[105 Eng]

SARDAR PATEL UNIVERSITY
B.Sc. Physics 1st Semester Examination
Day: Saturday, Date: 12.02.2022, Time: 03:00 P.M. to 05:00 P.M.
Subject: PHYSICS, Subject Code: US01CPHY51
Subject Title: Mechanics-I, Network Analysis and Optics

Total Marks: 70

Instructions: Figures to the right indicate marks.

Que.1 Choose the correct option for the following questions. [10]

(1) Any kind of deforming force is called _____.
   (a) Elasticity   (b) Plasticity
   (c) rubber   (d) load

(2) Theoretical value of Poisson's ratio lies between _____.
   (a) -1.0 and +0.5   (b) -1.0 and -2.0
   (c) -0.5 and +1.0   (d) -1.0 and 0.0

(3) The time period of the torsional pendulum is given by _____.

   (a) $t = 2\pi \sqrt{\dfrac{C}{I}}$ (b) $t = 2\pi \sqrt{\dfrac{I}{C}}$

   (c) $t = 2\pi \sqrt{\dfrac{I}{Y}}$ (d) $t = 2\pi \sqrt{\dfrac{C}{K}}$

(4) Ultrasonic waves are _____.
   (a) Mechanical waves   (b) Progressive wave
   (c) Transverse waves   (d) Non-mechanical waves

(5) The compound pendulum is also known as _____ pendulum
   (a) Simple   (b) Physical
   (c) Kater's   (d) Torsional

(6) A point in a network where three or more circuit elements are joined together is called as _____.
   (a) junction   (b) node
   (c) branch   (d) tree

(7) _____ is generally used as a null detector in the ac bridge.
   (a) headphone   (b) galvanometer
   (c) inductor   (d) capacitor

(8) How many arms does a Wheatstone bridge possesses?
   (a) 1   (b) 2
   (c) 4   (d) 3

(9) The Michelson interferometer is based on principle of division of ____ of a light beam.
   (a) Wavelength   (b) frequency
   (c) Amplitude   (d) Wave front

(10) The resolving power of a grating having N slits in nth order will be _____.
   (a) n/N   (b) nN
   (c) (n+N)   (d) (N-n)
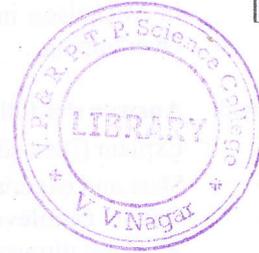
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Que.2 **Do as directed: (One mark of each question)** [8]
Fill in the blanks:
(1) The unit of twisting couple is _____.
(2) The magnetostriction effect is also known as _____.
(3) The reciprocal of resistance is called _____.
(4) The equation for resolving power of prism is _____.
Write True or False:
(5) The work done per unit volume in stretching the wire is equal to Stress x Strain.
(6) G. W. Pierce has designed a piezoelectric generator.
(7) Any closed path of a network is known as loop.
(8) In Michelson interferometer, dark region is obtained if the position of M_1' and M_2' is Overlapping.

Que.3 **Answer the following short questions. (Attempt any Ten)** [20]
(1) Explain (i) elasticity and (ii) plasticity.
(2) State and explain Hook's law
(3) Define: cantilever and bending of beam.
(4) What are ultrasonic?
(5) State the drawbacks of a simple pendulum.
(6) Explain the function of SONAR.
(7) State and explain voltage divider theorem.
(8) Give difference between ac and dc bridge.
(9) Give statement of Norton theorem and state its use.
(10) Draw the schematics diagram of Michelson interferometer.
(11) What is Interference? Explain constrictive and destructive interference
(12) State and explain Rayleigh's criterion for resolution.

Que.4 **Give detailed answer of the following questions. (Attempt any Four)** [32]
(1) Define Poisson's ratio. Describe an experiment with necessary theory to determine the Poisson's ratio for rubber.
(2) Describe dynamical method (Maxwell's vibrating needle method) of determination of modulus of rigidity.
(3) Give a detailed account of properties of ultrasonic waves.
(4) What is bar pendulum? Describe the experiment for determination of 'g' and 'k'.
(5) With proper example explain mesh current analysis method for three mesh networks.
(6) State use of Maxwell bridge and explain its construction and working. Explain its limitation.
(7) Explain construction and working of Jamin's refractometer.
(8) Define resolving power of plane transmission grating and derive expression for it.

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