Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018
SET-1

Course: Analog Electronics-I (ECEG 2011) **Semester: IV**
Program: B.Tech ECE
Time: 03 hrs. **Max. Marks: 100**

SECTION A

S. No.		Marks	CO
Q 1	Define I_{CBO} *and* I_{CEO}. How are they different? How are they related? Are they typically close in magnitude?	**4**	**CO1**
Q 2	What will happen to the output AC signal if the DC level is insufficient? Sketch the effect on the waveform.	**4**	**CO1**
Q 3	Apply the proper biasing between drain and source and sketch the depletion region for $V_{GS} = 0$ V.	**4**	**CO3**
Q 4	What are the major differences between the collector characteristics of a BJT transistor and the drain characteristics of a JFET transistor? Compare the units of each axis and the controlling variable.	**4**	**CO3**
Q 5	What is the reactance of a 10-μF capacitor at a frequency of 1 kHz? For networks in which the resistor levels are typically in the kilo-ohm range, is it a good assumption to use the short-circuit equivalence for the conditions just described? How about at 100 kHz?	**4**	**CO2**

SECTION B

Q 6	For the network of Fig. 1, VD = 9 V. Determine: (a) I_D. (b) V_S and V_{DS}. (c) V_G and V_{GS}. (d) V_P.	**10**	**CO2**

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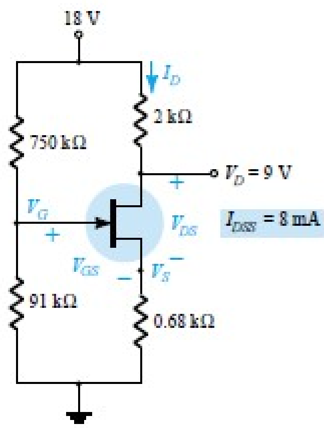

Fig 1
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<td>Q 7</td>
<td>
For the network of Fig.2:
(a) Determine Z_i and Z_o.
(b) Find A_v and A_i.

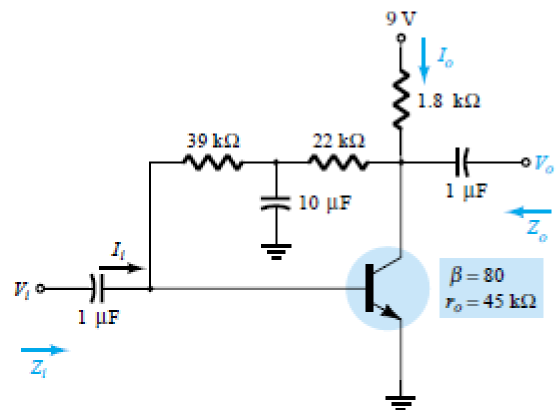

Fig.2
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<td>10</td>
<td>CO1</td>
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<td>Q 8</td>
<td>
Determine Z_i, Z_o, and A_v for the network of Fig. 3 if y_{fs} = 3000 µS and y_{os} = 50 µs.

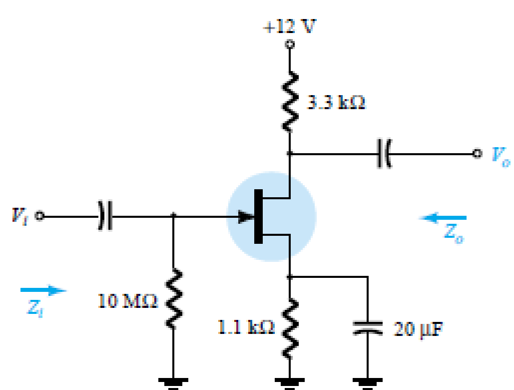

Fig. 3
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<td>10</td>
<td>CO5</td>
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<tr>
<td>Q 9</td>
<td>(a) What is the significant difference between the construction of an enhancement-</td>
<td>10</td>
<td>CO4</td>
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</table>

	type MOSFET and a depletion-type MOSFET? (b) Sketch a p-channel enhancement-type MOSFET with the proper biasing applied ($V_{DS} > 0\ V$, $V_{GS} = V_T$) and indicate the channel, the direction of electron flow, and the resulting depletion region.		

