

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

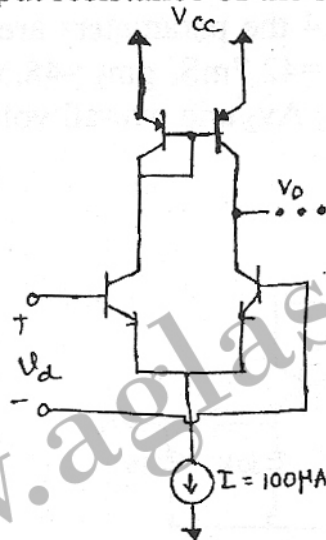


Fig-1

- [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

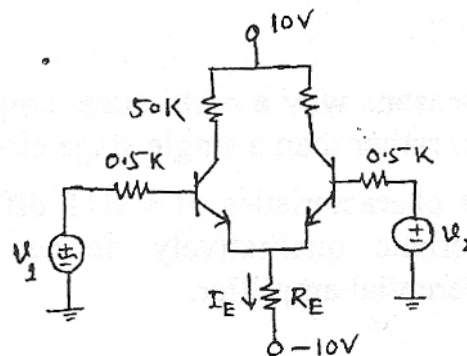


Fig-2

- 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

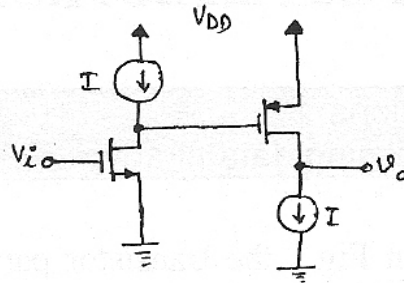


Fig-3

- [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

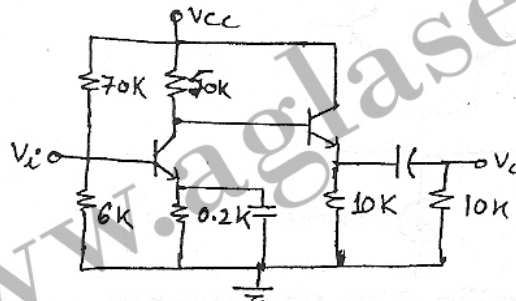


Fig-4

- 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

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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

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

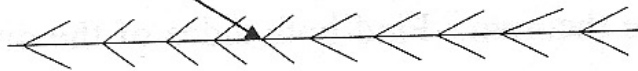
Medium 1

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

$$\epsilon_1 = 5 \epsilon_0$$

$$z > 0$$

$$\rho_s = 6\epsilon_0 E_0$$



$$E_2 = ?$$

Medium 2

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

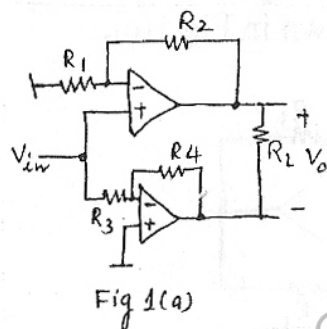
$$\epsilon_2 = 2 \epsilon_0$$

$$z < 0$$

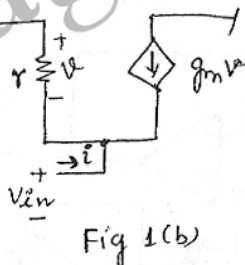
Note : Answer **ALL** questions.

Assume suitable missing data, if any.

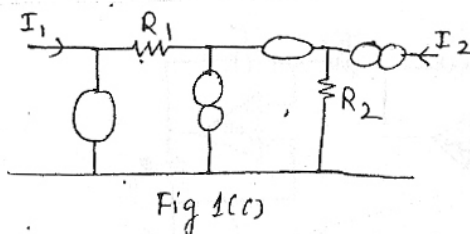
1[a] For the circuit shown in Fig. (a) determine V_o/V_i .



