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Sl.No. 2780



Barcode M-6

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III Semester B.Sc. Examination, October/November - 2018  
(Semester Scheme) (New Syllabus 2014-2015 onwards)

**PHYSICS**

**Waves, Acoustics and Optics (Paper - III)**

Time : 3 Hours

Max. Marks : 60

*Instruction :- Answer any three questions from Part - A and B, three questions from Part - C and six questions from Part - D.*

**PART - A**

1. a) Analyse a saw tooth wave with the help of Fourier theorem. [6]  
b) Obtain an expression for the velocity of longitudinal waves in a gaseous medium. [6]
2. a) Derive expressions for amplitude and phase at resonance. [6]  
b) Give the theory of Fresnel's Biprism. [6]

**PART - B**

3. a) Give the theory of Fraunhofer diffraction at a single slit. [6]  
b) Give the Fresnel's theory of optical rotation of polarised light. [6]
4. a) Obtain an expression for thickness of wedge shaped crystal plate and hence obtain the expression for fringe width. [6]  
b) What is Kerr effect? Describe Kerr-Cell method of determining the velocity of light. [6]

**PART - C**

5. A stretched string vibrates with a frequency 30 Hz in the fundamental mode. When length of string is 0.6m. It has a mass of 0.05kg/m. Find the tension in the string and velocity of propagation of transverse wave. [4]

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6. Newton's rings are formed in a reflected light of wavelength  $5893 \times 10^{-10}$  m. The diameter of the 10<sup>th</sup> dark ring is  $0.55 \times 10^{-2}$  m. Find the radius of curvature of the lens. [4]
7. Monochromatic light of wavelength 656 nm falls normally on a grating 0.02 m wide. The first order spectrum is produced at an angle of  $18^\circ 15'$  from the normal. What is the total no. of lines on the grating? [4]
8. The focal length of an achromatic doublet is 0.9 m and the dispersive power of the two lenses in contact are 0.034 and 0.046 respectively. Calculate their focal lengths. [4]

PART - D

9. a) Explain the principle on which a loudspeaker works. [2]
- b) Write Laplace formula for velocity of sound in air. Explain the terms. [2]
- c) What is antireflecting coating? [2]
- d) Distinguish between Fresnel's and Fraunhofer diffraction. [2]
- e) What are retarding plates? [2]
- f) What are +ve and -ve crystals? [2]
- g) Write the expression for intensity of sound in a medium and explain the terms used. [2]
- h) Write any two comparisons between Huygen's and Ramsden's eyepiece. [2]



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**III Semester B.Sc. Examination, Oct./ Nov. - 2018**  
**(Semester Scheme) (2015-16 Batch and Onwards)**  
**MATHEMATICS (Paper - III)**  
**Algebra II and Differential Equations I**

Time : 3 Hours

Max. Marks : 60

Instruction : Answer all the sections.

**SECTION - A**

- I. Answer any six questions. Each question carries two marks.
- Prove that identify element of every element of a group is unique.
  - Find all the generators of a cyclic group of order 12.
  - If  $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 4 & 3 & 5 & 1 \end{pmatrix}, \beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 4 & 2 & 5 & 3 & 1 \end{pmatrix}$  Find  $\alpha^{-1}\beta$ .
  - Is  $f:(R,+)\rightarrow(R,+)$  defined by  $f(x) = 3x + 1, \forall x \in R$  homomorphism?
  - Find order and degree of the differential equation  $y = x \left( \frac{dy}{dx} \right) + \frac{1}{\left( \frac{dy}{dx} \right)}$
  - Solve  $\frac{dy}{dx} = (x + y)^2$ .
  - Find the integrating factor of  $\frac{dy}{dx} + y \sec x = \tan x$ .
  - Solve  $\frac{d^3y}{dx^3} - 2\frac{d^2y}{dx^2} + 4\frac{dy}{dx} - 8y = 0$ .

**SECTION - B**

**(Algebra - II)**

- II. Answer any six questions. Each question carries four marks.
- Show that the set  $C^*$  of all non zero complex numbers is a group under multiplication.

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- b) Find all the right and left cosets of  $H = \{1, 3, 9\}$  in  $(Z_{13}, \otimes_{13})$ .
- c) If 'a' is a generator of the cyclic group of order 10, how many generators are there? And what are the generators.
- d) If  $N$  is a normal subgroup of  $G$  and  $H$  is a subgroup of  $G$  then prove that  $NH$  is a subgroup of  $G$ .
- e) Prove that every subgroup of a cyclic group is cyclic.
- f) Express  $1\phi = 3, 2\phi = 5, 3\phi = 6, 4\phi = 4, 5\phi = 1, 6\phi = 2$ , as product of disjoint cycles and find its order.
- g) If  $G$  is a group and  $H$  is a normal subgroup of  $G$  then prove that  $\frac{G}{H}$  is a homomorphic image of  $G$  with  $H$  as its Kernel.
- h) If  $f: G \rightarrow G'$  is a homomorphism and  $H$  is a subgroup of  $G$  then  $f(H)$  is a subgroup of  $G'$ .

### SECTION - C

#### (Differential Equation - I)

III. Answer any six questions. Each question carries four marks.

- a) Form the differential equation of family of circles touching the  $y$ -axis of the origin.
- b) Solve  $(1 + e^{x/y})dx + e^{x/y} \left(1 - \frac{x}{y}\right)dy = 0$ .
- c) Solve  $\frac{dy}{dx} - \frac{2}{x}y = \frac{y^2}{x^3}$ .
- d) Solve  $x^4 \frac{dy}{dx} + x^3y + \operatorname{cosec} xy = 0$ .
- e) Solve  $(D^2 - 2D + 1)y = e^x \cos x$ .
- f) Solve  $(D^2 - 4D + 4)y = e^{-4x} + 5 \cos 3x$ .
- g) Solve  $x^3 \frac{d^3y}{dx^3} + x \frac{dy}{dx} - y = 3x^4$ .
- h) Solve the simultaneous equations  $\frac{dx}{dt} = 3x + 2y, \frac{dy}{dt} = 5x + 3y = 0$ .



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**III Semester B.Sc. Examination, Oct./Nov. - 2018**

**(Semester Scheme)**

**(New Syllabus for Batches 2017-18 and Onwards)**

**CHEMISTRY (Paper - III)**

**Time : 3 Hours**

**Max. Marks : 60**

**Instruction :** Write neat labelled diagrams wherever necessary.

**PART - A**

**Answer all questions :**

**[6 × 1 = 6]**

1. a) What are Fullerenes?
- b) Water has maximum density at 4°C. Why?
- c) State Saytzeff's rule.
- d) Give an example for a dihydric alcohol.
- e) What is degree of polymerisation?
- f) Mention one application of distribution law.

**PART - B**

**(Inorganic Chemistry)**

**Answer any three questions :**

**[3 × 6 = 18]**

2. a) Explain n and p type semiconductors. [3]
- b) Explain the structure of Ice. [3]
3. a) Give the classification of metal carbonyls with suitable examples. [3]
- b) Give a method of preparation of hydrazine. Mention its any two applications. [3]

**P.T.O.**

