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 Register Number:

 Date :

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

B.Sc. – II SEMESTER

SEMESTER EXAMINATION – April 2020

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

**Time : 2½ hrs**  **Max. Marks: 70**

*This question paper has* ***two*** *printed pages and* ***three*** *parts.*

**PART – A**

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

1. a) Explain stress-strain diagram for a metallic wire.

    b) Obtain the expression for the couple required to twist a uniform solid cylinder.                                                                                                                                            (4+6)

2. a) Define critical velocity. Give the significance of Reynold’s number.

 b) Deduce the expression for pressure difference across a curved liquid surface. (3+7)

3. a) State law of equal areas.

 b) Calculate the gravitational potential due to spherical shell. (1+9)

4. a) Define simple harmonic motion and arrive at the differential equation of SHM.

    b) Show that the coupled system of two simple pendulums has two normal modes. (3+7)

5. a) Mention any three characteristics of wave motion.

 b) Analyse a square wave using Fourier theorem. (3+7)

6. a) Explain the term critical damping.

 b) Derive Planck’s law of radiation. (2+8)

**PART-B**

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

7. Find the energy stored in a wire 5 m long and 1mm in diameter when it is stretched     through 3 mm by a load. Young’s modulus of the material is 20x1010 N/m2.

8. Calculate the mass of water flowing in 10 minute through a tube 0.1 cm in diameter,     40 cm long if there is a constant pressure head of 20 cm of water. The co-efficient of     viscosity of water is 0.001 S.I. units. Density of water is 1000 kg/m3. g = 9.8 m/s2

9. Verify whether the force $\vec{F}$ = 2zy$\hat{i}$ + 2zx $\hat{j}$ + 2xy $\hat{k}$ is a conservative force or not.

10. A thin uniform bar of length 1.2 m is made to oscillate about an axis through its end. Find       the period of oscillation. g = 9.8 m/s2.

 PH-218-A

11. The phase velocity of water waves of wavelength λ is $\sqrt{\frac{gλ}{2Π}}$ . Show that the group velocity        is one half the phase velocity.

12. A filament is radiating maximum energy of wavelength 6400 A˚. Find the amount of        heat energy lost per second per unit area. The temperature of surrounding air is 20˚ C.        Stefan’s constant = 5.67x10-8 W/m2/K4 and Wien’s constant = 2.889x10-3 mK.

**PART-C**

13. Answer any **five** of the following (5X2=10)

a. Why steel girders are made in the form of I section?

b. Why does a liquid either raised or depressed in a capillary tube?

c. What is the period of artificial geostationary satellite? Justify.

d. Under what conditions two SHM acting simultaneously result in circular motion?

e. Will a rigid spring or a flexible spring has more spring constant? Justify.

f. What is the condition for constructive interference? Explain.