

FOURTH SEMESTER

B.E. (COE/EC/EE)

MID SEM EXAMINATION

March 2007

COE/EC/EE-211 ELECTRONICS-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

Assume suitable missing data, if any.

- 1[a] For the circuit shown in Fig.1 the transistor parameters are $\beta_0 = 100$, $V_A = 160$ V. Calculate the open circuit voltage gain. What will be the voltage gain if input resistance of the subsequent stage is $1\text{ M}\Omega$. 3

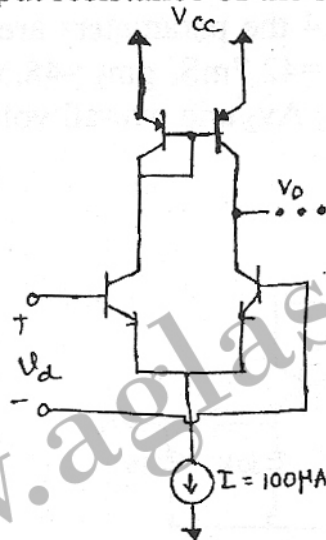


Fig-1

- [b] For the circuit shown in Fig.-2 the transistor parameters are : $\beta_0 = 100$, $V_{BE} = 0.7$ V and $V_A = \infty$

- Determine R_E such that $I_E = 150\text{ }\mu\text{A}$.
- Find A_{DM} (single ended), A_{CM} and CMRR.

5

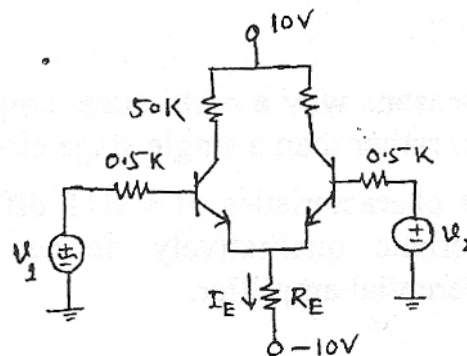


Fig-2

- 2[a] The circuit shown in Fig.3 is an IC MOS amplifier formed by cascading two common source stages. Assuming the biasing current sources have very high output resistance find an expression for overall voltage gain in terms of g_m and r_o of Q_1 and Q_2 . 2

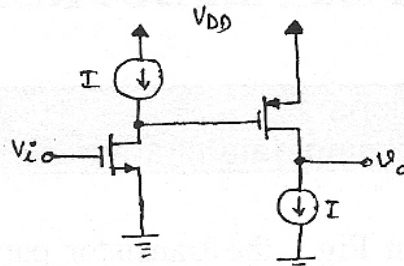


Fig-3

- [b] For the circuit shown in Fig.4 the parameters are $\beta_0 = 100$ and $V_A = \infty$ for both Q_1 and Q_2 and $g_{m1} = 42.7 \text{ mS}$, $g_{m2} = 48.5 \text{ mS}$. Determine the small signal voltage gain A_{v1} , A_{v2} and overall voltage gain. 4

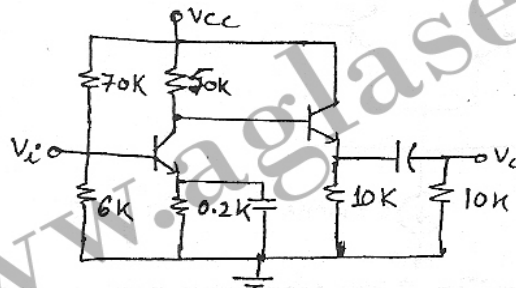


Fig-4

- 3 For the given transfer function sketch the Bode magnitude plot. 2

$$G(S) = \frac{10S}{(S + 20)(S + 2000)}$$

- 4[a] State at least two reasons why a multi stage amplifier circuit would be required in a design rather than a single stage circuit. 2
- [b] Sketch the transfer characteristics of a BJT differential amplifier and from the characteristic qualitatively define the linear region of operation for a differential amplifier. 2

Total No. of Pages 2

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FOURTH SEMESTER

B.E. (EE/EC/COE)

MID SEM EXAMINATION

March 2007

EE/EC/COE-212 ELECTROMAGNETICS

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer **ALL** questions.

Assume suitable missing data, if any.

- 1 State Divergence theorem. Find both sides of the divergence theorem if

$$\vec{A}(r, \theta, \phi) = 2r^2 \vec{a}_r$$

for the volume enclosed between $r = 1$ and $r = 3$. Is the theorem satisfied? 4

- 2 Transform the following vector from spherical to Cartesian coordinates

$$\vec{A}(r, \theta, \phi) = \frac{1}{r} \vec{a}_r$$

Find its value at $(1, -2, 1)$ 4

- 3 Derive the expression for energy stored in an Electrostatic field. 4

- 4 A point charge $-Q$ is placed at a height 'h' above an infinite conducting sheet. Using theory of images, find surface charge induced on the conducting sheet. 4

- 5 A common boundary separates two different media as shown.

