Q.6 Attempt any two:

i. Explain feedback amplifier with diagram and calculate its gain with negative feedback. The gain of an amplifier without feedback is 100, while with negative feedback it falls to 50. Now if amplifier gain reduced to 80 then find percentage reduction in gain with negative feedback. **5**

ii. Explain the effect of negative feedback on input impedance for voltage series feedback and voltage shunt feedback with suitable diagrams? **5**

iii. Explain block diagram of an oscillator and discuss Barkhausan criteria. Draw circuit diagram of Colpitt's oscillator and derive the expression of its frequency of oscillation. **5**

******

Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2018

EC3CO03/EI3CO03 Electronic Devices and Circuits

Programme: B.Tech. Branch/Specialisation: EC/EI

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. Potential barrier at PN junction is established due to the charge on either side of the junction. These charges are **1**

(a) Majority carriers. (b) Minority carriers.

(c) Both (a) and (b). (d) Donor and acceptor ions.

ii. The peak inverse voltage rating of a diode in a bridge rectifier is 'X' times larger than that of center-Tap yielding the same dc output voltage, where the value of 'X' is **1**

(a) 0.5 (b) 1.0 (c) 1.414 (d) 2.0.

iii. The emitter current in a junction with normal bias **1**

(a) Is almost equal to I_B.

(b) Is equal to the sum of I_B and I_C.

(c) Changes greatly by a small change in collector bias voltage.

(d) Is equal to I_{CBO}.

iv. For transistor action **1**

(a) The base region must be very thin and lightly doped

(b) The emitter junction should be forward biased and collector junction should be reverse biased

(c) The emitter should be heavily doped

(d) All of these

v. All FETs are basically **1**

(a) Power controlled devices

(b) Voltage controlled devices

(c) Current controlled devices

(d) Energy controlled devices

P.T.O.

vi. Mobility of electrons in N-channel JFET and mobility of holes in P-channel JFET **1**

(a) Large, poor (b) Poor, large

(c) Large, large (d) Poor, poor

vii. The gain of bipolar transistor drops at high frequencies. This is because of the **1**

(a) Coupling and bypass capacitors.

(b) Early effect

(c) Interelectrode transistor capacitances.

(d) Coupling and bypass capacitors and interelectrode transistor capacitances.

viii. Cascading of amplifiers results in **1**

(a) Increased gain and increased bandwidth.

(b) Increased gain and reduced bandwidth.

(c) Increased input impedance and decreased output impedance.

(d) Decreased input impedance and increased gain

ix. In negative feedback amplifier, when is the input impedance increased? **1**

(a) If the signal sampled is voltage.

(b) If the signal sampled is current.

(c) If the feedback signal is voltage.

(d) If the feedback signal is current.

x. Which one of the following oscillators is used for generation of high frequencies? **1**

(a) RC Phase shift. (b) Wein bridge.

(c) L-C oscillator. (d) None of these.

Q.2 i. What are the applications (any four) of Hall-Effect? **2**

ii. Draw and explain volt-ampere characteristics of PN junction diode. **3**

iii. Explain the working of a Full Wave Bridge Rectifier with its circuit diagram and input and output waveforms. Also explain the effect of shunt capacitor filter on the output of Rectifier. **5**

OR iv. What is Varacter diode? Draw and explain doping profile of Varacter diode. How voltage variable capacitance varies with reverse bias potential in this diode? **5**

Q.3 i. What is base width modulation? Define α and β for a Bipolar Junction Transistor. **2**

ii. Explain the working of a NPN transistor with diagram. Also define transistor current components. What is Ebers-Moll Model? **8**

OR iii. Explain DC and AC load line with related equation and diagram. For NPN transistor, with collector to base bias circuit, find I_C, V_{CE}, if V_{CC} = 10V, R_C=2kΩ, R_B=100kΩ and β = 100. **8**

Q.4 i. Explain Working of P-channel JFET with neat and clean diagram. **3**

ii. Draw and explain drain characteristics of N-channel JFET with diagram. The Pinch-off voltage of P-channel junction is 5V, I_{DSS}= -40mA, and drain to source voltage, V_{DS} is such that FET is operating in the saturation region and I_D= -15 mA then find the, V_{GS}, g_m and g_{mo}. **7**

OR iii. Explain construction of N-channel depletion type MOSFET. Explain working of depletion type MOSFET in both, depletion and Enhancement mode with neat labelled diagram. Also discuss transfer characteristics with diagram. **7**

