

**FACULTY OF SCIENCE**

**M. Sc. III – Semester Examination, December 2018 / January 2019**

**Subject : Physics**

**Paper – I : Modern Optics**

**Time : 3 Hours**

**Max. Marks: 80**

**Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.**

**PART – A (8 x 4 = 32 Marks)  
(Short Answer Type)**

- 1 What are the basic requirements to obtain lasing action in a medium?
- 2 Explain the threshold condition for laser action.
- 3 Discuss briefly about the Argon laser.
- 4 What are the applications of semiconductor lasers?
- 5 Mention different types of holograms and their applications.
- 6 Explain the limitations of Gabor hologram.
- 7 What is a thickness function? Explain.
- 8 Briefly discuss the Fourier transforming properties of lenses.

**PART – B (4 x 12 = 48 Marks)  
(Essay Answer Type)**

- 9 (a) What are Einstein's relations? Establish a relation between Einstein's A and B coefficients.  
**OR**  
(b) What are laser rate equations? Derive laser rate equations for a three level system and obtain pumping threshold condition.
- 10 (a) Describe the construction and working of a CO<sub>2</sub> laser.  
**OR**  
(b) Discuss the construction and working of a Ruby laser.
- 11 (a) Discuss in detail the recording and reconstruction of hologram.  
(b) Distinguish between a photograph and a hologram.  
**OR**  
(c) Discuss in detail about volume hologram and explain how they are used as optical memories.
- 12 (a) Distinguish between linear and non-linear optics. Explain harmonic generation of light and obtain phase matching condition for second harmonics.  
**OR**  
(b) Discuss the theory of parametric generation of light.  
(c) Explain the phenomena of self focusing of light.

**FACULTY OF SCIENCE**

**M. Sc. III – Semester Examination, December 2018 / January 2019**

**Subject : Physics**

**Paper – II (A) : Advanced Solid State Physics**

**Time : 3 Hours**

**Max. Marks: 80**

**Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.**

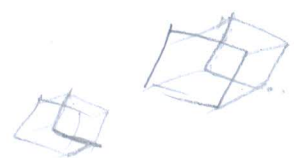
**PART – A (8 x 4 = 32 Marks)  
(Short Answer Type)**

- 1 Write a short note on the importance of Fermi surfaces.
- 2 Explain the concept of anomalous skin effect.
- 3 What is hysteresis loop and how do domains affect this loop?
- 4 What is the meaning of local fields?
- 5 What does Bloch wall represent and how does it move?
- 6 What is the role of Weiss field in ferromagnetism?
- 7 Give the concept of energy gap in superconductivity.
- 8 Write some important applications of super conductivity.

**PART – B (4 x 12 = 48 Marks)  
(Essay Answer Type)**

- 9 (a) What are periodic and reduced zone schemes? Explain their significance in the representation of energy bands.  
OR  
(b) Discuss Fermi surfaces of metals in simple cubic (SC) and FCC lattices.
- 10 (a) Describe the effect of alternating field on the behaviour of dielectric material.  
OR  
(b) Give a detailed description of ferroelectricity in  $\text{BaTiO}_3$ .
- 11 (a) Give the relevant theory of paramagnetism and explain the method of paramagnetic cooling.  
OR  
(b) Distinguish ferro, antiferro and ferromagnetic materials and give a few applications of ferrites.
- 12 (a) Discuss thermodynamic concept of superconductivity.  
OR  
(b) Describe Giaver-tunneling and Josephson effect in detail.

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**FACULTY OF SCIENCE****M. Sc. III – Semester Examination, December 2018 / January 2019****Subject : Physics  
(Specialization : Electronic Instrumentation)****Paper – III : Electronic Instrumentation****Time : 3 Hours****Max. Marks: 80****Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.****PART – A (8 x 4 = 32 Marks)  
(Short Answer Type)**

- 1 Obtain the response of first order system to a step input.
- 2 Distinguish between Gross, Systematic and Random errors.
- 3 Explain the principle of frequency to voltage converter.
- 4 Explain the response of second order band pass filter.
- 5 Explain the method of sweep frequency signal generation.
- 6 What is harmonic distortion? Define total harmonic distortion.
- 7 Explain the principle and working of a Q-meter.
- 8 Discuss the modes of operation of storage oscilloscope.

**PART – B (4 x 12 = 48 Marks)  
(Essay Answer Type)**

- 9 (a) Describe the time-domain response of second order system to an impulse input.  
**OR**  
(b) Distinguish between zero, first and second order systems.  
(c) Discuss the response of a second order system to a step input.
- 10 (a) Explain the working of Phase Lock Loop (PLL), using a block diagram. Mention its applications.  
**OR**  
(b) Explain the operation of phase sensitive detector with a circuit diagram.
- 11 (a) Explain the working and applications of AM and FM wave analyzers with a neat diagram.  
**OR**  
(b) Explain the working of (i) Frequency synthesized signal generator and (ii) function generator.
- 12 (a) Describe the construction and working of magnetic tape recorder.  
**OR**  
(b) Explain the characteristics of LED and LCD. Discuss their applications.

**FACULTY OF SCIENCE****M. Sc. III – Semester Examination, December 2018 / January 2019****Subject : Physics  
(Specialization : Electronic Instrumentation)****Paper – IV (A) : Digital Logic Circuits****Time : 3 Hours****Max. Marks: 80****Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.****PART – A (8 x 4 = 32 Marks)  
(Short Answer Type)**

- 1 Simplify the expression  $AB + AB' + AC' + A'C'$  and draw the required logic circuit using basic gates.
- 2 Discuss the 2's complement system and explain its importance.
- 3 Implement AND gate using only NOR gates.
- 4 Write a note on Presettable counters.
- 5 Explain the characteristics of digital IC's.
- 6 Write a note on bilateral switch.
- 7 What is flash memory? Explain.
- 8 Explain the format and syntax of HDL.

**PART – B (4 x 12 = 48 Marks)  
(Essay Answer Type)**

- 9 (a) Discuss the various processes to simplify the sum of products using Karnaugh map method.  
**OR**  
(b) Implement the full adder by two different methods and comment on carry propagation.
- 10 (a) Describe the construction and working of clocked R-S flip flop and explain how it can be brought in SET or RESET condition ignoring the current inputs.  
**OR**  
(b) Discuss the construction and operations of 4-bits synchronous counter with necessary diagram and list out the characteristics differences observed in synchronous and asynchronous counters.
- 11 (a) Explain the construction and characteristics of TTL.  
**OR**  
(b) Discuss the BCD to 7-segment display and liquid methods and write the performances difference between them.
- 12 (a) Describe the architecture of PROM and explain the programming of a PLD.  
**OR**  
(b) Explain the procedure for representing the data and truth tables using VHDL.