B.TECH/AEIE/3RD SEM/AEIE 2101/2021

ANALOG ELECTRONIC CIRCUITS (AEIE 2101)

Time Allotted : 3 hrs

Full Marks: 70

 $10 \times 1 = 10$

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group - A (Multiple Choice Type Questions)

- Choose the correct alternative for the following: 1.
 - (i) Removing bypass capacitor across the emitter-resistor in a CE amplifier causes (b) Decrease in current gain
 - (a) Increase in current gain
 - (c) Increase in voltage gain
- (d) Decrease in voltage gain
- The differential gain of an op-amp is (ii) (a) very high (b) very low (d) about 100 (c) dependent on input voltage
- For an op-amp having differential gain Av and common-mode gain Ac, the (iii) CMRR is given by (a) Av + Ac(b) Av / Ac
 - (c) Ac / Av (d) (Av / Ac)+1
- When a step-input is given to an op-amp integrator, the output will be (iv)(b) a sinusoidal wave (a) a ramp (c) a rectangular wave (d) a triangular wave with dc bias
- The output of a particular Op-amp increases 8V in 12µs. The slew rate is (v) (a) 90 V/ μ s (b) 0.67 V/μs (c) $1.5 V/\mu s$ (d) none of these

Which of the following oscillators is suitable for frequencies in the range of Kilo hertz? (vi) (a) RC phase shift (b) Wien bridge (c) Hartley (d) Both (1) and (2)

- In an amplifier with negative feedback, (vii)
 - (a) only the gain of the amplifier is affected
 - (b) only the gain and bandwidth of the amplifier are affected
 - (c) only the input and output impedances are affected
 - (d) All of the four parameters mentioned above would be affected

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- (viii) Wien bridge oscillator can typically generate frequencies in the range of
 (a) 1KHz 1MHz
 (b) 1 MHz 10MHz
 (c) 10MHz 100MHz
 (d) 100MHz 150MHz
- (ix) An astablemultivibrator generates
 (a) Triangular wave
 (c) Ramp wave
- (b) Square wave
- (d) Sawtooth wave
- (x) A Schmitt trigger uses

 (a) positive feedback
 (b) negative feedback
 (c) compensating capacitors
 (d) pull up resistors.

Group-B

- 2. (a) Design and explain differential amplifier circuit using BJT. Also find differential gain. [(CO2) (Create/HOCQ)]
 - (b) Determine the output voltage, V_0 for the circuit (Fig.1) shown below. [(CO3) (Understand/LOCQ)]



7 + 5 = 12

- 3. (a) Determine the output voltage of an Instrumentation amplifier with neat circuit diagram. Write downits advantageous features. [(CO3) (Understand/LOCQ)]
 - (b) Determine the output voltage, V_0 for the circuit (Fig. 2) shown below. [(CO3) (Understand/LOCQ)]



(5+2)+5=12

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Group - C

- 4. (a) Explain the operation of the circuit for which output voltage is a logarithmic function of the input voltage. [(CO3) (Analyze/IOCQ)]
 - (b) Design a practical circuit to obtain integral of input signal as an output. [(CO3) (Create/HOCQ)]

6 + 6 = 12

- 5. (a) What is the necessity of the precision rectifier? Explain the operation of the full wave precision rectifier with neat circuit diagram. [(CO3) (Analyze /IOCQ)]
 - (b) Design a circuit to solve the following differential equation $2\frac{\alpha^2 v}{dt^2} 3\frac{dv}{dt} + v = 2$ where, $\frac{dv}{dt} = -2$ and v=3 at t=0. [(CO3) (Create/HOCQ)]

6 + 6 = 12

Group - D

- 6. (a) Compare the frequency response of the amplifier between open loop and closed loop condition where the amplifier having open loop gain 'A' and feedback ratio "β" which is connected to the inverting input. [(CO3) (Analyze/IOCQ)]
 - (b) State Barkhausen criterion. Determine the oscillation frequency of phase shift oscillator with neat circuit diagram. [(CO4) (Remember/LOCQ)]

6 + (2 + 4) = 12

- 7. (a) Determine the hysteresis voltage of a non-inverting Schmitt trigger with neat sketch of circuit diagram and transfer characteristics. [(CO3) (Remember/LOCQ)]
 - (b) Design an analog Divider to obtain, output voltage, V₀=(Vin1/Vin2).
 [(CO3) (Create/HOCQ)]

6 + 6 = 12

Group - E

- 8. (a) Design a circuit to obtain rectangular pulse with duty ratio greater than 50% using IC555 timer. [(CO4) (Create/HOCQ)]
 - (b) Explain the operation of Astablemultivibrator using op- amp with neat circuit diagram. [(CO5) (Understand/LOCQ)]

6 + 6 = 12

- 9. (a) Explain how operational amplifier can be used as
 - (i) Current to voltage converter.
 - (ii) Anti-Logarithmic amplifier
 - (iii) Unity follower. [(CO6) (Understand/LOCQ)]

4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	48.96%	18.75%	32.29%

Course Outcome (CO):

After the completion of the course students will be able to

- 1. Apply the knowledge of semiconductor fundamentals to analyze simple electronic circuits based on diodes and transistors with special focus on designing different biasing methods of BJT.
- 2. Design and analyze BJT amplifiers for small and large signal.
- 3. Learn basic function of operational amplifier, ideal and practical characteristics and their mathematical applications.
- 4. Design and compare between different types of Oscillators to meet the specified needs with appropriate consideration.
- 5. Design, analyze and understand the application of different types of multivibrators with and without IC 555.
- 6. Analyze and design analog electronic circuits using discrete components with specified needs for enhancement of knowledge.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

Department & Section	Submission Link	
AEIE	https://classroom.google.com/c/NDA1MjIyNTMwNjY3/a/NDc1MDI0ODMzNzg0/details	