

Date:

Registration number:

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

B.Sc. PHYSICS-II SEMESTER

SEMESTER EXAMINATION: APRIL 2022

(Examination conducted in July 2022)

**PH 218: Properties of matter, Waves and Radiation**

Time- 2 ½ hrs Max Marks-70

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

**Part A**

Answer any **four** of the following: [4x10=40]

1. a) Define Youngs modulus, bulk modulus, rigidity modulus, and Poisson’s ratio.

b) Explain the stress-strain diagram for a metallic wire. (4+6)

1. a) Explain critical velocity of a liquid. Obtain an expression for critical velocity by using the

method of dimensions.

b) Explain surface tension of a liquid on the basis of molecular theory. Define angle of

contact. (6+4)

1. a) What is central force? Give its characteristics. Show that in a central force field, the angular

momentum of a particle is conserved.

b) Obtain the relation between gravitational field and potential. (6+4)

1. a) Calculate the velocity and acceleration of a particle executing simple harmonic motion.

b) Show that resultant of two simple harmonic motions at right angles to each

other is an ellipse. (4+6)

1. a) State and explain Fourier theorem.

b) Obtain an expression for the velocity of a wave in a stretched string. (3+7)

1. a) What is a black body? Deduce Planck’s equation for black body radiation.

b) Define solar constant. (8+2)

**Part B**

Answer any **four** of the following: [4x5=20]

1. A square bar of length 1m and cross section 1 cm2 is clamped horizontally at one end and a weight of 1 kg is applied at the other end. Neglecting the weight of the bar calculate the depression of the loaded end.
2. A steel ball of radius 2x10-3 m falls in a vertical column of castor oil. The coefficient of viscosity of castor oil is 0.7 Nsm-2 and it’s density 0.98x103kg m-3.The density of steel is 7.8x103 kgm-3  and g= 9.8ms-2. Find the terminal velocity of the ball.
3. If the mass of the sun is 2×1030 kg, distance of earth from the sun is 1.5×1011m and period of revolution of the former around the latter is 365 days, find the value of G.
4. Find the position of an oscillating particle when its kinetic energy and potential energy

 are equal.

1. A transverse harmonic wave on a string is described by

y = 3 Sin (36 t + 0.018 x) where x and y are in cm and t in s.

(a) What is the speed of its propagation? (b) What are its amplitude and frequency?

1. The wavelength of the radiation from a spherical black body of radius 4 m for which energy maximum is 6000 Å. Calculate the surface temperature of the black body and the energy emitted by the black body. Wien’s constant = 2.89 x 10-3 m-K.

Stefan’s constant = 5.67 x10-8 Wm-2K-4.

**Part C**

Answer any **five** of the following: [2x5=10]

1. a) Steel girders are made in the form of I-section. Give reason.

b) Explain why water on a clean glass surface tends to spread out while mercury on

the same surface tends to form drops.

1. Why do two ships moving fast and close to each other likely to collide?

d) In which kind of damping does the shock absorber work - under damping, over

damping or critical damping?

e) Why does a platinum wire while heating, gradually appears first red, then blue?

f) Under what condition the period of oscillation of a compound pendulum is

minimum?