Register Number:

DATE: **21** **-04-2018 (9AM)**

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**ST. JOSEPH’S COLLEGE (AUTONOMOUS), BENGALURU-27**

B.Sc. PHYSICS – II SEMESTER

SEMESTER EXAMINATION: APRIL 2018

**PH215: Properties of Matter, Waves and Radiation**

Time: 21/2Hours Max Marks: 70

 This paper contains **two** printed page and **three** parts

**PART A**

Answer any **four** of the following (4x10=40)

1. a) Explain the term neutral axis of a bent beam.

 b) Derive an expression for the depression produced at the free end of a loaded cantilever.

 (2+8=10)

2) a) Derive Stoke’s formula by the method of dimensions.

 b) Obtain an expression for the terminal velocity of a spherical body moving

 through a viscous medium. (4+6=10)

3) Define gravitational potential at a point. Calculate the gravitational potential due to a uniform      solid sphere at an external point and at an internal point.                                                                                                                           (10)

4) Show that the combination of two simple harmonic motions of equal amplitude

 in perpendicular directions differing in phase by $π$/2 is a circular motion. (10)

5) State Fourier theorem and evaluate the Fourier coefficients. (10)

6) Explain Planck’s radiation law and derive an expression for it. (10)

**PART B**

Answer any **Four** of the following (4x5 = 20)

7) A wire of area of cross section 2 mm2 and natural length 20 cm is fixed at one end and a

 mass of 1kghung from the other end. Find the elastic potential energy stored in the wire in

 steady state. Young’s modulus of the material of the wire=1.9X1011 Nm-2, g = 10ms-2

8) A mercury drop of radius 2mm is broken into 1000 equal drops. Calculate the gain in surface     energy. Surface tension of mercury = 0.464Nm-1

9) A satellite of mass 1000kg is supposed to orbit the earth at a height of 2000km above the

 earth’s surface. Find a) its speed in the orbit. b) its time period. Mass of earth = 6X1024kg.

 Radius of the earth=6400 km

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10) A block of mass 0.5Kg hanging from a vertical spring executes simple harmonic motion of     amplitude 0.1m and time period 0.314s. Find the maximum force exerted by the spring on

 the block.

11) A particle having mass 10g oscillates according to the equation x=2.0cm Sin [(100s-1)t+π/6]

      Find a) the amplitude, time period and the spring constant b) the position, the velocity

      and the acceleration at t=0.

12) The moment of inertia of the disc used in a torsional pendulum about the suspension wire is      0.4kgm-2. It oscillates with a period of 4s. Another disc is placed over the first one and the      time period of the system becomes 5s. Find the moment of inertia of the second disc about     the wire.

**PART C**

 Answer any **Five** of the following (5x2 = 10)

13 a) What should be done to its length when a pendulum clock is taken to high altitudes?

 b) Explain why a person sitting in a chair in a satellite feels weightlessness.

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 c) The excess pressure inside a soap bubble is twice the excess pressure inside a second         soap bubble. How large the volume of the second bubble is in comparison with the first         bubble.

 d) A sine wave is travelling in a medium. What is the minimum distance between the two           particles always having the same speed?

 e) Will a perfect black body reflect any radiation falling on it? Explain

 f) When the temperature of a black body increases, the wavelength of maximum intensity          radiation radiated from it decreases. Is it true? Explain