36

2M18092 (Pages : 3) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Physics Degree Examination, March 2018

BPHY2B02 – Properties of Matter, Waves and Acoustics

(2017 Admission onwards)

ıx. Time: 3 hours Max. Marks : 80

SECTION A

(Answer in a word or phrase)

Answer all questions; each question carries 1 mark

1. Velocity of longitudinal wave in a gas depends upon elasticity and ..... of the medium
2. When kinetic energy of an SHM is minimum, potential energy is .....
3. Dimension of stress (in MLT) is .....
4. Velocity of sound wave is greatest in

   a)Vacuum b)Air c)Water d)Metal
5. What fraction of total energy is kinetic when the displacement is half of the amplitude

   a)1/2 b)1/8 c) 1/4 d)3/4
6. Give one example of forced oscillator
7. The potential energy of a SHO when the particle is half way to its end point is

   a)U/8 b) U/4 c)2U/3 d)3U/2
8. By which of the following phenomenon the light waves differentiated from sound waves

   a)Reflection b)Refraction c)Interference (d) Polarization
9. For an undamped oscillator, the quality factor is .....
10. Range of wavelength of ultrasonic wave is ..... **(10 x 1 = 10 Marks)**

SECTION B

(Answer in Two or Three sentences)

Answer all questions; each question carries 2 marks

11. Define bulk modulus of elasticity a material.
12. What do you mean by quality factor for a damped harmonic oscillator?
13. Write down the equation of progressive wave motion.
14. Distinguish between group velocity and wave velocity.
15. Define pitch and loudness of sound.
16. State Fourier theorem.
17. What are the conditions for the acoustics of a building

(7x 2 = 14 Marks)

SECTION C

(Answer in a paragraph of about half a page to one page)
Answer any five questions; each question carries 4 marks

18. State Hooke's law. Outline the different types of modulus of elasticity.
19. Derive an expression for the couple per unit twist of a uniform cylinder.
20. Explain the Lissajous figures and give its applications
21. Derive general equation of wave motion.
22. Derive the expression for the kinetic energy and potential energy of a SHO.
23. Assuming the results of forced oscillations, discuss the sharpness of resonance.
24. What is reverberation? How can it be minimized?

(5 x 4 = 20 Marks

SECTION D

(Problems – formula and important steps)
Answer any four questions; each question carries 4 marks

25. A torsion pendulum with a wire of length 1 *m*, diameter 1.2 *mm* and rigidity modulus 80 *GPa* oscillates with a period 1.25 *s*. Find the moment of inertia of the suspended body about the axis of suspension.
26. A brass rod of length 3 *m* is clamped at the centre. It emits a note of frequency 600 *cps*, when it vibrates longitudinally. If the density of the brass is 8.3 *gm/cc*, calculate its Young's modulus.
27. The equation of a progressive wave is given by $y = 10\sin(0.5\,x - 200\,t)$, where x and y are in *cm* and t is in second. Calculate amplitude, wavelength, frequency and velocity of the wave.
28. A source of sound has a frequency of 512 *Hz* and amplitude of 0.25 *cm*. What is the flow of energy across a cm^2/s, if the velocity of sound in air is 340 *m/s* and the density of air is 0.00129 gm/cm^3
29. For a forced harmonic oscillator, the amplitude of vibrations increases from 0.02 *mm* at very low frequencies to a value 5 *mm* at the frequency 100 *Hz*. Find the Q- factor of the system and also find the damping constant and the relaxation time.
30. A particle of mass 10 *gm* lies in a potential field $V = 50\ x^2 + 100$ units. Deduce the frequency of oscillation.
31. If the intensity of sound wave is increased by a factor of 25, by how many decibels is the sound level increased?

(4 x 4 = 16 Marks

SECTION E

(Essays - Answer in about two pages)

Answer any two questions; each question carries 10 marks

2. What is Poisson's ratio? Derive the relation connecting Young's modulus, bulk modulus and Poisson's ratio.
3. What are damped oscillations? Ste up the differential equation for a damped oscillator. Explain the three cases of damping with graphical representation.
4. Derive an expression for the velocity of longitudinal waves in a gas.
5. What are ultrasonic waves? Explain the production of ultrasonic wave by piezoelectric crystal method. What are the applications of ultrasonic waves?

(2 x 10 = 20 Marks)

37

32M18093 (Pages : 2) Reg. No:.....

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Physics Degree Examination, March 2018

PH2C02 – Mechanic, Relativity, Waves and Oscillations

(2015/2016 Admission onwards)

Max. Time: 3 hours Max. Marks : 64

Part A

Answer *all* questions(Each question carries one mark)

Earth is

a)an inertial frame b)non inertial frame

c)Absolute frame d)Inertial and rotational

. The deviation of a freely falling particle due to coriolis force is towards --------- in the orthern hemisphere.

. In orbital motion the gravitational pull is balanced by ---------- force.

. The relation between conservative force 'F' and potential energy 'U' is ----------

. The velocity of centre of mass in the centre of mass frame of reference is ----------

. The unit of angular velocity is ----------

. A progressive harmonic wave is given by $y = 10\ Sin(400t-100x)$. The wave velocity is -- -------

. According to Schrodinger equation a particle is equivalent to ----------

. Electron microscope was invented by ----------

0. The apparent length of an object moving with the velocity of light relative to an observer at rest is ----------

(10 x1 =10 Marks)

Part B

Answer *all* questions(Each question carries two marks)

1. Define pseudo force.
2. What are the conclusions do you draw from Michelson – Morley experiment?
3. Prove that conservative force is negative gradient of potential energy.
4. What is ether hypothesis?
5. Explain Fourier theorem. Mention one application.
6. Derive one dimensional wave equation.
7. List out the postulates of quantum mechanics.

(7 x 2= 14 Marks)

Part C

Answer *any three* questions(Each question carries four marks)

18. Show that a freely falling body undergo deviation due to coriolis force.
19. How does mass change with velocity? Show that 'c' is the ultimate speed of particles.
20. Show that curl of a conservative force is always zero.
21. Distinguish between harmonic oscillator and anharmonic oscillator.
22. Define central force. Show that angular momentum of a particle moving under central force is conserved.

(3 x4 = 12 Mark

Part D

Answer *any three* questions(Each question carries four marks)

23. A rocket is moving upward with an acceleration 3g. Calculate the effective weight of a man sitting in it, if his actual weight is 75Kg.
24. Consider two twins A & B, age 20 years. Twin B takes a round trip space voyage to a s at velocity v = 0.99c. According to those of us on earth the star is 40 light years away. What will be the ages of A & B when B finishes his trip.
25. Check whether the force $F= (y^2 - x^2)\, i + 3xy\, j$ is conservative or not.
26. Locate the centre of mass of a system of three particles of masses 1Kg,2Kg & 3Kg, placed at the corners of an equilateral triangle of 1m side.
27. A mass of 1.6 Kg extends a spring by 8cm from its unstretched position. The mass is replaced by a body of mass 50gm. Find the period of oscillation if the mass is pulled a released.

(3 x 4 = 12 Mar

Part E

Answer *any two* questions(Each question carries eight marks)

28. Derive the relativistic formula for variation of mass.
29. Give the basic principles of rocket propulsion. Hence derive an expression for final velocity of rocket.
30. Derive an expression for the velocity of longitudinal waves in gases. Discuss the Laplace's correction to Newton's formula.
31. Derive the time dependent Schrodinger equation of matter waves. Give the physical intrepretation of wave function.

(2 x 8=16 Mar