

Roll No.

91561

B. Sc. (Hons.) Mathematics 2nd Sem. Latest Examination – April, 2018

PHYSICS-II (opt. II)

Time : Three Hours] [Maximum Marks : 60

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting at least *one* question from each Unit. Question No. **1** is *compulsory*. All questions carry equal marks.

(Compulsory Question)

- 1. (a) What is meant by p-type semiconductor ? Explain with the help of diagram how holes contribute to electric current ? 2 each
- (b) Define the term transition capacitance of a P-N diode.
- (c) Explain following (i) why transistor is a low powered device (ii) why base made thin ?

- (d) Define load line and Q-point of a transistor amplifier.
- (e) Why is population inversion necessary for laser action ?

UNIT – I

- 2. (a) What is P-N junction ? Explain the formation of potential barrier of a P-N junction. 4
- (b) Give the construction of a semiconductor photodiode. Draw and discuss its V-I characteristics. 4
- (c) If the output voltage of a centre tap full wave rectifier and a bridge type full wave rectifier is 100 V, determine the peak inverse voltage in both the cases. 4 $\frac{1}{2}$
- 3. (a) Name and draw the three possible transistor connections. Explain transistor as an amplifier. 3, 3 $\frac{1}{2}$
- (b) Sketch CB input characteristics for a PNP transistor. Explain the shape of the curves qualitatively. 4
- (c) Why collector current is slightly less than emitter current ? 2

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UNIT – II

4. (a) Describe the potential divider method in detail. Define the stability factor and calculate its value. 3, 3
- (b) Draw the circuit diagram of two stage R. C. coupled amplifier. Derive an expression for the voltage gain in mid frequency region. 3, 3 $\frac{1}{2}$
5. (a) State the conditions under which a feedback amplifier works as an oscillator. 2
- (b) Draw the circuit diagram of a transistor Hartley oscillator. Explain the function of each component. 2, 2
- (c) Explain a feedback amplifier with the help of a block diagram. 6 $\frac{1}{2}$

UNIT – III

6. (a) Write a short note on He-Ne laser along with its level scheme. 4
- (b) Why is the diameter of He-Ne laser tube kept in the range of a few mm only. 2
- (c) How even a 2 mW He-Ne laser is much much brighter than a 100 W ordinary bulb ? What precaution one should observe an account of this ? 6 $\frac{1}{2}$

7. (a) How lasers are preferable in the field of communication ? Give some illustrations. 4
- (b) Explain the phenomenon of self focussing in a laser beam. 5
- (c) What is laser pumping ? Define an expression for the optical pumping power. 3 $\frac{1}{2}$
8. (a) Derive an expression for ratio of spontaneous emission to stimulated emission in thermal equilibrium. 5
- (b) How are lasers used for surgical as well as diagnostic purpose both ? 3
- (c) Write a short notes on following :
- (i) temporal coherence 2
- (ii) directionality 1 $\frac{1}{2}$
- (iii) life time 1