



**P.E.S. College of Engineering, Mandya - 571 401**

*(An Autonomous Institution affiliated to VTU, Belgaum)*

**Third Semester, B.E. - Electronics and Communication Engineering**

**Semester End Examination; Dec - 2016/Jan - 2017**

**Analog Electronics Circuits**

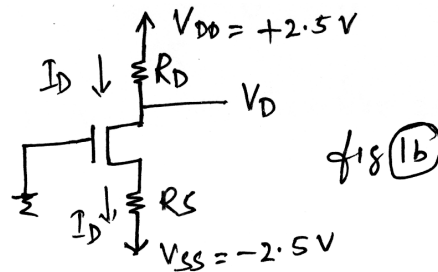
Time: 3 hrs

Max. Marks: 100

*Note: Answer FIVE full questions, selecting ONE full question from each unit.*

**UNIT - I**

- 1 a. Draw the Physical structure of the Enhancement type NMOS transistor. Mention the different parts. 4
- b. Design the circuit of Fig. 1b. The transistor operation at  $I_D = 0.4 \text{ mA}$ ,  $V_D = 0.5 \text{ V}$ ,  $V_{th} = 0.7 \text{ V}$ ,  $L = 1 \mu\text{m}$  and  $W = 32 \mu\text{m}$  and  $\mu_n C_{OX} = 100 \mu\text{A/V}^2$ , Assume  $\lambda = 0$ .



- c. What is biasing? Explain biasing using a constant current source. 8
- 2 a. With relevant diagram derive the equation for finite output resistance of a MOSFET. 10
- b. Draw and explain the small signal operation of the common source MOSFET amplifier. 10

**UNIT - II**

- 3 a. Define the: 6
  - i) CMRR    ii) Slew rate    iii) PSRR.
- b. Explain the working of differential input/output amplifier. 10
- c. Develop the equation for  $Z_{in}$  for high input impedance capacitor coupled Voltage Follower. 4
- 4 a. Explain with circuit diagram and derive an equation for the output voltage of a two input Inverting and non-inverting summing amplifier. 12
- b. Design capacitor coupled investing amplifier, a signal frequency range of 50 Hz to 1 kHz is applied. If the  $R_L$  is  $250 \Omega$ , calculate the requirred capacitor values and sketch the circuit with values. Assume  $R_1 = 1 \text{ k}\Omega$  and  $R_2 = 47 \text{ k}\Omega$ . 8

**UNIT - III**

- 5 a. Define gain bandwidth product. Determine the upper cutoff frequency for a voltage follower with  $A_{OL} = 40 \text{ DB}$  and gain bandwidth product is 1 MHz. 5

- b. Mention the any five precautions for Op-Amp circuit stability. 5
- c. Explain with neat sketch the Integrating circuit. Discuss its DC operation. 10
- 6 a. Explain miller effect. Derive the equation relating the input capacitance of an inverting amplifier. 8
- b. Discuss the effects of slow rate of an Op-Amp. 6
- c. Explain with neat sketch the current amplifier and derive an equation for current gain. 6

#### UNIT - IV

- 7 a. With circuit diagram and waveform, explain the working of a saturating precision full wave rectifier. 10
- b. Explain with neat diagram of Astable multi vibrator using Op-Amp. 10
- 8 a. Sketch the circuit of a voltage type peak detector. Explain the circuit operation. 10
- b. Draw an Op-Amp sample and hold circuit. Sketch the signal, control and output voltage waveforms. Explain the circuit operation. 10

#### UNIT - V

- 9 a. Draw circuit and output waveform of a triangular wave generator. Explain the circuit operation. 10
- b. using a BIFET Op-Amp with a supply of  $\pm 12$  V, design a Wein Bridge oscillator to have an output frequency of 15 kHz, Choose  $C = C_1 = C_2 = 0.01 \mu\text{f}$ . 6
- c. Explain the operation of DC voltage regulator with sketch. 4
- 10 a. What is Barkhansen Criterion? Explain how oscillation starts in an oscillator. 6
- b. Sketch the circuit of 2<sup>nd</sup> order Low pass Active filter and explain the circuit operation. 10
- c. Draw the basic circuit of a 723 IC DC voltage Regulator. 4

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