BASIC ELECTRONICS
(ECEN 1011)

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) Negative feedback in amplifiers
(a) results in oscillation (b) reduces gain
(c) decreases stability (d) decreases bandwidth.

(ii) Semiconductors have
(a) Zero temperature coefficient of resistance
(b) Positive temperature coefficient of resistance
(c) Negative temperature coefficient of resistance
(d) Positive/ Negative temperature coefficient of resistance depending on material.

(iii) For npn transistors, Ico doubles for rise in temperature by
(a) 5 °C (b) 7 °C (c) 9 °C (d) 10 °C.

(iv) In Enhancement n-channel MOSFET, an induced n type channel can be produced between the source and the drain if
(a) V_{GS}= 0 (b) V_{GS} is positive
(c) V_{GS} is negative (d) None of these

(v) In a centre-tapped full wave rectifier, if V_m is the peak voltage between centre-tap and one end of the secondary, the PIV is
(a) Vm (b) 2Vm (c) Vm/2 (d) Vm/√2.

(vi) The Slew rate of an ideal op amp is
(a) zero (b) infinity (c) less than unity (d) greater than unity.

(vii) The ripple factors of half wave and full wave rectifier are:
(a) 1.11 and 0.48 (b) 0.49 and 1.12
(c) 1.21 and .81 (d) 1.21 and 0.48

(viii) If the differential voltage gain is 4700 and the common mode gain is 0.47, the CMRR is
(a) 40dB (b) 10,000
(c) 80dB (d) Both (b) and (c).

(ix) In a Common Base BJT, for a fixed emitter base junction forward bias, increase in reverse bias across the collector base junction,
(a) increases emitter current (b) decreases emitter current
(c) keeps emitter current constant (d) makes emitter current zero.

(x) Avalanche breakdown is primarily dependent on the phenomenon of
(a) Collision (b) Doping
(c) Diffusion (d) Recombination.

Group – B

2. (a) Define Fermi Level. Mention and describe the different breakdown mechanisms in a pn junction.

(b) Explain with circuit diagram how Zener diode is used as a voltage regulator.

(2 + 4) + 6 = 12

3. (a) Explain the operation of a bridge rectifier with the help of a circuit diagram.

(b) Evaluate the ripple factor and efficiency of a full wave rectifier.

6 + 6 = 12

Group – C

4. (a) Draw the input and output characteristics of a CB mode npn transistor. Indicate the various regions of operation in the output characteristics.

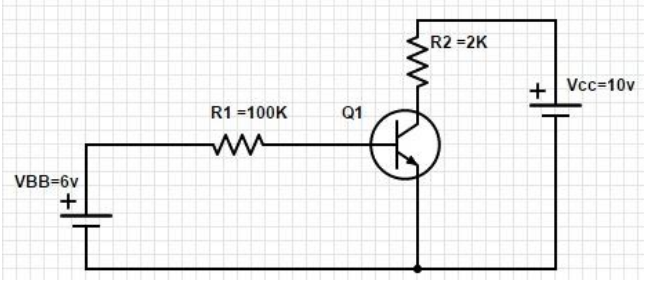
(b) Explain (i) Early effect (ii) Punch through

6 + (3 + 3) = 12

5. (a) What are the factors that affect the biasing stability of a transistor?

(b) Draw the circuit diagram for collector to base bias circuit and explain why it has better stability compared to fixed bias. Calculate its stability factor S.

(c) Calculate V_{CE} and Ic in the circuit given below. Assume V_{BE}= 0.7 V and β=50.



3 + 5 + 4 = 12

Group – D

6. (a) Explain the operation of n-channel JFET with the help of a diagram.

   (b) Draw the drain and transfer characteristics of n-channel JFET.

   (c) Differentiate between enhancement and depletion MOSFET.

4 + 4 + 4 = 12

7. (a) A JFET has pinch off voltage (V_P) = - 4.5V, saturation drain current (I_{DSAT}) = 10mA and Drain current (I_D) = 2.5mA. Determine the transconductance.

   (b) Mention the FET parameters and derive the relationship between them.

   (c) Explain the formation of inversion layer in an n-channel enhancement MOSFET.

4 + 4 + 4 = 12

Group – E

8. (a) Define (i) Slew rate (ii) CMRR

   (b) Explain the operation of an op-amp comparator circuit.

   (c) In the Fig. 1. If V_1=0.5V and V_2=0.1V, find V_o.

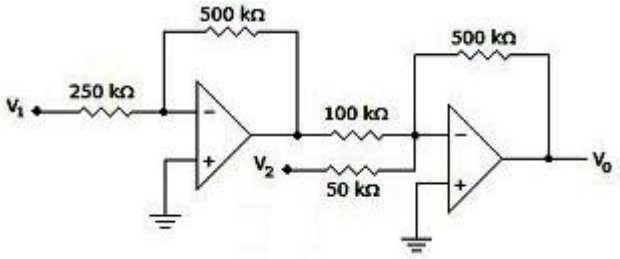


Fig.1

4 + 4 + 4 = 12

9. (a) To an amplifier having 60 dB gain a negative feedback of β = 0.01 is applied. What would be the change in overall gain of the feedback amplifier if the internal amplifier is subjected to a gain reduction of 11%? Comment on the result.

   (b) Describe the use of an op-amp as an integrator. Derive the input output relation. Draw appropriate input and output waveforms.

(4 + 1) + (5 + 2) = 12

Department & Section	Submission Link
ME A	https://classroom.google.com/w/Mjc0MDM5NDY3NjQw/tc/MjkxNDI1NjY4OTY5
ME B	https://classroom.google.com/w/MjMwNDg1MjgyODYz/tc/MjY1MDA5NTg1NTIy
BT	https://classroom.google.com/w/MjMxNjcyMTgzMjUx/tc/MjkxNDUyMzk1OTQw
EE	https://classroom.google.com/u/0/w/MjMxNjkyNTgxNzc3/tc/MjkxMzg0MDQ2Mzgw
CE A	https://classroom.google.com/u/1/w/MjMwOTg4NDQ2ODI3/tc/MjkxNDMzOTE0NzY4

CE B	https://classroom.google.com/w/MjYyMjc1Njg2MzAz/tc/Mjc0NTE0NDkwMTY0
CHE	https://classroom.google.com/w/MTcxNzUxODkzNzE2/tc/MjkxNDY3MTg2NzY4
BACKLOG	https://classroom.google.com/c/MjkxNDA2NDgxMjQx?cjc=ecqx62q