Ref. No. : EX/ET/T/215/2017(6)

B. ETCE 2ND YEAR 1ST SEMESTER SUPPLEMENTARY EXAMINATION 2017

Subject: ANALOG CIRCUITS-I **Time: 3 Hours** **Full Marks: 100**

All parts of the same question must be answered at one place only
Use separate answer script for each PART

PART- I

(Answer any Five Questions)

1. Explain the working principle of a voltage multiplier with proper circuit diagram. [Marks: 10]
2. Explain the working principle of a half wave rectifier. Find V_{dc} ,V_{rms} and efficiency(η) of a half wave rectifier. [Marks: 10]
3. Find the output voltage V_0 of the diode circuit shown below and **plot** the output voltage for a temperature range 0 to 100°C. [*All diodes are real and identical*] [Marks: 6+4=10]

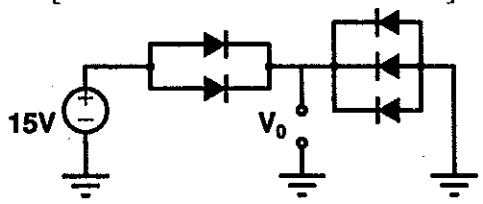

Figure 1

4. A) Draw the output waveform of the circuit shown below. *(V_{B1}= 2V, V_{B2}= 3V and diodes are real)*
   B) Determine the minimum or maximum value of V_{B1} and V_{B2} to avoid the clipping of output waveform. [Marks: 6+4=10]

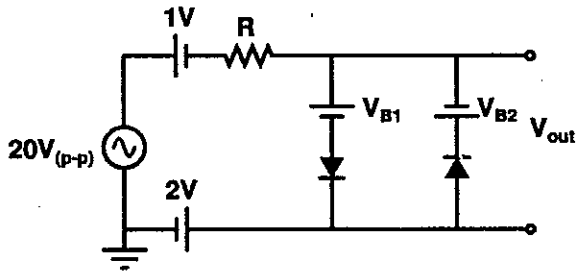

Figure 2

5. Determine the expression of stability factor S**(Ico)** for a voltage divider network. [Marks: 10]
6. Explain the function of a current mirror circuit. Design one current mirror with 1μA current in primary branch and 0.75 μA in secondary branch. *(Available transistors are identical with β=1000 and V_{BE} =0.7V. Supply voltage 3V)*

7. One CE amplifier with proper biasing arrangement is shown below. Find the following parameters: [$\beta = 100$, $C_E = C_C = C_B = 1\ \mu F$ *and neglect* r_o]

   A) All low frequency poles and zeros due to coupling capacitor and lower cut-off frequency.

   B) Gain versus frequency plot (for very low to mid frequency range) [Marks: 7+3=10]

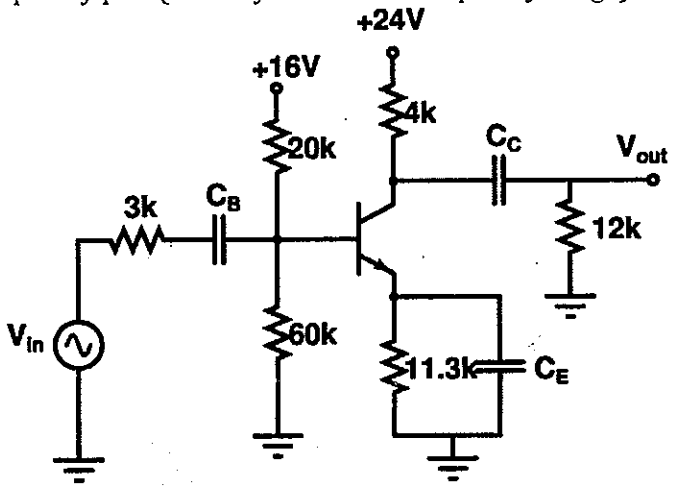

Figure 3

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Subject: ANALOG CIRCUITS – I Time: 3 Hours Full Marks: 100

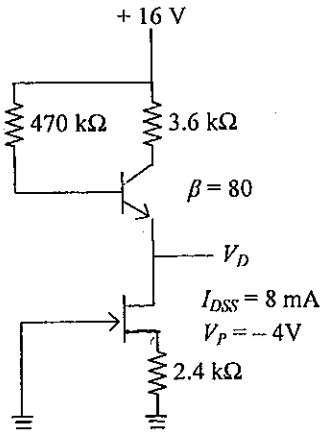
PART-II

Answer any FIVE.

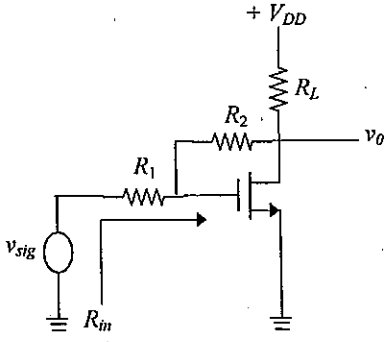
All parts of the same question must be answered at one place only.

1. Explain the operation of an n-channel JFET. 10

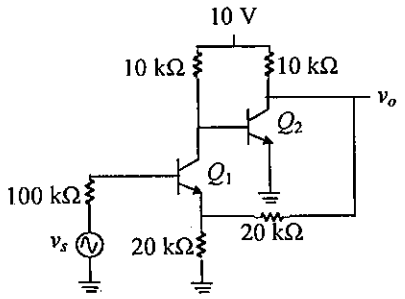
2. Determine V_D. 10



3. Find v_0/v_{sig} and R_{in} of the following circuit with g_m = 1 mA/V, r_0 = 100 kΩ, R_L = 10 kΩ, R_1 = 500 kΩ, R_2 = 1 MΩ. 10



4. Determine the feedback configuration of the following circuit and hence quantitatively explain how the feedback connection helps in improving the behavior of the circuit as an ideal source. 10

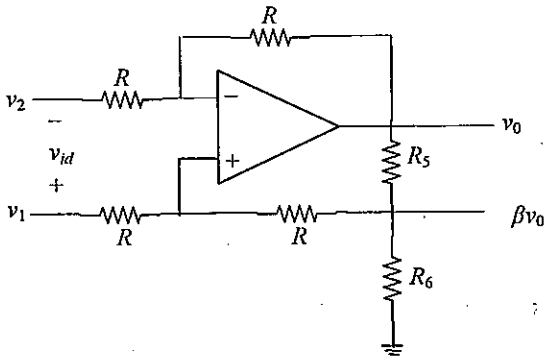


$\beta = 200$

$I_{E1} = I_{E2} = 0.5$ mA

5. Explain how a differential amplifier with active load and Wilson current mirror can achieve a near ideal value of CMRR. 10

6. Assume that R_5 and R_6 of the following circuit are much smaller than R so that the current through R is much lower than the current in the voltage divider, so that $\beta = R_6/(R_5 + R_6)$. Show that the differential gain is given by $A_d = 1/(1-\beta)$. Also design the circuit to obtain $A_d = 10$, $R_{id} = 2\ \text{M}\Omega$ by selecting R, R_5 and R_6 such that $(R_5 + R_6) \leq R/100$. 10



7. Explain the operation of a monostable multivibrator. 10