INTERNATIONAL CENTRE FOR APPLIED SCIENCES
MAHE, MANIPAL
B.Sc. (Applied Sciences) in Engg.
End – Semester Theory Examinations – Nov./ Dec. 2020
III SEMESTER - ANALOG ELECTRONIC CIRCUITS (IEC 231)
(Branch: CS, E&E and Mechatronics)

Time: 3 Hours   **Date: 19 November 2020**   **Max. Marks: 50**

- ✓ **Answer ALL the questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1. For the circuit shown in Fig.Q1 below determine I_{BQ}, I_{CQ}, V_{CEQ}, V_C, V_E, V_B. Draw the load line.
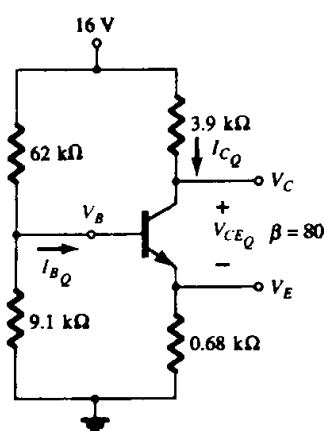

Fig.Q1   **10M**

2A. Draw the circuit diagram of RC coupled amplifier without feedback using NPN transistor. Mention the function of each component. Explain the working at low, medium and high frequencies.   **5M**

2B. Define α_{dc} and β_{dc} of a transistor. Write the expressions for α_{dc} and β_{dc}.   In a transistor, 99% of the carriers injected into the base cross over to the collector region. If collector current is 4mA and collector leakage current is 6 μA, calculate emitter and base currents.   **5M**

3A. For the circuit in Fig. Q3A, $\mu_{nCox} = 200$ μA/V² and $V_{TH}=0.5V$, $I_d=0.1$mA and $\lambda=0$. Calculate:

   i) Small signal Voltage gain of the CS stage.
   ii) Verify that M_1 operates in saturation
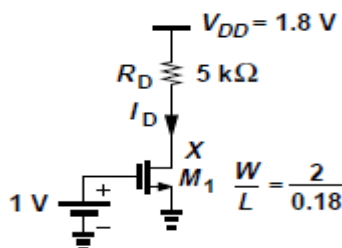   iii)Draw small signal model for Fig.Q3A   **5M**

Fig. Q3A

3B. State and prove Miller's theorem. For the circuit shown in **Fig. Q3B**, draw the small signal model. Using Miller's theorem, determine Miller's input and output impedances.
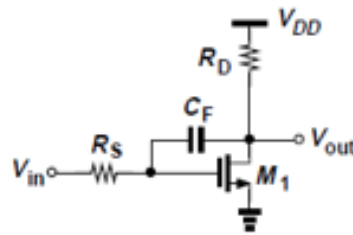

Fig.Q3B   **5M**

4A. Draw the circuit diagram of a Hartley oscillator. In a Hartley oscillator $L_1=20$ µH, $L_2=2$ mH and C is variable. Find the range of C for frequency range 1MHz to 2.5 MHz Neglect the mutual inductance.   **5M**

4B. Define class A, class B and class AB power amplifiers. With the help of output characteristics and the dc load line, illustrate their operation. What are the theoretical efficiencies of a series-fed class A and class B power amplifiers?   **5M**

5. Explain the Following:
   ii)Second order effects in MOSFET
   ii) Cross over Distortion
   iii) Emitter follower
   iv) MOS trans conductance   **2.5X4=10M**

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