Register Number:

**Date: 12/04/2019**

**St. Joseph’s College (Autonomous), Bangalore-27**

**B.Sc. PHYSICS – II SEMESTER**

**SEMESTER EXAMINATION: APRIL 2019**

**PH218: Properties of matter, Waves and Radiations**

Time: 21/2Hours MaxMarks: 70

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

**PART A**

Answer any **four** of the following (4X10 = 40)

1. Define neutral surface. Derive an expression for the bending moment in the case of a          uniform straight metallic beam bent into an arc of a circle of small curvature.          (2+8)

2. Define gravitational potential. Derive an expression for the gravitational potential at a point

  i) outside ii) on the surface iii) inside a solid sphere.            (2+8)

3. a) Show that simple harmonic motion is a projection of circular motion.

   b) Find the time period of a compound pendulum and hence define the length

        of an equivalent simple pendulum.                                         (4+6)

4. a) Distinguish between oscillatory motion and simple harmonic motion.

 b) Compose the resultant of two simple harmonic motions having the same period moving

 in perpendicular direction and discuss the case when their phase difference =$ π/2$.

            (2+8)

5. a) Explain the terms phase velocity and group velocity.

 b) Obtain an expression relating phase velocity and group velocity.           (4+6)

6. What is Planck’s law of radiation? Derive Planck’s formula for energy distribution in

 Black body spectrum.     (2+8)

**PART B**

Answer any **four** of the following (4X5 = 20)

7. Find the Young’s modulus of the material of a steel wire of radius 2x10-4 m and length 4 m.

 It is extended through 2x10-3 m under a load of 1.3 kg. Find also the Poisson’s ratio

 if the rigidity modulus for steel is 6.842x1010 N/ m2.

8. Calculate the mass of water flowing in 10 minute through a tube 0.1cm in diameter 40 cm

 long if there is a constant pressure head of 20 cm of water. The coefficient of viscosity of     water is 0.00089 N-sm-2.

9. Calculate the excess pressure inside a liquid drop of radius 3 mm. Surface tension of the

 liquid is 0.04 Nm-1. Also calculate the surface energy.

10. Find the gravitational self-energy of the sun [Given G=6.67x10-11Nm2/kg2, mass of

 sun= 2x1030kg. radius of the sun = 7x108m.]

11. A simple harmonic wave travelling along x-axis is given by y = 5sin2π (0.2t-0.5x).

 Calculate the amplitude, frequency, wave velocity and particle velocity.(all the quantities

 are in SI system).

12. Luminosity of Rigel star in Orion constellation is 17000 times that of our sun. If the

 surface temperature of the sun is 6000K, calculate the temperature of the star.

**PART C**

13. Answer any **five** of the following (2X5= 10)

a) Explain how I-section girders help to save material and to reduce the cost without

 sacrificing the strength of the girder.

b) The branches of the trees are bending towards a busy highway road. Why?

c) Why narrow tubes, low density and high viscosity help in producing orderly motion.

d) In the case of a liquid surface the potential energy of the molecules lying within the

 surface film is greater than the potential energy of the molecules lying below .why?

e) Surface tension vanishes at critical temperature. How? Explain

f) What is the significance of Fourier series?

**PH218\_A\_19**