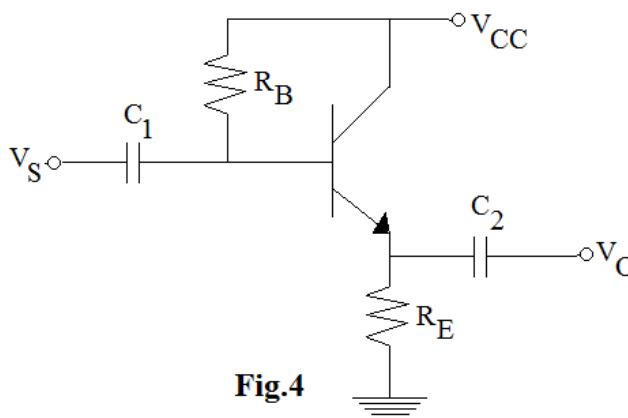


Q.4 a. Explain how MOSFET is different from JFET. (8)

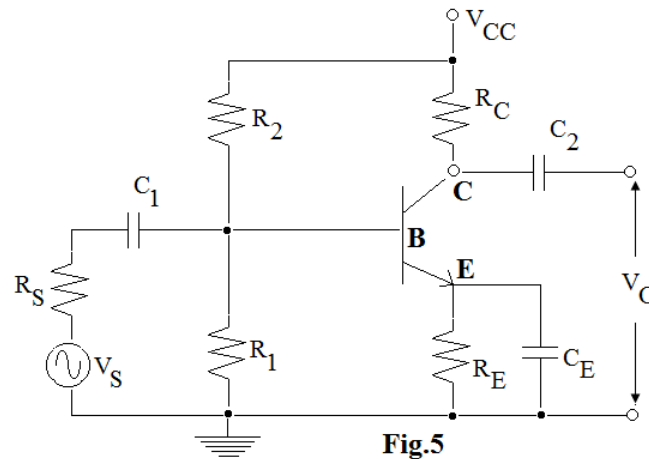
b. An nMOS transistor is used in the circuit of Fig.3. MOSFET has device parameter of $K = 2$. The circuit has $R_D = R_S = 2.5K\Omega$, $R_1 = 100K\Omega$, $R_2 = 200K\Omega$. Determine I_D and V_{DS} . (8)

Q.5 a. Write circuit and small signal model of BJT amplifier (CE configuration). Derive an expression for i_c . (8)

b. The emitter follower circuit of Fig.4 has $\beta = 98, r_{\pi} = 1.275K\Omega$, $R_B = 220K\Omega$, $R_E = 3.3K\Omega$, $V_{CC} = +12V$. Calculate:
 (i) voltage gain
 (ii) input and output impedances. (8)



- Q.6** a. Briefly explain the importance of the terms 'Quality factor' in Tuned Amplifier. (8)
- b. The amplifier circuit of Fig.5 uses silicon BJT with $\beta = 100$. The values of other circuit elements are $R_1 = 60\text{K}\Omega$, $R_2 = 140\text{K}\Omega$, $R_S = 4\text{K}\Omega$, $R_E = 3\text{K}\Omega$, $R_C = 4\text{K}\Omega$. Capacitances are assumed to be large and $V_{CC} = 10\text{V}$. Find DC bias current I_C and V_{CE} . (8)



- Q.7** a. Explain briefly functioning of series fed class-A large signal amplifier. (8)
- b. With neat sketch explain the working of class-B push-pull amplifier. (8)
- Q.8** a. Explain various types of feedback connections. (8)
- b. A voltage series feedback amplifier has the following data. $A = -500$, $R_I = 1.5\text{K}\Omega$, $R_O = 50\text{K}\Omega$, $\beta = \frac{1}{20}$. Calculate amplifier gain, input and output resistances. (8)
- Q.9** a. Explain briefly oxidation and photolithography process of IC Fabrication technique. (6)
- b. What is the length required to fabricate $20\text{K}\Omega$ resistor whose width is $25\mu\text{m}$, given $R_s = 200\Omega/\text{Square}$? (4)
- c. Write cross-sectional view of CMOS fabrication and explain briefly. (6)