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B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Third Semester

Electrical and Electronics Engineering

14UEE305 - SEMICONDUCTOR DEVICES AND CIRCUITS

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. In a PN diode with the increase of reverse bias, the reverse current

    (a) increases   (b) decreases   (c) remains constant
    (d) may increase or decrease depending on the doping

2. LEDs have response time of the order of

    (a) $0.1ns$ (b) $1ns$ (c) $100ns$ (d) $1\mu s$

3. The avalanche effect takes place in which of the following regions of transistor operation?

    (a) saturation   (b) cutoff   (c) breakdown   (d) active

4. Which of the following change is likely to occur in the Q-point when the collector current increases?

    (a) no change   (b) shifts to saturation region
    (c) shifts to cut-off region   (d) oscillates in the active region

5. n-channel FETs are superior to p-channel FETs because

    (a) they have lower switching time
    (b) they have lower pinch off voltage
    (c) mobility of charge carrier electron in n-channel FET is greater than the mobility of charge carrier hole in p-channel FET
    (d) they have higher input impedance

6. The dynamic drain resistance of MOSFET is of the order of

    (a) 10 $K\Omega$ (b) 500 $K\Omega$ (c) 5 $M\Omega$ (d) 100 $M\Omega$

7. The effect of current shunt feedback in an amplifier is

    (a) Increase the input resistance and decrease the output resistance
    (b) Increase both input and output resistance
    (c) Decrease both input and output resistance
    (d) Decrease the input resistance and increase the output resistance

8. To obtain very high input and output impedances in a feedback amplifier ,the topology must be

    (a) voltage series   (b) current series   (c) voltage shunt   (d) current shunt

9. In UJT, a 3-mil aluminum wire called the

    (a) base B (b) emitter E (c) base $B1$ and $B2$ (d) all the above

10. A circuit that adds positive or negative DC voltage to an input sine wave is called

    (a) clamper   (b) clipper   (c) diode clamp   (d) limiter

<center>PART - B (5 x 2 = 10 Marks)</center>

11. A diode with $V_F = 0.7V$ is connected as a half wave rectifier. The load resistance is 500 *ohm*, and the *rms* ac input is 22*V*. Determine the peak output voltage, the peak load current, and the diode peak reverse voltage.

12. Give the relationship between α and β.

13. Write a short note of JFET fabrication and packaging.

14. State the condition to produce oscillation.

15. State the applications of Schmitt trigger.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Why Zener diodes are used as voltage regulators? Explain series voltage regulator with a neat diagram. (8)

(ii) A Zener rated 8.2 V and 500 mW is used as a voltage regulator. If the DC input voltage is 12 V and the diode has the slope resistance of 1.75Ω, determine
  (1) value of the resistance to be connected in series for safe operation
  (2) magnitude of the diode current when a load of 2.0$K\Omega$ is connected and
  (3) percentage change in potential difference across the load when the input voltage varies by 10%. (8)

Or

(b) Draw the circuit diagram of Full wave rectifier and explain its operation with necessary waveforms. Also derive the expression for rectification, efficiency and transformer utilization factor. (16)

17. (a) Describe the construction, operation and characteristics of BJT in common base configuration. (16)

Or

(b) Discuss in detail the analysis of BJT amplifier using h-parameters. (16)

18. (a) Assuming that the saturation drain current I_{DS} is given by the parabolic relation

$I_{DS} = I_{DS} \left(1 - \frac{V_{GS}}{V_P}\right)^2$. Prove that the transconductance g_m is given by

$g_m = g_{m0} \left(1 - \frac{V_{GS}}{V_P}\right)$, where g_{m0} is the value of g_m at $V_{GS} = 0$. (16)

Or

(b) Discuss in detail about the fabrication, operation and characteristics of P and N-channel JFET. (16)

19. (a) Explain the different methods of coupling multistage amplifiers. (16)

Or

(b) Draw the circuit diagram of Colpitt oscillator and explain its operation. Obtain the expression for its frequency of oscillation. (16)

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20. (a) Draw the circuit diagram of a Astable multivibrator and explain its operation with relevant waveforms. (16)

Or

(b) For a certain UJT sweep circuit, the resistance is 20 K while the capacitance is 0.2 μF. The valley potential is 1.5 V when VBB = 15 V. Assuming diode cut in voltage of 0.7 V and intrinsic stand-off ratio as 0.5. Calculate the frequency of oscillations. (16)

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