Q.5 i. What is Multistage Amplifier? Explain with suitable diagram. Derive the expression of overall voltage gain for a multistage amplifier. **4**

ii. Define and draw h-parameter model of CE transistor amplifier. Derive the expression of input impedance and voltage gain. **6**

OR iii. Give any four differences between voltage and power amplifier. Also calculate efficiency of class-A and class-B power amplifier. **6**

Marking Scheme

EC3CO03/EI3CO03 Electronic Devices and Circuits

Q.1	i.	Potential barrier at PN junction is established due to the charge on either side of the junction. These charges are (d) Donor and acceptor ions.		**1**
	ii.	The peak inverse voltage rating of a diode in a bridge rectifier is 'X' times larger than that of center-Tap yielding the same dc output voltage, where the value of 'X' is (a) 0.5		**1**
	iii.	The emitter current in a junction with normal bias (b) Is equal to the sum of I_B and I_C.		**1**
	iv.	For transistor action (d) All of these		**1**
	v.	All FETs are basically (b) Voltage controlled devices		**1**
	vi.	Mobility of electrons in N-channel JFET and mobility of holes in P-channel JFET (c) Large, large		**1**
	vii.	The gain of bipolar transistor drops at high frequencies. This is because of the (c) Interelectrode transistor capacitances.		**1**
	viii.	Cascading of amplifiers results in (b) Increased gain and reduced bandwidth.		**1**
	ix.	In negative feedback amplifier, when is the input impedance increased? (c) If the feedback signal is voltage.		**1**
	x.	Which one of the following oscillators is used for generation of high frequencies? (c) L-C oscillator.		**1**
Q.2	i.	Applications (any four) of Hall-Effect 0.5 mark for each	(0.5 mark *4)	**2**
	ii.	Explanation of V-I characteristics Diagram	2 marks 1 mark	**3**
	iii.	Explanation Diagram	2 marks 1 mark	**5**
		Waveform	1 mark	
		Effect of shunt capacitor	1 mark	
OR	iv.	Definition of Varactor diode Explanations of doping profile Diagram Effect of variable capacitance	1mark 1 mark 1 mark 2 marks	**5**
Q.3	i.	Base width Modulation α and β for BJT	1 mark 1 mark	**2**
	ii.	Explanation of NPN working Diagram Current component explanation Ebers moll model explanation Diagram	2 marks 1 mark 2 marks 2 marks 1 mark	**8**
OR	iii.	AC load line Explanation Diagram DC load line Explanation Diagram Numerical for each parameter I_C – 3.08 mA, V_{CE} – 3.78 v (1 mark for each parameter)	2 marks 1 mark 2 marks 1 mark 2 marks	**8**
Q.4	i.	Explanation of working Diagram	2 marks 1 mark	**3**
	ii.	Explanation of Characteristics N channel circuit diagram Characteristics diagram Numerical for each parameter V_{GS}– 1.95 v, g_m– 9.76 ms and g_{mo}– 16 ms. (1 for each parameter)	2 marks 1 mark 1 mark 3 marks	**7**
OR	iii.	Construction Explanation of N channel Diagram Explanation of Depletion Mode Diagram Explanation of Enhancement Mode Diagram Transfer characteristics	1 mark 1 mark 1 mark 1 mark 1 mark 1 mark 1 mark	**7**

Q.5	i.	Multistage amplifier definition	1 mark	**4**
		Diagram	1 mark	
		Derivation	2 marks	
	ii.	Explanation of h-parameter	2 marks	**6**
		Diagram	1 mark	
		Derivation of Input impedance and voltage gain (1.5 for each parameter)	3 marks	
OR	iii.	Any four differences between voltage and power amplifier		**6**
		4 difference 0.5 mark each (0.5 mark * 4)	2 marks	
		Derivation expression of Efficiency of class-A	2 marks	
		Derivation expression	2 marks	
Q.6		Attempt any two		
	i.	Explanation of Feedback amplifier	1 mark	**5**
		Diagram	1 mark	
		Derivation of gain	1 mark	
		Numerical calculation of gain	2 marks	
	ii.	Explanation of effect of negative Feedback on input impedance for voltage series feedback	2 marks	**5**
		Diagram	0.5 mark	
		Explanation of effect of negative Feedback on input impedance for voltage shunt feedback	2 marks	
		Diagram	0.5 mark	
	iii.	Explanation of oscillator	1 mark	**5**
		Diagram	1 mark	
		Barkhausan criteria	1 mark	
		Circuit diagram of Colpitt's oscillator	1 mark	
		Calculation of frequency of Oscillation	1 mark	

******