

Group - E

8. (a) Explain using neat circuit diagram and waveforms, the application of timer IC555 as a monostable multivibrator.

(b) Write a short note on logarithmic amplifier.

8 + 4 = 12

9. (a) Design a circuit using op-amp to solve the given equations

$$3x + 7y = 9$$

$$4x + 5y = 5.$$

(b) Write a short note on Integrator.

7 + 5 = 12

ANALOG ELECTRONICS

(AEIE 2101)

Time Allotted : 3 hrs

Full Marks : 70

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)

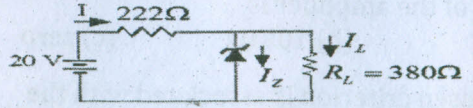
1. Choose the correct alternative for the following: 10 × 1 = 10

- (i) The 'slew rate' of an operational amplifier indicates
 (a) how fast its output current can change
 (b) how fast its output impedance can change
 (c) how fast its output power can change
 (d) how fast its output voltage can change when a step input signal is given.
- (ii) In class C power amplifier, the conduction angle is
 (a) equal to zero
 (b) equal to 180°
 (c) less than 180°
 (d) greater than 180°.
- (iii) Obtaining a stable dc operating point in a transistor circuit requires
 (a) resistors in biasing circuit that provide negative feedback
 (b) coupling capacitors to provide stability
 (c) temperature sensitive device to offset the temperature variations in transistor parameters
 (d) feed forward compensation to cause pole-zero cancellation.
- (iv) An amplifier having only upper cut-off frequency of 10KHz. Then the band width of the amplifier is
 (a) infinite
 (b) 10KHz
 (c) zero
 (d) 20KHz.
- (v) The Barkhausen criterion is associated with the
 (a) negative feedback
 (b) positive feedback
 (c) both of them
 (d) none of them.

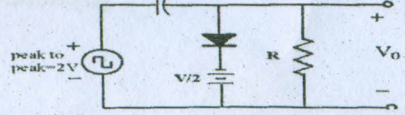
- (vi) The breakdown mechanism in a lightly doped p - n junction under reverse biased condition is called
 - (a) avalanche breakdown
 - (b) zener breakdown
 - (c) breakdown by tunnelling
 - (d) high voltage breakdown.
- (vii) A circuit that removes a part of positive or negative cycles of input waveform is called
 - (a) clamper
 - (b) differentiator
 - (c) integrator
 - (d) clipper.
- (viii) In a bipolar junction transistor the base region is made very thin so that
 - (a) recombination in base region is minimum
 - (b) electric field gradient in base is high
 - (c) base can be easily fabricated
 - (d) base can be easily biased.
- (ix) Cascading amplifier stages to obtain a high gain is best done with
 - (a) common-emitter(CE) stages
 - (b) common-base(CB) stages
 - (c) common-collector(CC) stages
 - (d) combination of CE and CB stages.
- (x) Thermal runaway in a transistor circuit refers to the phenomenon of
 - (a) uncontrolled increase in temperature due to the positive feedback caused by self-biasing and increase in collector currents with increasing temperature
 - (b) reduction in thermal resistance with increasing temperature
 - (c) change in the slope of the thermal load line with changing temperatures
 - (d) uncontrolled increase in temperature due to avalanche multiplication.

Group - B

- 2. (a) For the given circuit, if Zener break down voltage is 10V then
 - (i) Find I , I_L and I_Z .
 - (ii) Find the value of R_L that will establish maximum power dissipated by the Zener diode is 400mW



- (b) Explain the given circuit and draw the output voltage waveform.



$(5 + 4) + 3 = 12$

- 3. (a) Design a circuit using p - n junction diode to shift the dc level of the applied input wave form by a fixed positive reference value. Explain the operation of the circuit with output waveform.
- (b) What is zener break down?

$(5 + 4) + 3 = 12$

Group - C

- 4.(a) Draw the circuit of a BJT amplifier in CE configuration. Briefly discuss the effect of emitter swamping resistance.
 - (b) What is load line? How to achieve a stable operating point against temperature variation.
- $(2 + 4) + (2 + 4) = 12$
- 5. (a) In a voltage divider bias circuit, establish that output current is independent of the current gain.
 - (b) What are the reasons behind the upper cut-off frequency in frequency response of a RC coupled CE amplifier connected with an ac source having internal resistance R_s ?
 - (c) In a collector to base bias circuit a transistor with current gain = 50 is used. Supply voltage $V_{cc} = 10V$, $V_{BE} = 0.7V$ collector resistor $R_C = 2k\Omega$. The bias is obtained by connecting 100K resistor from collector to base. Find the Q - point of the transistor.

$5 + 3 + 4 = 12$

Group - D

- 6.(a) An amplifier having open loop gain 'A' and feedback ratio 'β', derive mathematical expressions to illustrate the effect of negative feedback on band width and gain.
 - (b) Design an amplifier circuit having gain -2.5.
 - (c) Design an amplifier circuit having output voltage is the exponential form of the input voltage.
- $5 + 3 + 4 = 12$
- 7.(a) Explain the operation of an Instrumentation amplifier. What are the advantages of this amplifier?
 - (b) Design a precision full wave rectifier circuit and explain its operation.

$6 + 6 = 12$