SECTION-C

Q 11

Given the typical values of h_{ie} = 1 kΩ, h_{re} = 2×

10^{-4}, and A_v = -160 for the input configuration of Fig. 4:

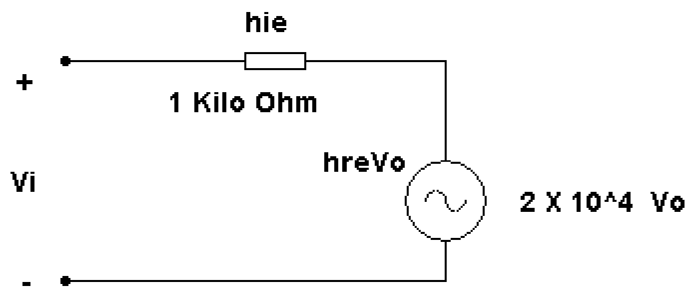
<table>
<tr>
<td colspan="2">(a) Determine V_o in terms of V_i.
(b) Calculate I_b in terms of V_i.
(c) Calculate I_b if $h_{re}V_o$ is ignored.
(d) Determine the percent difference in I_b using the following equation:
% difference in I_b = $\frac{I_b(without\,h_{re}) - I_b(with\,h_{re})}{I_b(without\,h_{re})} \times 100\%$
(e) Is it a valid approach to ignore the effects of $h_{re}V_o$ for the typical values employed in this example?


Fig.4</td>
<td>20</td>
<td>CO3</td>
</tr>
<tr>
<td>Q 12</td>
<td>For the self-bias JFET network of Fig.5:
(a) Determine A_{vNL}, Z_i, and Z_o.
(b) Sketch the two-port model with the parameters determined in part (a) in place.
(c) Determine A_v and A_{vs}.
(d) Change R_L to 6.8 kΩ and R_{sig} to 1 kΩ and calculate the new levels of Av and Avs. How are the voltage gains affected by changes in R_{sig} and R_L?
(e) For the same changes as part (d), determine Z_i and Z_o. What was the impact on both impedances?</td>
<td>20</td>
<td>CO5</td>
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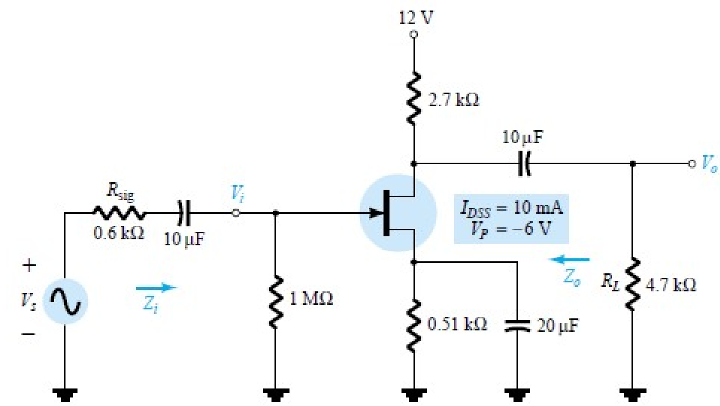

Fig.5

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Name: Enrolment No:	UPES

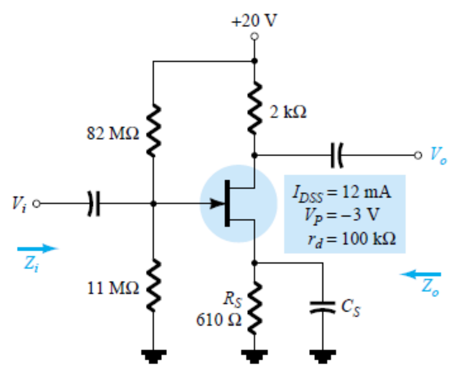
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018
SET-2

Course: Analog Electronics -I (ECEG 2011) **Semester: IV**
Program: B.Tech ECE
Time: 03 hrs. **Max. Marks: 100**

SECTION A

S. No.		Marks	CO
Q 1	Can you think of the analogy that would explain the importance of the DC level on the resulting AC gain?	4	CO1
Q 2	In general, comment on the polarity of the various voltages and direction of the currents for an n-channel JFET versus a p-channel JFET.	4	CO2
Q 3	With the help of small signal transistor model define the phase relationship of input and output waveform. Define the above statement with the valid equations.	4	CO1
Q 4	Describe in your own words why I_G is effectively zero amperes for a JFET transistor.	4	CO5
Q 5	Why is the terminology field effect appropriate for this important three-terminal device FET?	4	CO4

