Enrollment No......................................

Faculty of Engineering
End Sem (Odd) Examination Dec-2018
EE3CO23/EX3CO23 Analog Electronics

Programme: B.Tech.   Branch/Specialisation: EE/EX

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.   To operate properly, a transistor's base-emitter junction must be forward biased with reverse bias applied to which junction?   **1**
(a) Collector-emitter   (b) Base-collector
(c) Base-emitter   (d) Collector-base

   ii.   A JFET is a ………… driven device   **1**
(a) Current   (b) Voltage
(c) Both (a) and (b)   (d) None of these

   iii.   Which of the following is referred to as the reverse transfer voltage ratio?   **1**
(a) h_i (b) h_r (c) h_f (d) h_o

   iv.   A common-emitter amplifier has _____ voltage gain, _____ current gain, _____ power gain, and _____ input impedance.   **1**
(a) High, low, high, low   (b) High, high, high, low
(c) High, high, high, high   (d) Low, low, low, high

   v.   When a differential amplifier is operated single-ended,_____   **1**
(a) The output is grounded
(b) One input is grounded and signal is applied to the other
(c) Both inputs are connected together
(d) The output is not inverted

   vi.   A voltage follower ……….   **1**
(a) Has a voltage gain of 1   (b) Is non-inverting
(c) Has no feedback resistor   (d) Has all of these

vii. Find the output voltage of the log-amplifier **1**
(a) $V_O = -(kT) \times \ln(V_i/V_{ref})$ (b) $V_O = -(kT/q) \times \ln(V_i/V_{ref})$
(c) $V_O = -(kT/q) \times \ln(V_{ref}/V_i)$ (d) $V_O = (kT/q) \times \ln(V_i/V_{ref})$

viii. Zero crossing detectors is also called as **1**
(a) Square to sine wave generator
(b) Sine to square wave generator
(c) Sine to triangular wave generator
(d) All of these

ix. Pin 8 of 555 timer IC consist of **1**
(a) Voltage supply   (b) Output
(c) Ground   (d) Discharge

x. In an unregulated power supply, if load current increases, the **1**
output voltage ………..
(a) Remains the same   (b) Decreases
(c) Increases   (d) None of these

Q.2 i. Define stability factor with reference to transistor biasing. State **2**
the factors affecting the stability.

ii. In a certain transistor, collector current is 0.98mA and base **3**
current is 20mA. Determine the values of
(a) Emitter current   (b) Current amplification factor (β)
(c) Current gain factor

iii. Explain enhancement type MOSFET under to following heads: **5**
(a) Construction
(b) Operation
(c) Characteristics (Drain and transfer)

OR iv. Why CE configuration is most popular in amplifier circuits? Draw **5**
its circuit diagram. Explain the output characteristics with
indication of the active, saturation and cut off region.

Q.3   Attempt any two:
i. Why negative feedback is preferred over positive feedback. Draw **5**
different feedback topology with their input and output
expression.

ii. With the help of circuit diagram, explain the working of class B **5**
push-pull amplifier. Also, mention its advantages and
applications.

iii. Draw circuit diagram and explain working principle of **5**
(a) Colpitt's Oscillator   (b) Hartley Oscillator

Q.4 i. The op-amp is used in the inverting and non-inverting mode with **2**
$R_1 = 2K\Omega$ and $R_F = 100K\Omega$. If Vcc = $\pm 15V$ and rms input value Vi =
20mv, calculate the output voltage in each case.

ii. What is an op-amp? Write the characteristics of an ideal op-amp. **3**

iii. Define following parameters **5**
(a) CMRR   (b) PSRR   (c) Slew rate
(d) Input offset current   (e) Output offset voltage

OR iv. Derive expression of closed loop voltage gain for inverting and **5**
non-inverting amplifier.

Q.5 i. Derive output expression (closed loop configuration) for summing **2**
amplifier.

ii. Draw and explain second order high pass butterworth filter with **3**
frequency response.

iii. Draw integrator and differentiator circuit. Derive their output **5**
voltage expression with suitable output waveform.

OR iv. What is the main difference between square wave generator and **5**
Schmitt trigger? Explain Schmitt trigger with suitable
waveform. Write its effects of hysteresis.