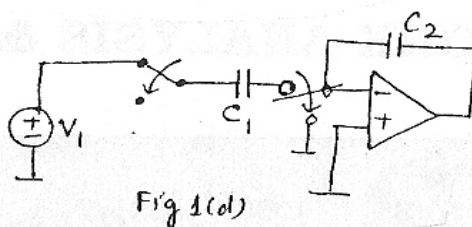
[b] Determine the input impedance for the circuit shown in Fig.1(b).



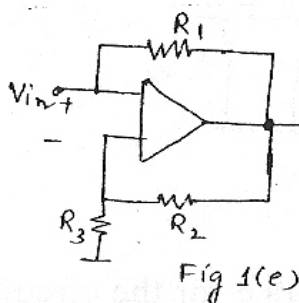
[c] Determine the current I_2 in Fig.1(c) and show that this circuit is a VCCS.



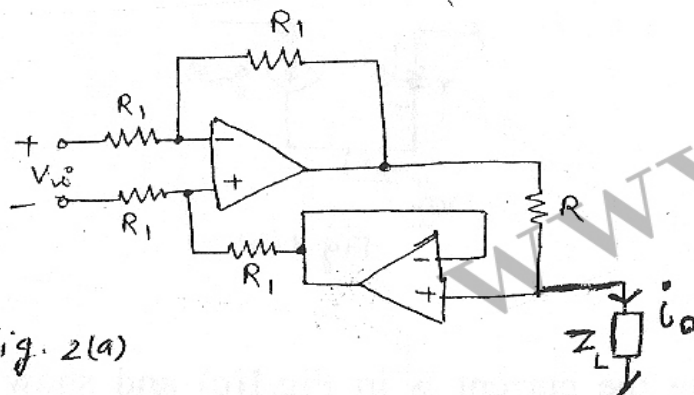
[d] Show that the circuit given in Fig.1(d) is an inverting SC integrator.



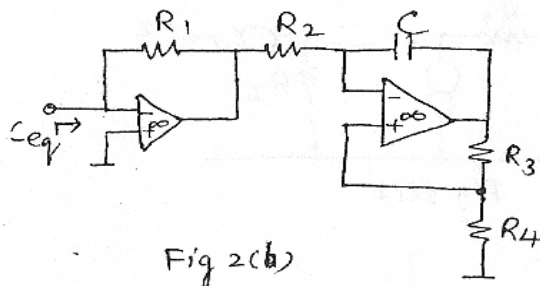
[e] Based on the integrator model of op-amp determine the correct polarity of the op-amp in the circuit shown in Fig.1(e). 1x5



2[a] Determine current i_o through the load Z_L in the circuit shown in Fig 2(a) 3



[b] Determine C_{eq} of the circuit shown in Fig.2(b). 2



- 3[a] Examine whether the circuit given in Fig.3(a) is that of an oscillator. If so determine the condition of oscillation and frequency of oscillation.

3

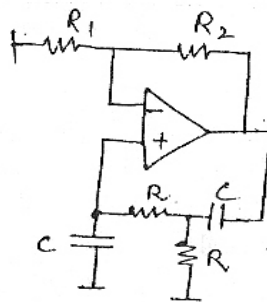


Fig 3(a)

- [b] Determine the transmission matrix of the circuit shown in Fig.3(b). 2

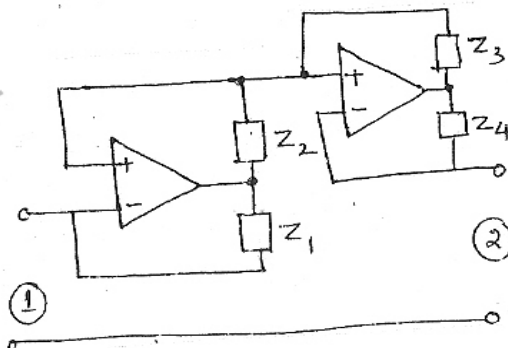


Fig. 3(b)

