## INTERNATIONAL CENTRE FOR APPLIED SCIENCES MAHE, MANIPAL B.Sc. (Applied Sciences) in Engg. End – Semester Theory Examinations – MAY 2021- Repeaters 2018 Batch III SEMESTER: Analog Electronics Circuits (IEC 231) (BRANCH: E & E)

Time: 3 Hours	Date: 31 May 2021	Max. Marks: 100
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- ✓ Answer Any 5 Full Questions.
- ✓ Missing data, if any, may be suitably assume.
- 1A Draw the circuit diagram of common emitter configuration using NPN transistor. Draw and explain the input and output characteristics. Indicate cut-off, saturation and active regions. (10)
- 1B 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. (10)
- 2A Draw the circuit diagram of BJT Fixed bias circuit. Mention the drawbacks of a fixed bias circuit. Explain how it is overcome using a self-bias configuration.

(10)

- 2B. Draw a self-bias circuit using NPN transistor. Derive expressions for base and collector currents. (10)
- 3A Draw and explain the frequency response of RC coupled amplifier with and without feedback. In a 3-stage RC coupled amplifier, if the individual stage voltage gains are:  $A_1 = 20dB, A_2 = -7dB$  and  $A_3 = 5dB$  respectively, find the output voltage at each stage and overall gain in decibels if the input voltage applied is

 $V_i = 10\sin(2\pi ft) \text{ millivolts.}$ (10)

**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.



(10)

- 4A Draw the circuit diagram of a Transformer coupled Class B push pull amplifier and write the expression for power efficiency. What is crossover distortion in class B amplifier and how is it overcome? (10)
- **4B** Draw and explain the circuit diagram of a Colpitts oscillator. If  $C_1$ =100 pF,  $C_2$ =7500 pF and the inductance is variable, determine the range of inductance values, if the frequency of oscillation is to vary between 950 KHz and 2050 KHz. (10)
- 5A Explain the with neat diagram of structure of NMOS transistor. Draw and explain the input and output characteristics. Indicate operating regions. (10)
- **5B** 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? (10)
- **6A** 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?

(10)

- **6B** Draw the circuit diagram of a crystal oscillator and explain the working. Mention any two advantages of Crystal oscillators. (10)
- 7A Draw the circuit diagram of a self-bias CS stage amplifier with coupling and bypass capacitors. Write the expression for voltage gain and explain with relevant expressions, how the lower cutoff frequency is chosen? (10)

- **7B.** An amplifier has a voltage gain of 50, an input resistance of  $10K\Omega$  and an output resistance of  $100\Omega$ . The amplifier is connected to a sensor input that produces a voltage of 2V and has source resistance of  $50\Omega$ , and a load resistance of  $100\Omega$ . What will be the output voltage of the amplifier? Also draw the equivalent circuit of an amplifier.
- **8.** Explain the following:
  - i) Early effect in BJT
  - ii) Channel length modulation in MOSFET
  - iii) Positive and Negative feedback
  - iv) Barkhausen Criterion for oscillation

(20)

(10)

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