B SC ELECTRONICS
Fifth Semester
Microwave Theory
(BSE-22)

Duration: 3Hrs. **Full Marks: 70**

Part-A (Objective) =20
Part-B (Descriptive) =50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins. **Marks: 50**

Answer any *four* from *Question no.* 2 to 8
***Question no.* 1 is compulsory.**

1.(a) Explain with diagram operation of PIN diode.

(b) Explain the operation of reflex Klystron with the aid of a suitable schematic diagram; indicate the polarity of the voltages applied to the various electrodes. **5+5=10**

2.(a) Find the greatest number of half waves of electric intensity with which it may be possible to propagate a signal of $10\,GHz$ in a waveguide whose wall separation is 0.05m. Calculate the guide wavelength for this mode of propagation.

(b) What are different microwave frequency bands? Write some of the applications of microwave communications. **5+5=10**

3. (a) What is magnetron? Explain the working principle of magnetron.

(b) Explain the process of velocity modulation. **5+5=10**

4. (a) What is crossed field amplifier? Explain its operation.

(b) Explain the operation of TWT with a suitable schematic diagram. **5+5=10**

5. (a) Explain the working principle of Gunn diode. State how domain is formed in Gunn diode.

(b) Write short notes on (any two)

i) Negative resistance ii) Schottky diode iii) π mode oscillation

6+4=10

6. (a) What is IMPATT diode? Explain the working principle of IMPATT diode.

(b) Write short notes on

i) Varactor diode ii) TRAPATT **6+4=10**

7. (a) Explain with diagram basic principles of RADAR.

(b) Derive RADAR range equation. **5+5=10**

8. (a) Derive current and voltage equations of transmission line.

(b) Write the block diagram of pulsed RADAR system. **6+4=10**

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Duration: 20 minutes **Marks – 20**

(PART A - Objective Type)

I. Choose the correct answer: **1×20=20**

1. Klystron is a microwave

a) oscillator b) amplifier c) switch d) none of the above

2. Velocity of wave in free space is

a) $\frac{1}{\sqrt{\mu\varepsilon}}$ b) $\sqrt{\mu\varepsilon}$ c) $\frac{1}{\sqrt{\mu_0\varepsilon_0}}$ d) $\sqrt{\mu_0\varepsilon_0}$

3. Wave guide supports

a)TE mode b)TM mode c)TEM mode d)both TE and TM mode

4. Which one of the following is a crossed field device

a) Magnetron b) Klystron c) TWT d) TRAPATT.

5. Velocity modulation is involved in the working principle of

a) Klystron b) Magnetron c) TWT d) both a) and b).

6. Performance characteristics of Gunn diode is related to

a) –ve resistance b) voltage c) current d) none of the above.

7. Range of frequencies in X- band is

a) 2-4 GHz b) 4-8 GHz c) 8-12 GHz d) none of the above.

8. Klystron can be used as power

a) source b) receiver c) both a) and b) d) none of the above.

9. Continuous interaction between r.f. field and electron beam occurs in

a) TWT b) Klystron c)CFO d)IMPATT diode

10. Cut off frequency expression for parallel plate wave guide is

$(a)\frac{1}{\lambda_0^2}=\frac{1}{\lambda_c^2}+\frac{1}{\lambda_g^2}$ $(b)\frac{1}{\lambda_c^2}=\frac{1}{\lambda_0^2}+\frac{1}{\lambda_g^2}$

$(c)\frac{1}{\lambda_g^2}=\frac{1}{\lambda_c^2}+\frac{1}{\lambda_0^2}$ $(d)\frac{1}{\lambda_c^2}=\frac{1}{\lambda_g^2}+\frac{1}{\lambda_0^2}$

11. Π -mode is supported in

a) Magnetron b) Klystron c) TWT d) both a) and b).

12. RADAR uses

a) antenna b) duplexer c) only antenna d) both a) and b).

13. Electrons in Reflex Klystron are captured at repeller end by

a) buncher cavity b) catcher cavity

c) resonant cavity d) none of the above.

14. Which one of the following is not a microwave semiconductor device

a) Magnetron b) TRAPATT c) IMPATT d) Schottky diode.

15. In PIN diode, layer between PN junction is

a) intrinsic layer b) insulator layer

c)impedance layer d) none of the above.

16. Which of the following statements are true for a transmission line parameters *R*, *L*, *G* and *C*?

a) *R* and *L* are series elements

b) *G* and *C* are shunt elements

c) both *R* and *G* depend on conductivity of the conductors forming the line

d) only *R* depends explicitly on frequency.

17. Signals coming back from RADAR target is known as

a) echos b) reflected signal c) pulse d) none of the above.

18. Performance of RADAR is determined by

a)range equation b) echos c)pulses d) antenna

19. Negative resistance effect is observed in

a) TRAPATT b) IMPATT c)Gunn diode d) Magnetron

20. VSWR is used for calculating

a) voltage ratio b) current ratio c) pulse ratio d) none of the above.

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