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End Semester Examination of Semester-III, 2015

Subject : ELECTRONICS (HONS.) (UG)

Paper : VII

Full Marks : 40

Time : 2 Hrs

The figures in the margin indicate the marks corresponding to the question.

Candidates are requested to give their answers in their own word as far as practicable.

Illustrate the answers wherever necessary.

Group A

Answer any two out of four questions : 10x2=20

1. a) Why is biasing of transistor necessary? Draw the circuit diagram showing the self-bias of an n-p-n transistor in CE-configuration. Derive expression for its stability factor. 2+2+3
- b) A transistor operating in the CE-mode draws a constant base current I_B of 30 μ A. The collector current I_C is found to change from 3.5 mA to 3.7 mA when the collector emitter voltage V_{CE} changes from 7.5 V to 12.5 V. Calculate the output resistance and β at $V_{CE} = 12.5$ V. 3
2. a) What is pinch off voltage in a JFET? Explain how it can be found out from (i) Output characteristic curve and (ii) mutual characteristic curve.

(2)

- b) An n-channel JFET has $I_{DSS} = 12 \text{ mA}$. If the transconductance g_m at $V_{GS} = 0$ is 4 millmho, find the 'Pinch Off' voltage.
- c) Draw the circuit of a common source JFET amplifier. Obtain an expression for voltage gain for small Signal equivalent circuit. 4+3+3
3. a) Starting from Maxwell's equation derive the wave equation for electric and magnetic fields in free space.
- b) Hence show that electric magnetic and propagation vectors are all mutually perpendicular to each other.
- c) The intensity of sunlight reaching the earth's surface is about 1300 Watt m^{-2} . Calculate the strength of the electric field and the magnetic field of the incoming sunlight. 3+3+4
4. a) Define reflection co-efficient for voltage of terminated uniform transmission line.
- b) Obtain a general expression for the line impedance as a function of distance from the load. 2+8

Group B

Answer any two out of four questions : 5x2=10

5. Discuss how a Zener diode can be used to get a regulated voltage. Find the maximum load current it can deliver. 3+2
6. a) What are the advantages of using h-parameters model?

(3)

- b) A transistor having $h_{ie} = 1100 \Omega$, $h_{fe} = 100$, $h_{re} = 2.5 \times 10^{-4}$ and $h_{oe} = 25 \mu A/V$ is connected as a CE amplifier with a load resistance of $1 K\Omega$. Calculate the current gain and input resistance. 2+3
7. What is a TE mode in rectangular waveguide? Derive the expressions for the field components of TE waves in a rectangular waveguide. 1+4
8. Explain Radiation resistance of transmission antenna. An aerial having a directivity of 90 is operating at a wavelength of 2 m. Calculate the maximum effective aperture of the aerial. 2+3

Group C

Answer **any five** out of ten questions : 2X5=10

9. How the diode is used as a clipper? Show its circuit?
10. Calculate ripple factor for a full-wave rectifier circuit.
11. Is it possible to make a transistor by joining two diodes back to back?
12. What do you mean by Q-point of a transistor amplifier?
13. Draw a diagram of wanking a diode as on envelope dectector for AM.
14. State and explain Brewster's law for e.m. wave.
15. What is skin depth?

(4)

16. The intensity of sunlight reaching the earth's surface is about 1300 W.m^{-2} . Calculate the strength of electric and magnetic fields of the incoming sunlight.
 17. Derive the condition of distortionless transmission line.
 18. Why is an antenna array used instead of a single antenna?
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