

AMIETE -CS/IT (OLD 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.

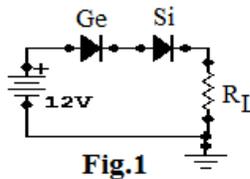
Q.1 Choose the correct or the best alternative in the following: (2×10)

a. Which of the following is trivalent?

- | | |
|----------------|--------------|
| (A) Arsenic | (B) Aluminum |
| (C) Phosphorus | (D) Bismuth |

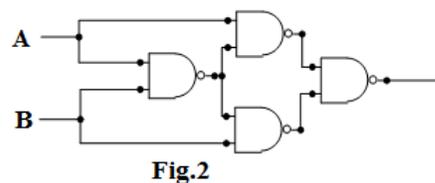
b. The value of load resistor in this circuit (Fig.1) is if current through the diode is 2mA

- (A) 5K
 (B) 5.5K
 (C) 5.5 Ω
 (D) 4.5K



c. Identify the output of the following circuit shown in Fig.2

- (A) AND
 (B) XOR
 (C) XNOR
 (D) NOR



d. When simplified the result of expression $y = (\bar{A} + B)(A + B)$ is ___

- | | |
|---------------|--------|
| (A) \bar{B} | (B) B |
| (C) A | (D) AB |

e. A Zener diode has dc power dissipation rating of 50mW and Zener voltage rating of 7.5 V The value of I_{ZM} is

- | | |
|-------------|-------------|
| (A) 76.76mA | (B) 66.67mA |
| (C) 76.68mA | (D) 67.86mA |

f. In ECL logic family the logic swing with 5 V power supply is __

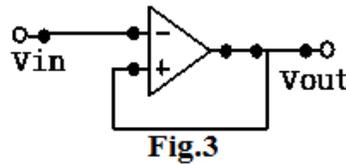
- (A) less than 2V (B) 3.6V
(C) 5V (D) 4V

g. For a transistor $\beta = 40$, $I_B = 25\mu A$, the value of I_E will be

- (A) 1mA (B) 1.025mA
(C) 0.975mA (D) 1.25 μA

h. The opamp circuit shown in Fig.3 is

- (A) Inverting Amplifier
(B) Voltage Follower
(C) Summer
(D) Active half wave



i. How many 16K X 4 RAMS are required to achieve a memory with a capacity of 64K and word length of 8 bits?

- (A) 4 (B) 8
(C) 6 (D) 16

j. MOS circuits as compared to bipolar circuits take _____

- (A) same chip area (B) less chip area
(C) more chip area (D) none

Answer any FIVE Questions out of EIGHT Questions.

Each question carries 16 marks.

Q.2 a. Draw a neat schematic representation of p-n junction and explain what happens when junction is (i) forward biased (ii) reverse biased. Draw the practical VI-characteristics of pn-junction diode and discuss the effect of temperature on current flowing through the diode? (8)

b. With neat circuit diagram and input-output waveforms explain FET works as a switch? (4)

c. (i) Find the values of V_L, V_R, I_Z and P_Z in the Zener network shown below in Fig.4 (2)

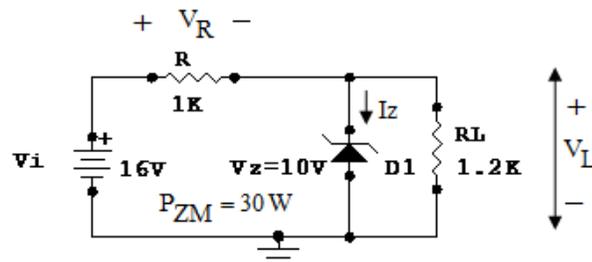
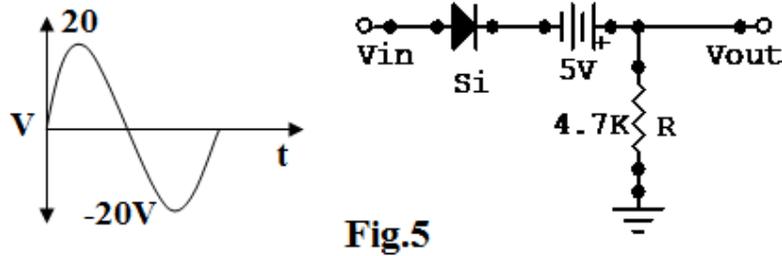
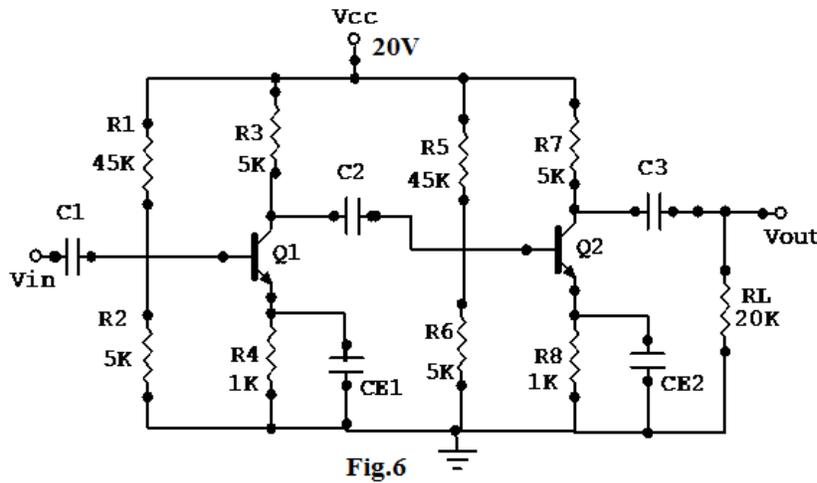


