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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. - 2015

FET and Op-Amp Circuits

Time: 3 hrs *Max. Marks: 100*

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

UNIT - I

1 a. Derive i_D-V_{DS} relationship of the NMOS transistor with suitable figure. 10

b. For a 0.8 μm process technology for which t_{ox} = 15 nm and μ_n = 550 cm^2/V-s, find $C_{OX} K'_n$ and the overdrive voltage required to operate a transistor having W/L = 20 in saturation with I_D = 0.2 mA. 6

c. Explain the operation of MOSFET as a switch. 4

2 a. Explain the operation of MOSFET common source amplifier circuit and derive expressions for its input resistance, voltage gain and output resistance. 10

b. Find the mid band gain and upper 3-dB frequency of a MOSFET common source amplifier fed with a signal source having an internal resistance R_{sig} = 100 Ω. The amplifier has R_G = 4.7 MΩ , $R_D = R_L$ = 15 kΩ, g_m = 1 mA/V, r_0 = 150 kΩ, C_{gs} = 1 pF and C_{gd} = 0.4 pF. 6

c. Briefly discuss depletion type MOSFET. 4

UNIT - II

3 a. Explain the following :

i) Input Offset voltage ii) Input offset current

iii) Offset Nulling iv) Slew rate and frequency limitation. 12

b. Design an inverting amplifier using 741 Op-Amp to obtain a voltage gain of 50 and the output voltage amplitude of 2.5 V. 8

4 a. Illustrate how the input impedance of a high Z_{in} capacitor coupled voltage follower can be increased? 6

b. Sketch and explain the circuit of a capacitor coupled non inverting amplifier. 6

c. Using a 741 Op-Amp, design a high input impedance non-inverting amplifier to operate with a single polarity power supply of + 36 V and a load resistance 12 kΩ, to achieve a voltage gain of 7 at lower cutoff frequency of 150 Hz. 8

UNIT - III

5 a. Explain the operation of capacitor coupled inverting amplifier and also the procedure to set the upper cutoff frequency in such circuit. 8

Contd…2

	b.	In a capacitor-coupled inverting amplifier having a signal frequency range of 10 Hz to 1 kHz, if the values of R_1, R_2 and R_L are 1 kΩ, 47 kΩ and 250 Ω respectively, calculate the required capacitor values.	6
	c.	Explain the capacitor-couples voltage follower using a single- polarity supply.	6
6.	a.	With suitable diagrams, explain various frequency compensating methods.	12
	b.	Explain the current amplifier.	5
	c.	Calculate the slew rate limited cutoff frequency for a voltage follower circuit using a 741 Op-Amp if the peak of Sine wave output is to be 5 V.	3

UNIT - IV

7	a.	Sketch the output waveforms produced by an Op-Amp differentiating circuit with triangular and rectangular inputs. Explain each output wave shape. Discuss the distortion that occurs and how it can be minimized.	10
	b.	Explain the precision full-wave rectifier.	10
8	a.	Explain the operation of inverting Schmitt trigger circuit and its input/ output characteristics.	10
	b.	Explain the operation of Op-amp monostable multivibrator and discuss its design procedure.	10

UNIT - V

9	a.	Draw the II order high pass filter circuit and its input and output waveforms. Explain its operation.	10
	b.	What is Barkhausen Criteria? Explain Wein bridge oscillator.	10
10	a.	Discuss the operation and performance of Adjustable output regulator.	10
	b.	Explain the operation, the design procedure and performance of voltage follower regulator circuit.	10

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