# **Question Paper**

Exam Date & Time: 21-Dec-2022 (09:30 AM - 12:30 PM)



### MANIPAL ACADEMY OF HIGHER EDUCATION

## INTERNATIONAL CENTRE FOR APPLIED SCIENCES END SEMESTER THEORY EXAMINATION - DECEMBER 2022 III SEMESTER B.Sc. (Applied Sciences) in Engg.

#### ANALOG ELECTRONIC CIRCUITS [IEC 231 - S2]

Marks: 50

Duration: 180 mins.

#### Answer all the questions.

#### Missing data may be suitably assumed.

- <sup>1)</sup> Draw the circuit diagram of common base configuration using NPN transistor. <sup>(5)</sup> Draw and explain the input and output characteristics. Indicate cut-off,
  - A) saturation and active regions.
    - <sup>B)</sup> A fixed bias circuit with silicon transistor with  $\beta$ =100 is used. Draw the DC load <sup>(5)</sup> line and determine the operating point. Given R<sub>B</sub>=200K $\Omega$ , V<sub>cc</sub>=10V and R<sub>C</sub>=2K $\Omega$ . Assume V<sub>BE</sub>=0.7V. Neglect I<sub>CO</sub>. Draw the circuit diagram.
- With the help of a circuit diagram, explain the working of transformer coupled <sup>(5)</sup>
  Class B push pull power amplifier. Derive an expression for the maximum power efficiency. Mention one drawback of this amplifier.
  - <sup>B)</sup> Draw the circuit diagram of Low Frequency Model of MOSFET and explain. <sup>(5)</sup> Write the expressions for the cutoff frequency of the amplifier.
- <sup>3)</sup> Assuming  $\lambda = 0$ ,  $V_{TH} = 0.4V$  and  $\mu_n C_{ox} = 100 \ \mu\text{A}/\text{V}^2$ , compute  $W/_L$  of M<sub>1</sub> <sup>(5)</sup> <sub>A)</sub> in **Fig. Q3A** such that the device operates at the edge of saturation.
  - A) In Fig. Q3A such that the device operates at the edge of sati  $-V_{DD} = 1.8 V$



- B) State Barkhausen criteria for sustained oscillations. Draw the circuit diagram of <sup>(5)</sup> Hartley oscillator and explain its working. Write the expression for frequency of oscillations.
- <sup>4)</sup> With the help of a block diagram, explain positive feedback. Derive an

(5)