SECTION B

Q 6	Determine Z_i, Z_o, and V_o for the network of Fig. 1 if $V_i = 20$ mV.  Fig 1	10	CO2
Q 7	For the common-base network of Fig. 2: (a) Determine Zi and Zo. (b) Calculate Av and Ai. (c) Determine α, β, r_e, and r_o.	10	CO4

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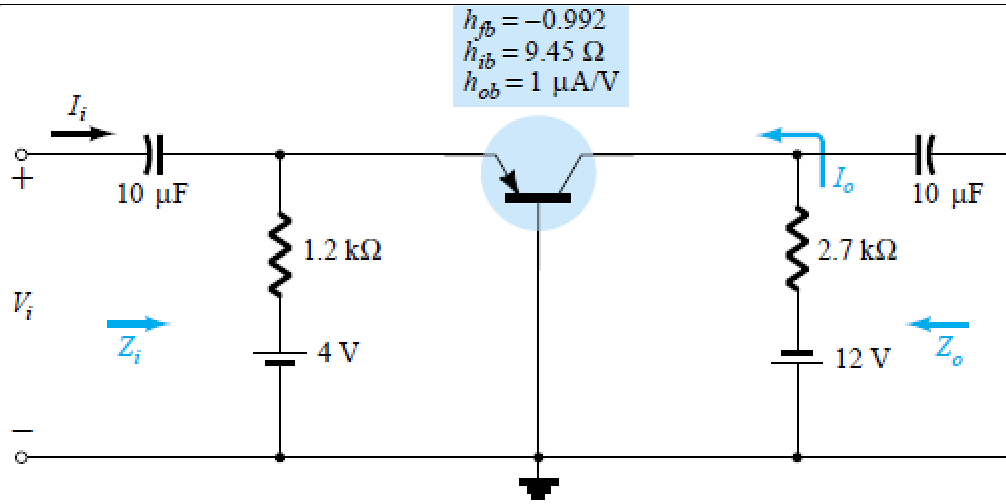
<td>

Fig.2</td>
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<tr>
<td>Q 8</td>
<td>Does the current of an enhancement-type MOSFET increase at about the same rate as a depletion-type MOSFET for the conduction region? Carefully review the general format of the equations, and if your mathematics background includes differential calculus, calculate dI_D/dV_{GS} and compare its magnitude.</td>
<td>10</td>
<td>CO5</td>
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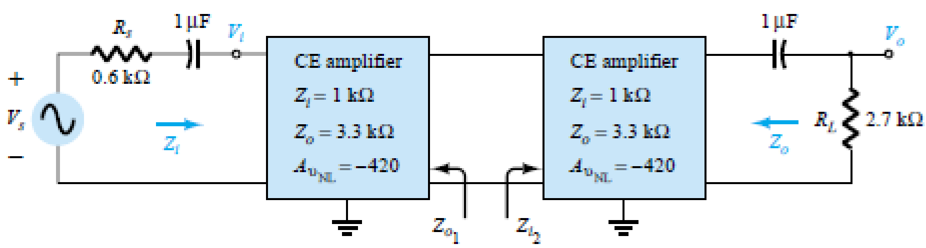
<tr>
<td>Q 9</td>
<td>For the cascaded system of Fig. 3 with two identical stages, determine:
(a) The loaded voltage gain of each stage.
(b) The total gain of the system, Av and Avs.
(c) The loaded current gain of each stage.
(d) The total current gain of the system.
(e) How Zi is affected by the second stage and RL.
(f) How Zo is affected by the first stage and Rs.
(g) The phase relationship between Vo and Vi.


Fig. 3</td>
<td>10</td>
<td>CO4</td>
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<tr>
<td>Q 10</td>
<td>For the network of Fig. 4:

(a) Determine Zi and Zo.

(b) Find Av and Ai.</td>
<td>10</td>
<td>CO1</td>
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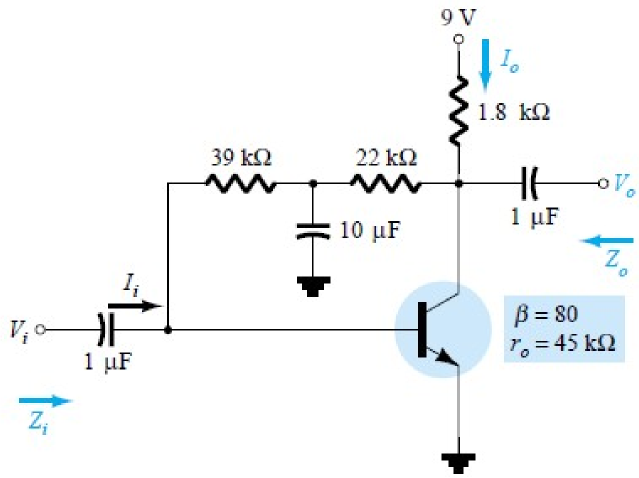
<tr><td></td><td>

