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INTERNATIONAL CENTRE FOR APPLIED SCIENCES

(MAHE)

III-SEMESTER B.Sc. (Applied Sciences) DEGREE EXAMINATION – NOV/DEC 2021

SUBJECT: ANALOG ELECTRONIC CIRCUITS (IEC 231)

(BRANCH: CS)

Time: 3 Hours **Max. Marks: 100**

- ✓ **Answer ANY FIVE FULL Questions.**
- ✓ **Missing data, if any, may be suitably assumed**

1A. Explain the working of of Class 'A 'power amplifier and derive an expression for efficiency. **10M**

1B. The CS stage shown in **Fig Q1B** must achieve a voltage gain A_V = 15 at a bias current of 0.5mA. If $\lambda_1 = {}^{0.15}/_{V}$ *and* $\lambda_2 = {}^{0.05}/_{V}$, determine the required value of $\left({}^{W}/_{L}\right)_2$. Assume $\mu_P C_{OX} = 100\,\frac{\mu A}{V^2}$ **10M**

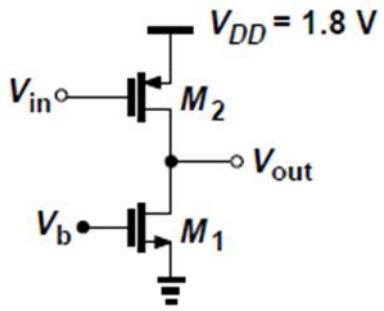

Fig Q1B

2A. Explain the working of Transistor as a switch and highlight the biasing region of the operation. **10M**

2B. Determine I_B, I_C, I_E, V_{CE}, V_B, V_C and V_E for the voltage divider configuration shown in **Fig Q2B** given that β=80. Assume V_{BE}=0.7V and neglect I_{CO}. What is the region of operation? **10M**

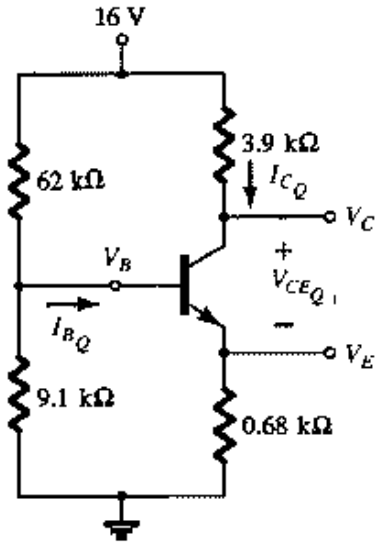

Fig Q2B

3A. Draw the circuit diagram of a common source stage using a NMOSFET, with NMOS diode connected as load. Draw the small signal model of the circuit. Obtain the expression for the voltage gain and output resistance. Assume $\lambda \neq 0$. **10M**

3B. State and explain Millers theorem with an illustration. Explain any one application of this theorem with necessary circuit. **10M**

4A. Draw the circuit diagram of Transformer coupled amplifier with feedback using NPN transistor. Mention the function of each component. Explain the working at low, medium and high frequencies. **10M**

4B. The degenerated CS stage of **Fig. Q4B** must provide a voltage gain of 4 with a bias current of 1 mA. Assume a drop of 200 mV across R_S and $\lambda=0$. If R_D =1K**Ω**, determine the required value of W/L. Does the transistor operate in Saturation for this choice of W/L? Assume $\mu_n C_{OX} = 200\frac{\mu A}{V^2}, V_{th} = 0.4V$. **10M**

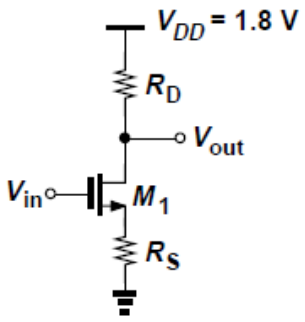

Fig. Q4B

5A. Draw the circuit diagram of a crystal oscillator and explain the working. Mention any two advantages of Crystal oscillators. **10M**

5B. Draw the circuit diagram of a common source stage using a NMOSFET, with a source degeneration resistance R_S. Draw the small signal model of the circuit. Obtain the expression for the voltage gain (Assume $\lambda=0$) and output resistance with the assumption $\lambda \neq 0$. **10M**

6A. Draw the circuit diagram of a common source stage using NMOSFET, with a PMOS current source. Draw the small signal model of the circuit. Obtain the expression for the voltage gain and output resistance. Assume $\lambda \neq 0$. **10M**

6B. With the help of a circuit diagram, explain the working of transformer coupled Class B push pull power amplifier. Derive an expression for the maximum power efficiency. Mention the main drawback of this amplifier. **10M**

7A. Draw the block schematic of i) Voltage shunt ii) Current series feedback amplifiers. What is the effect of series and shunt feedback on the input and output resistance of an amplifier? **10M**

7B. Explain the working of Transistor as a switch and highlight the biasing region of the operation. **10M**

8. Explain the following: **4x5=20M**

i) Early effect in BJT
ii) Channel length modulation in MOSFET
iii) Advantages and disadvantages of Positive and Negative feedback
iv) Piezoelectric effect in crystals