QT-5324

M. Sc. (Sem.-I) Examination,
December-2023

PHYSICS

Paper - PHY - 104

(Advanced Electronics)

Time Allowed : **Three Hours**

Maximum Marks : **70**
Minimum Marks : **28**

Note : *This question paper contains* ***two*** *sections as under:*

Section-A ***Max. Marks-20***

This section will have ***10*** *questions, having* ***02*** *questions from each unit with no internal choice. Answer in about* ***20*** *words. All questions will have* ***equal*** *marks.* ***(10×02=20)***

Section-B ***Max. Marks-50***

This section will have ***10*** *questions, having* ***02*** *questions from each unit, one question to be attempted from each unit. Words limit approximately* ***400-500*** *words. Questions may have sub divisions. All questions will have* ***equal*** *marks.* ***(10×05=50)***

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SECTION - A

1 (i) What properties of microwaves allow their application to communication and navigation?

(ii) Write two limitations of microstrip line.

(iii) What are degenerate modes? In a square waveguide name the degenerate TE and TM modes.

(iv) Write two type of power loss which cause attenuation of signal transmission in metallic waveguide.

(v) Explain beam spreading / debunching in two cavity Klystron amplifier. What is the impact of debunching?

(vi) Write two applications of magnetron with peak power generated by them.

(vii) Name four commercial materials used to fabricate LED.

(viii) Explain the phenomenon to total internal reflection used to propogate light in an optical fibre.

(ix) What is the importance of heterostructures?

(x) Write the factors limiting the speed of response in terms of a photodetector.

SECTION - B

UNIT - I

2 Explain effective dielectric constant and characteristic impedance for microstrip line. What are the causes of losses in microstrip line? Deduce an expression for quality factor Q of microstrip line.

2+2+2+4

OR

Define reflection and transmission coefficient, standing wave ratio. Explain two uses of Smith chart.

2+2+2+4

UNIT - II

3 Derive expression for the modes of propagation of microwaves in a cylindrical waveguide. Which mode is the principal mode of propagation in it and why?

8+2

OR

What do you mean by E ad H plane tees? Describe their applications in microwave circuits?

10

UNIT - III

4 Describe the working of a two cavity Klystron amplifier and derive an expression for the output power.

5+5

OR

What are avalanche transit time devices? Explain the construction and operation of TRAPATT diode.

2+8

UNIT - IV

5 Describe the construction and working of LED. What are the basic process involved in working of LEDs? How do we increase the efficiency of excitation of LED?

6+2+2

OR

(a) What is Optical fibre? What is the necessity of cladding in optical fibre? Describe numerical aperture and maximum angle of acceptance for a fibre.

2+2+2

(b) An optical fibre has a refractive index of core to be 1.5 and the relative refractive index difference of core-cladding to be 0.01. Determine the numerical aperture and the maximum angle of acceptance.

4

UNIT - V

6 Describe the construction and working of avalanche photodiode. For a photodetector explain responsivity, spectral response and dark current.

3+4+3

OR

(a) Explain pumping and population inversion in a semiconductor laser.

2+2

(b) Explain the working of a heterojunction laser.

3

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(c) A semiconductor heterojunction laser is grown wth GaAsP active region layer with lattice constant 0.56 nm. Assume that laser transition occurs from the bottom of conduction band involving band gap energy 1.85eV. Determine wavelength of laser emitted out. **3**

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