Fig.4

(ii) Sketch correct output waveform for the following circuit: (2)

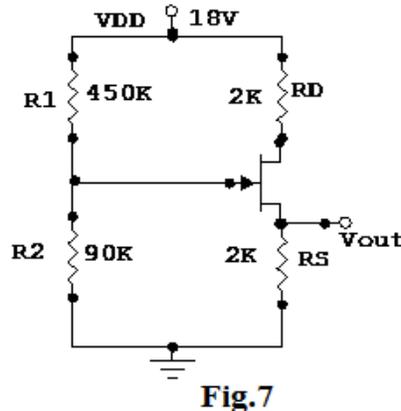


Q.3 a. Compute the overall voltage gain for the two stage-RC coupled amplifier shown in the Fig.6. Assume $V_{BE}=0.7V$ and β_1 (of Q1) = β_2 (of Q2) = 100 (Hint:-Use r_e model) (8)



- b. Draw a neat circuit and prove that current gain in Darlington amplifier is β^2 (4)
- c. Given the following hybrid- π parameters for the transistor at $I_C=10mA$, $V_t = 0.026V$, $V_{CE}=10V$ and room temperature $h_{fe}=100$, $h_{ie}=500\Omega$, $|A_i|=10$ at 10MHz, $C_C=3pF$. Find the values of (i) $r_{b'e}$ (ii) $r_{bb'}$ (iii) f_T and (iv) f_β (4)

Q.4 a. Determine I_D and V_{DS} if $V_P = -4V$ and $I_{DSS}=10mA$ for the following circuit shown in Fig.7: (6)



- b. A voltage $200 \cos 100t$ is applied to a half wave rectifier circuit having load resistance of $5K\Omega$. Rectifier may be represented as an ideal diode in series with resistance of $1K\Omega$. Find (i) Average value of current through the load and voltage across the load (ii) RMS current (iii) Rectifier efficiency (iv) PIV (6)
- c. Design LC filter for full wave rectifier to provide output of 25 V with load current of 100mA and its ripple limited to 3%. (4)
- Q.5** a. With neat circuit and input/output waveforms indicate how operational amplifier works as inverting and non-inverting amplifier derive expression for gain in each case. (8)
- b. Draw the circuit of Wien bridge oscillator and derive the expression for frequency of oscillations. List advantages and disadvantages of this circuit. (8)
- Q.6** a. Prove using Boolean laws that If $\overline{AB} + \overline{CD} = 0$ then expression $AB + \overline{C}(A + \overline{D}) = AB + BD + \overline{B}\overline{D} + \overline{A}\overline{C}\overline{D}$ (4)
- b. Simplify using K-map and realize the result using only NOR gates. $f(A, B, C, D) = \prod(0,1,2,3,7,8,9,10,11) + d(6,14,15)$ (6)
- c. Design 4:1 multiplexer using NAND gates only (6)
- Q.7** a. Explain basic TTL circuit and compare it with DTL in brief (6)
- b. List any four characteristics ECL logic family. (4)
- c. Sketch the circuit and characteristics of CMOS inverter and verify truth table for NOT operation. (6)
- Q.8** a. Sketch the circuit for SR flip-flops using NAND gates. Draw the truth table and obtain characteristic equation for the SR flip-flop. How to convert it into T flip-flop? (8)
- b. Show how a modulo-4 counter designed with two flip-flops can generate a repetitive sequence of binary word 1101 with minimum number of memory elements? (8)
- Q.9** a. Discuss any six applications of ROM. (6)
- b. What is latency time in CCD memory? Explain CCD memory organization in brief. (4)
- c. What is Random Access Memory? How are they classified? List its advantage & disadvantage with respect to ROM. (3)
- d. How PLAs are different from ROM? Explain (3)