Q.6 i. Compare LM78XX and LM317 regulators. **2**

ii. Draw and explain block diagram of three pin IC voltage regulator. **3**

iii. What is the necessity of SMPS? Draw and explain the block **5**
diagram of SMPS. Write its applications.

OR iv. Draw the circuit of astable multivibrator using 555 timer. Explain **5**
its operation and sketch the relevant waveform.

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Marking Scheme
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Q.1 i. To operate properly, a transistor's base-emitter junction must be forward biased with reverse bias applied to which junction?   **1**
(d) Collector-base

ii. A JFET is a ………… driven device   **1**
(b) Voltage

iii. Which of the following is referred to as the reverse transfer voltage ratio?   **1**
(b) h_r

iv. A common-emitter amplifier has _____ voltage gain, _____ current gain, _____ power gain, and _____ input impedance.   **1**
(b) High, high, high, low

v. When a differential amplifier is operated single-ended,_____   **1**
(b) One input is grounded and signal is applied to the other

vi. A voltage follower ……….   **1**
(d) Has all of these

vii. Find the output voltage of the log-amplifier   **1**
(b) $V_O = -(kT/q) \times \ln(V_i/V_{ref})$

viii. Zero crossing detectors is also called as   **1**
(b) Sine to square wave generator

ix. Pin 8 of 555 timer IC consist of   **1**
(a) Voltage supply

x. In an unregulated power supply, if load current increases, the output voltage ………..   **1**
(b) Decreases

Q.2 i. Stability factor   1 mark   **2**
Factors affecting the stability (at least 2)   1 mark

ii. (a) Emitter current   1 mark   **3**
(b) Current amplification factor (β)   1 mark
(c) Current gain factor   1 mark

iii. Explain enhancement type MOSFET under to following heads: **5**
(a) Construction   1 mark
(b) Operation   2 marks
(c) Characteristics (Drain and transfer)   2 marks

OR iv. CE configuration is most popular in amplifier circuits   **5**
                                                                     1 mark
Circuit diagram.   1 mark
Explanation the output characteristics   2.5 marks
Indication of the active, saturation and cut off region
                                                                     0.5 mark

Q.3 Attempt any two:

i. Preferred Negative feedback to positive feedback   1 mark   **5**
Different topology with their input and output expression
1 mark for each (1 mark *4)   4 marks

ii. Construction   1 mark   **5**
Circuit diagram   1 mark
Working   2 marks
Advantages   0.5 mark
Applications   0.5 mark

iii. (a) Colpitt's Oscillator   **5**
Circuit diagram   1 mark
Working principle   1.5 marks
(b) Hartley Oscillator
Circuit diagram   1 mark
Working principle   1.5 marks

Q.4 i. Calculate the output voltage in each case.   **2**
1 mark for each case   (1 mark *2)

ii. Definition of an op-amp   1 mark   **3**
Characteristics of an ideal op-amp   2 marks

iii. Define following parameters   **5**
1 mark for each parameters   (1 mark *5)
(a) CMRR   (b) PSRR   (c) Slew rate
(d) Input offset current   (e) Output offset voltage

OR iv Expression of closed loop voltage gain for inverting   **5**
                                                                     2.5 marks
Expression of closed loop voltage gain for non-inverting
                                                                     2.5 marks

Q.5 i. Expression (closed loop configuration) for summing amplifier.   **2**

	ii.	Diagram	0.5 mark	**3**
		Explanation	2 marks	
		Frequency response	0.5 mark	
	iii.	Draw integrator and differentiator circuit. Derive their output voltage expression with suitable output waveform.		**5**
		2.5 marks for each	(2.5 mark *2)	
OR	iv	Difference b/w square wave generator and Schmitt trigger		**5**
			1 mark	
		Explanation	2 marks	
		waveform	1 mark	
		effects of hysteresis	1 mark	
Q.6	i.	Compare LM78XX and LM317 regulators.		**2**
		At least any two points	(1 mark *2)	
	ii.	Diagram	1 mark	**3**
		Explanation	2 marks	
	iii.	Necessity of SMPS	1 mark	**5**
		Draw	1 mark	
		Explanation	2 marks	
		Applications	1 mark	
OR	iv.	Draw the circuit	1 mark	**5**
		Explanation of its operation	3 marks	
		Waveform	1 mark	

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