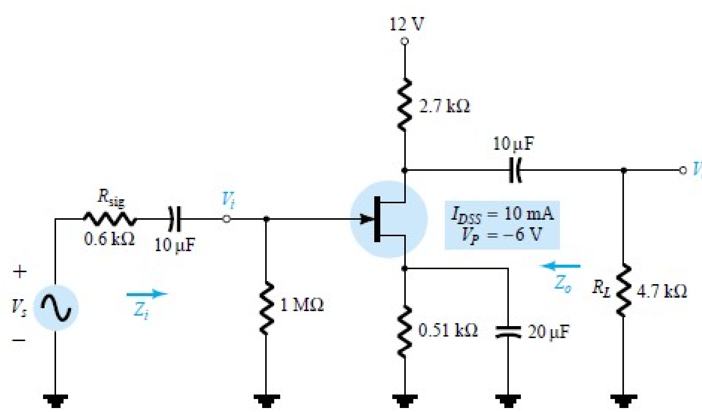
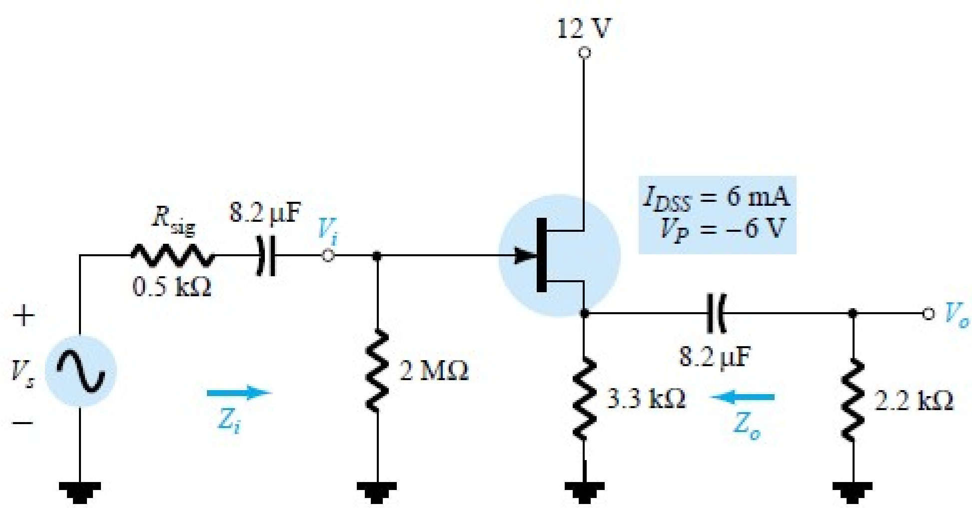
Fig. 4</td><td></td><td></td></tr>
<tr><td colspan="4">Section C</td></tr>
<tr><td>Q 11</td><td>1. For the self-bias JFET network of Fig.5:
(a) Determine A_{vNL}, Z_i, and Z_o.
(b) Sketch the two-port model with the parameters determined in part (a) in place.
(c) Determine A_v and A_{vs}.
(d) Change RL to 6.8 kΩ and R_{sig} to 1 kΩ and calculate the new levels of Av and Avs. How are the voltage gains affected by changes in R_{sig} and R_L?
(e) For the same changes as part (d), determine Z_i and Z_o. What was the impact on both impedances?


Fig.5</td><td>20</td><td>CO2</td></tr>
</table>

Q 12	For the source-follower network of Fig. 6: (a) Determine A_{vNL}, Zi, and Zo. (b) Determine Av and Avs. (c) Change R_L to 4.7 kΩ and calculate Av and Avs. What was the effect of increasing levels of RL on both voltage gains? (d) Change Rsig to 1 kΩ (with R_L at 2.2 kΩ) and calculate Av and Avs. What was the effect of increasing levels of Rsig on both voltage gains? (e) Change R_L to 4.7 kΩ and Rsig to 1 kΩ and calculate Zi and Zo. What was the effect on both parameters?  Fig.6	**20**	**CO2**