Find \vec{E}_2

$$\bar{E}_1 = E_0(4\bar{a}_x - 5\bar{a}_y - 6\bar{a}_z)$$

Medium 1

$$\mu_1 = \mu_0 ; \sigma_1 = 0$$

$$\epsilon_1 = 5 \epsilon_0$$

$$z > 0$$

$$\rho_s = 6\epsilon_0 E_0$$



$$E_2 = ?$$

Medium 2

$$\mu_2 = \mu_0 ; \sigma_2 = 0$$

$$\epsilon_2 = 2 \epsilon_0$$

$$z < 0$$

FOURTH SEMESTER

B.E. (COE)

MID SEM EXAMINATION

March

2007

COE-213 DATA STRUCTURES

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

Assume suitable missing data, if any.

- 1 Define the following terms
 - i. Abstract data type
 - ii. Pseudo code
 - iii. Connected component of graph
 - iv. Binary tree
 - v. Time complexity and space complexity. **5**
- 2 Write an algorithm, that count the terminal nodes of a binary tree. **3**
- 3 What is spanning tree? Write Kruskal's minimum cost spanning tree algorithm. Explain with the help of example. **4**
- 4 Write an algorithm to convert infix expression to postfix expression. Use this algorithm to convert the following infix expression to postfix expression
$$A*(B/(C*(D+(F*G))))+H/J$$
4
- 5 Write the functions in C/C++ to implement the insertion and deletion in a circular queue. **4**

FOURTH SEMESTER**B.E. (EC/COE)****MID SEM EXAMINATION****March 2007****EC/COE-214 DIGITAL CIRCUITS & SYSTEMS****Time: 1 Hour 30 Minutes****Max. Marks : 20****Note :** Answer **ALL** questions.

All the parts of a question are to be attempted in continuity.

Assume suitable missing data, if any.

- 1 Consider the following multi-output function

$$f_1 = \sum m(0,1,2,5,7)$$

$$f_2 = \sum m(1,2,3,7)$$

Using Quine-McCluskey method, implement the function and indicate

- i. All prime Implicants
- ii. All essential Prime Implicants
- iii. All possible minimum solutions.

4

- 2 Design a combinational circuit whose inputs are two 8-bit unsigned binary integers X and Y, and output is an 8-bit unsigned binary integer Z such that

$$Z = 0 \text{ if } X = Y$$

$$Z = \min(X, Y) \text{ if MIN/MAX} = 1$$

$$Z = \max(X, Y) \text{ if MIN/MAX} = 0$$

Specify the IC numbers used in the circuit.

4

- 3[a] Design a 4-digit multiplexed display system with leading zero blanking.

3

- [b] Design the following function of 4-variables using 4-to-16 line decoder with active low outputs.

$$f_1 = \sum m(0,3,5,6,9,10,12,15)$$

$$f_2 = \prod M(0,1,3,7,9,10,11,13,14,15)$$

3

- 4[a] In TTL NAND gate with totem pole output, what happens if

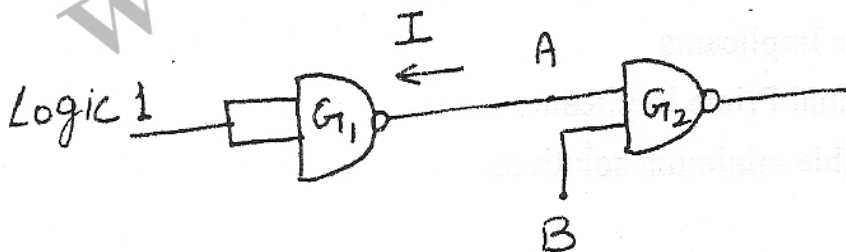
(i) Diode D is not present

(ii) Output accidentally gets shorted to ground.

3

- [b] Consider the circuit shown in figure given below which uses TTL gates. The current I is 1.6 mA when terminal B is left unconnected. Find the value of I when B is connected to A. Comment on the effect of this connection on the fan-out of gate G_1 .

3



FOURTH SEMESTER

B.E.(COE)

MID SEM EXAMINATION

March 2007

COE-215 PRINCIPLE OF COMMUNICATION
ENGINEERING

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

Assume suitable missing data, if any.

- 1[a] Why modulation is needed in a communication system. 2
- [b] Give block diagram of a SSB transmitter using phase-shift method and discuss its working. 3
- [c] Let a message signal $m(t)$ be transmitted using SSB modulation. The power spectral density of $m(t)$ is

$$S_M(f) = \begin{cases} \frac{a|f|}{W} & |f| \leq W \\ 0 & \text{otherwise} \end{cases}$$

where a and W are constants. White Gaussian noise of zero mean and power spectral density $N_0/2$ is added to the SSB modulated wave at the receiver input. Find an expression for the output S/N of the receiver.

5

- 2[a] Show that for optimum detection in an envelope detector the time constant is given by

$$RC = \frac{\sqrt{1 - \mu^2}}{\omega_m \mu}$$

where symbols have usual meaning.

4

- [b] The antenna current of an AM broadcast transmitter, modulated to a depth of 40% by an audio sine wave is 11 amperes. It increases to 12 amperes as a result of simultaneous modulation by another audio sine wave. Find the modulation index due to this second sine wave. 2

[c] The system shown in Fig. is used to generate an AM signal. The modulating signal has zero mean and its maximum (absolute) value is $A_m = \max |m(t)|$. The non linear device has a input-output characteristics $y(t) = ax(t) + bx^2(t)$

- (i) What is the modulation index?
- (ii) Specify the filter characteristics that yield an AM signal at its output.

4

