

Roll No. \_\_\_\_\_

1E1003

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B. Tech. I-Sem. (Reback) Exam., Feb. 2013

103-Physics

Common to all branches of Engg.

Time: 3 Hours

Maximum Marks: 80  
Min. Passing Marks: 24*Instructions to Candidates:*

Attempt any **five** questions, selecting **one** question from **each** unit. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

2. \_\_\_\_\_

**UNIT-I**

- Q.1. (i) What do you mean by interference of light? How shall you measure the wavelength separation of two nearby wavelengths using Michelson's interferometer? Derive the formula used. [6]
- (ii) What are interference filters & explain anti reflection coating? [6]
- (iii) What are the basic conditions for observing interference of light. [4]

**OR**

- Q.1. (i) What do you mean by polarization of light? Discuss quarter and half wave plates how these are used in production & detection of circular and elliptically polarized light. [6]
- (ii) What is optical activity? Explain specific relation and its measurement using Bi-quartz device. [6]
- (iii) Explain the difference between the interference by Newton's ring experiment and Michelson interferometer. [4]

UNIT-II

- Q.2. (i) Mention the differences between interference and diffraction. Derive the formula for intensity variation in single slit diffraction. [6]
- (ii) Discuss the formation of spectrum by plane transmission grating. [3+3=6]
- (iii) What is resolving power? Explain the Rayleigh's Criterion for resolution. [4]

OR

- Q.2. (i) Explain the basic theory of holography? What are the basic requirements of holographic laboratory? [3+3=6]
- (ii) On a plane grating of 4250 lines per centimeter parallel light beam is incident normally. In the second order spectrum at  $30^\circ$  a wave line is seen. Find the wavelength of this wave line. [4]
- (iii) Explain the fundamental differences between a hologram and a photograph. [4]

UNIT-III

- Q.3. (i) What is Laser? What do you mean by spatial & temporal coherence? [6]
- (ii) What are optical fibers? Explain their important application. [6]
- (iii) Explain the idea of Q-switching and mode locking. [4]

OR

- Q.3. (i) Explaining the theory of Laser action, determine & explain the Einstein coefficients. [6]
- (ii) Discuss the theory, design and applications of He-Ne Laser. [6]
- (iii) Explain coherent time and 'Q' Factor for light. [4]

UNIT-IV

- Q.4. (i) What is uncertainty principle? Discussing the origin of quantum nature of light explain the physical interpretation of wave function and its properties at boundary conditions. [2+4=6]
- (ii) What is Compton effect? Deduce the formula for wave-length shift. [4]
- (iii) Calculate momentum of photon if frequency associated with a photon  $5 \times 10^{13}$  Hz [4]

OR

- Q.4. (i) Discussing the barrier penetration potential as an application of Schrödinger equation explain tunnel effect. [6]
- (ii) Explain Sommerfield's free electron gas model and obtain an expression for the "density of states" for a Fermi- gas. [6]
- (iii) An electron is trapped in an infinitely deep cubical potential well of width  $1A^0$ . What is its first excitation energy? [4]
- [Given  $m_e = 9.1 \times 10^{-31} \text{ kg}$  &  $h = 6.6 \times 10^{-34} \text{ J x second}$ ]

UNIT-V

- Q.5. (i) What is Michelson Morley experiment? Explain its negative result. [4+2=6]
- (ii) Deduce the mass- energy relation. Give two examples in favur of this relation. [6]
- (iii) Lifetime of a particle in a laboratory frame is  $2.5 \times 10^{-7}$  second. The laboratory frame is moving with velocity  $2.8 \times 10^8 \text{ m/s}$ . [4]
- Find its proper time – interval.

OR

- Q.5. (i) What do you mean by Nuclear radiation detectors? Discuss the construction, working and properties of Geiger-Muller counter. [1+5=6]
- (ii) Obtain relativistic expression for the velocity addition. [6]
- (iii) Explain when Lorentz transformations converts into Galilian transformation giving necessary mathematics. [4]