- 4[a] Determine the admittance matrix of the circuit shown in Fig.4(a). 2

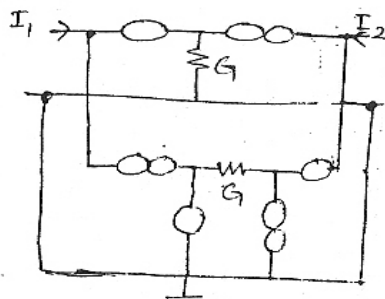


Fig. 4(a)

- [b] For the circuit shown in Fig.4(b) determine the transfer function $\frac{V_O}{V_{in}}$ and find out the type of filter function realized by it.

3

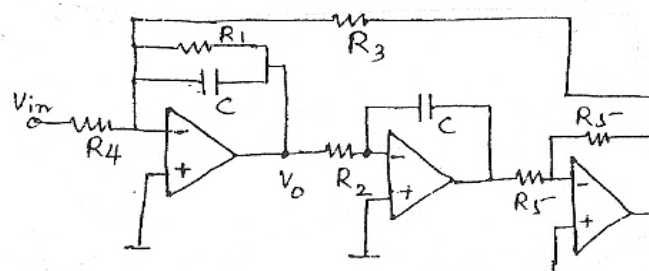


Fig. 4(b)

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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

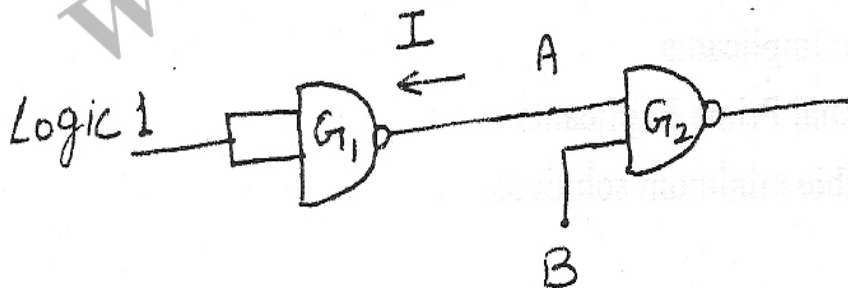
(i) Diode D is not present

(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. (EC)

MID SEM EXAMINATION

March-2007

EC-215 ELECTRICAL MACHINES-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer **ALL** questions.

Assume suitable missing data, if any.

- 1 Draw and explain the power flow diagram of a 3 phase induction motor. Show that rotor copper loss is slip times the power input to rotor. 3
- 2 Discuss the methods of starting of 3 phase induction motors. 3
- 3 A 1100 V, 50 Hz delta connected induction motor has star-connected slip ring motor with a phase transformation ratio of 3.8. The rotor resistance and stand still leakage reactance are 0.012Ω and 0.25Ω per phase respectively. Neglecting the stator impedance and magnetising current, determine ;
 - i. the rotor current at start with slip ring shorted
 - ii. the rotor power factor at start with slip ring shorted
 - iii. the rotor current at 4% slip with slip ring shorted
 - iv. the rotor power factor at 4% slip with slip ring shorted. 4
- 4 A 40 h.p. 3 phase induction motor has a full load slip of 3%. The stator losses amount to 5% of the input and the mechanical losses are 1.5% of the output. If the current in each rotor phase is 45 A, find the resistance per phase of the rotor and the efficiency of this machine. 4
- 5 A 220 V, single phase induction motor has the following test results
No load : $V = 220\text{ V}$, $I = 6\text{ A}$, $P = 350\text{ W}$
Blocked Rotor : $V = 125\text{ V}$, $I = 15\text{ A}$, $P = 580\text{ W}$
The stator winding resistance is 1.2 ohm measured with direct current, Estimate the power factor, output, efficiency when slip is 0.05. 3
- 6 Explain how high starting torque is obtained in double cage induction motor. 3