

## THIRD SEMESTER B.TECH. (INSTRUMENTATION AND CONTROL ENGG.) END SEMESTER EXAMINATIONS, DEC- 2017

## SUBJECT: ANALOG ELECTRONICS CIRCUITS [ICE 2104]

**Duration: 3 Hours** 

Max. Marks:50

## Instructions to Candidates:

- Answer ALL the questions.
- Missing data may be suitably assumed.
- 1A With the help of neat diagram, explain the construction and working of a n-channel 4 enhancement type MOSFET.



R<sub>S</sub> δ 680 Ω

Fig. 1

 $C_1$ 

Fig. 2

1KΩ

2

2

4

- 1C Give any four differences between a BJT and FET.
  2A Derive the DC biasing parameters for a feedback configuration of E-MOSFET.
- 2B For the circuit in Fig. 2, determine input impedance, output impedance and amplifier gain. 4
- 2C Derive the amplifier parameters (Z<sub>out</sub> and A<sub>v</sub>) for JFET source follower amplifier 4 considering the effect of source and load resistance.
- **3A** For the circuit in Fig. 3, determine the lower and higher cut-off frequency. Q-point values 5 are -3 V & 3.6 mA. C<sub>wi</sub> = 4pF, C<sub>wo</sub> = 7pF, C<sub>gd</sub> = 2.5pF, C<sub>gs</sub> = 8pF, C<sub>ds</sub> = 1 pF.
- **3B** For the circuit in Fig. 4, determine the change in the overall gain and output voltage when 3 a source resistance of  $20k\Omega$  and load resistance of  $5000\Omega$  is added at the input and

output respectively. Vi = 0.5V, VGS(TH)=4V, ID(ON)=4mA, VGS(ON) =7V, gos=40  $\mu$ S & k = 2mA/V<sup>2</sup>.



- **3C** Draw the AC model for a common source amplifier with active load and derive the 2 amplifier parameters.
- **4A** State any two important advantages of having a negative feedback. With block diagram, 4 derive expressions for amplifier gain and input impedance for a current series feedback configuration.
- **4B** For a practical voltage series amplifier, calculate the amplifier gain with and without 3 feedback having the following circuit values:  $R_1=50k\Omega$ ,  $R_2=60k\Omega$ ,  $R_0=7.5k\Omega$ ,  $R_{D=}10k\Omega$ ,  $r_d=25k\Omega$  and  $g_m=4000\mu$ S.
- **4C** Design a RC phase shift oscillator having  $g_m=200\mu$ S,  $r_d=20k\Omega$  and a feedback of 3 R=80k $\Omega$ . Select a suitable value of the capacitor for the oscillator operation at 20 kHz and R<sub>D</sub> such that phase shift gain is satisfied. Also draw the oscillator circuit for the same.
- **5A** Describe the working principle of a crystal oscillator. With circuit diagram explain the 3 impedance versus frequency characteristics of crystal oscillator.
- **5B** Design a FET Collpit's oscillator having a feedback inductance of 2 H which is expected 2 to operate at 77 kHz.
- **5C** What are power amplifiers? List the advantages and uses of power amplifiers.
- **5D** Differentiate class A and class B power amplifiers.

2

3