



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

(An Autonomous Institution affiliated to VTU, Belagavi)

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

**Semester End Examination; Dec - 2017/Jan - 2018**

**FET and Op-Amp Circuits**

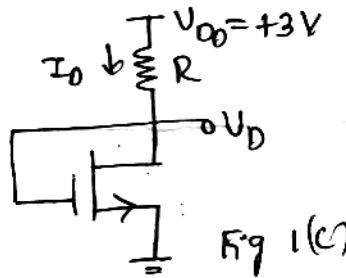
Time: 3 hrs

Max. Marks: 100

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

### UNIT - I

- 1 a. Explain the formation of channel for current flow in NMOS transistor. Also determine the total capacitance between gate and channel. 8
- b. Explain how MOSFET is used as a switch? 5
- c. Design the circuit in Fig. 1(c) to obtain a current  $I_D$  of  $80 \mu\text{A}$ . Find the value required for  $R$ , and find the dc voltage  $V_D$ . Let the NMOS transistor have  $V_t = 0.6 \text{ V}$ ,  $\mu_n C_{ox} = 200 \mu\text{A/V}^2$ ,  $L = 0.8 \mu\text{m}$  and  $\omega = 4 \mu\text{m}$ . Neglect the channel length modulation effect. ( $\lambda = 0$ ). 7



- 2 a. Draw a hybrid- $\pi$  model of common source MOSFET amplifier. Show that overall gain is given by  $A_v = -g_m(R_D \parallel R_L \parallel r_o)$ . 10
- b. Draw and explain frequency response of capacitively coupled common-source amplifier. 10

### UNIT - II

- 3 a. Draw and explain the internal circuit of basic Op-Amp. 7
- b. Explain the following : 6
- i) CMRR      ii) PSRR      iii) Input offset voltage.
- c. Design an inverting amplifier using a 741 Op-Amp. The voltage gain is to be 50 and the output voltage amplitude is to be 2.5 V. 7
- 4 a. Briefly explain a high input impedance capacitor coupled voltage follower. 10
- b. Write the circuit diagram, explain high  $Z_{in}$  capacitor-coupled Non-inverting amplifier. 10

### UNIT - III

- 5 a. For an inverting amplifier, explain how to set the upper cut-off frequency? 6
- b. With a neat diagram, explain phase-lag and phase lead frequency compensation methods. 10
- c. Define the following : 4
- i) Gain bandwidth product      ii) Full Power bandwidth.

- 6 a. List the precautions that should be observed for Op-Amp circuit stability. 6
- b. Write the circuit of a current source for a floating load and explain its circuit operation. 6
- c. With a circuit diagram, explain the working of current amplifiers. 8

#### UNIT - IV

- 7 a. Sketch the circuit, typical input and output waveform of an Op-Amp employed as a non-inverting zero crossing detectors. Explain the circuit operation. 7
- b. Design an inverting Schmitt trigger circuit for the following specification  $V_{CC} = \pm 12\text{ V}$ , trigger point =  $\pm 2\text{ V}$ . 6
- c. With a neat diagram, explain the circuit operation of differentiating circuits. 7
- 8 a. With circuit diagram and waveforms, explain the working of precision rectifier peak detector circuit. 10
- b. With a neat circuit diagram and voltage waveform, explain the operation of sample and hold circuit. 10

#### UNIT - V

- 9 a. Explain the working operation of triangular wave generator. 10
- b. State Barkhausen criteria. Explain the phase shift oscillator circuit. 10
- 10 a. Sketch the circuit of a first order high pass filter and explain how it operates? 8
- b. Define the following parameter with respect to voltage regulator circuit : 4
- i) Source effect
- ii) Load effect.
- c. Discuss the operation and performance of adjustable output regulator. 8

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