Keg. No
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MANIPAL INSTITUTE OF TECHNOLOGY

(A Constituent Institute of Manipal University)

Manipal – 576 104



## THIRD SEMESTER B.Tech (BME) DEGREE END-SEM EXAMINATIONS, NOV/DEC 2015 SUBJECT: ELECTRONIC DEVICES AND CIRCUIT (BME-201) Thursday, November 26, 2015 (9.00 a.m. - 12.00 noon)

## **TIME: 3 HOURS**

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**MAX. MARKS: 100** 

I	Instruction to Candidates:			
	Answ Assur	ver any FIVE full questions. me relevant data if missing. diagnome whenever reconstruct		
L	Give	diagrams wherever necessary.		
1	(a)	How do you experimentally decide whether a given PN-junction diode is made up of Silicon or Germanium? Explain.	(6)	
	(b)	What is "pinch-off"? Name the semiconductor device that exhibits pinch-off phenomenon. What is the status of output current during pinch-off?	(2+1+1= 4)	
	(c)	Draw the structure and circuit symbol of:	(3+3=6)	
		(i) LED		
		(ii) N-channel Enhancement MOSFET.		
	(d)	How do you employ a BJT as a switch in an electronic circuit?	(4)	
2	(a)	With a circuit diagram and waveforms, explain the working of a transistor as an amplifier.	(6)	
	(b)	Draw the <i>n</i> -channel depletion metal oxide semiconductor field effect transistor structure and explain its operation with a neat output characteristic and a transfer characteristic.	(6)	
	(c)	For the hybrid common emitter model in the approximate form, determine the expressions for the current gain, input resistance, voltage gain and output resistance, respectively.	(8)	
3	(a)	With the help of basic amplifier circuit and its h-parameter equivalent, determine voltage gain, current gain, input impedance and output impedance.	(8)	
	(b)	Draw the circuit of fixed bias and explain its operation. Derive an expression for its stability factor.	(6)	

(c) Calculate the circuit factors voltage gain, input impedance and output impedance of a common source amplifier circuit. The values of voltages and currents are:  $I_{DSS} = 6mA$ ,

 $V_P = -4V$ ,  $V_{GSQ} = -0.85V$ ,  $C_1 = C_2 = 0.002\mu F$ ,  $C_s = 10\mu F$ ,  $R_G = 1M\Omega$ ,  $R_D = 1.5K\Omega$ ,  $R_s = 500\Omega$ .

4 (a) Express  $h_{f_{\rho}}$  and  $h_{r_{\rho}}$  in terms of common base h-parameters. (3+3)

- (b) Arrive at a relation between trans-conductance; drain resistance and the amplification (6) factor of a field effect transistor. Explain the three parameters individually.
- (c) Describe the voltage divider bias in the case of field effect transistor. How (8) advantageous is this over the fixed bias?
- 5 (a) Draw the hybrid –Π model of BJT in CE configuration and operating at high frequency, (2+3+3)
  and derive expressions for the feedback and the output conductance.
  - (b) What is epitaxy? Describe the process with an appropriate diagram. (6)
  - (c) What is photolithography? What are the steps involved in the photolithography (2+4) process?
- 6 (a) With the help of an equivalent circuit of an UJT, explain the "intrinsic stand-off ratio". (5)
  - (b) How does the Gate current helps in firing the SCR? Explain with the help of a twotransistor analogy.
  - (c) Name and sketch circuit symbol of a Thyristor, which is suited for bi-directional power
    (2) control.
  - (d) For a typical common emitter amplifier circuit with  $R_s = 1.5K$ ,  $R_L = 2K$ . The following (8) h-parameter values are

provided:  $h_{fe} = 100, h_{ie} = 1K, h_{oe} = 25 \mu m hos \& h_{re} = 2.5 X 10^{-4}$ , Calculate  $A_I, A_V, R_i, R_o \& A_{VS}$ 



(6)