SECOND SEMESTER B.Sc. DEGREE EXAMINATION, JUNE 2016
(CUCBCSS – UG)
(Complementary Course: Physics)
CC15U PH2 C03 – Mechanics, Relativity, Waves and Oscillations
(2015 Admission)

Time: Three Hours   Maximum: 64 Marks

Section A (Answer all questions) (Each carries one mark)

For conservative forces the sum of kinetic energies and potential is -------------.

The velocity with which a rod will contract fifty percent along its length is--------------------.

The force which does not really act on the particle but appears due to the acceleration of the frame is----

The expression for relativistic momentum for a photon, P is ---------------------.

The maximum possible acceleration for a S H oscillator is -------------------.

The pressure variation in the case of a longitudinal progressive wave travelling through gas is ------------

The time dependent Schrodinger equation is ----------------------.

-----------------------is transmitted by a wave.

Eigen value of the operator $\frac{d}{dx}$ is 5 then corresponding Eigen function is -----------------.

0. A satellite is revolving round the earth, -------------------- is not conserved.   (10 x 1 mark=10 marks)

Section B (Answer all questions) (Each carries two marks)

. What is a centrifugal force? How does it affect the acceleration due to gravity?

. What is an anharmonic oscillator?

. What do you mean by relativistic time dilation?

. Explain the expression for time period of a loaded spring.

. Discuss the principle of Electron microscope.

. What is meant by Galilean transformation?

. Explain the difference between inertial frame and non inertial frame.   (7 x 2 marks =14 marks)

Section C (Answer any three questions) (Each carries four marks)

. What is Coriolis force? Show that the total Coriolis force acting on a body of mass m in a rotating frame is -2m ω×υ, where ω is the angular velocity of rotating frame and υ is the velocity of the body in rotating frame.

. Prove that the oscillation of a simple pendulum is simple harmonic.

20. Show that in the non-relativistic limit, the Lorentz transformations reduce to Galilean transformation.

21. State and explain Fourier theorem.

22. What are the postulates of quantum mechanics? $(3 \times 4 \text{ marks} = 12 \text{marks})$

Section D (Answer any three questions) (Each carries four marks)

23. A rod has a length of 1 m. It is moving in a space ship moving with a velocity 0.4 c relative to the earth. Calculate its length as measured by an observer a) on space ship b) on earth.

24. Two masses m_1 and m_2 are connected by a spring of length l. If the force constant of the spring is 10 N/m, calculate the frequency of oscillation. (m_1=0.01kg, m_2=0.09 kg and l=10cm).

25. Two particles of masses 1 kg and 2 kg have velocities ($7\hat{i} +4 \hat{j} -11 \hat{k}$) and ($4 \hat{i} - 8 \hat{j} + 4 \hat{k}$) m respectively at a particular instant. What are their velocities in the frame of reference moving with the centre of mass?

26. If the propagation constant of a wave is 280 per cm and its velocity is 400 m/s, calculate the wavelength and frequency.

27. Explain Einstein's mass energy equivalence. Give any one example. $(3 \times 4 \text{ marks} = 12 \text{marks})$

Section E (Answer any two questions) (Each carries eight marks)

28. Deduce the differential equation for the damped harmonic oscillator. Give its solution.

29. What are conservative and non-conservative forces? Explain potential energy curve, positions of equilibrium. What is the significance of parabolic potential well?

30. What are the basic postulates of wave mechanics? Derive Schrodinger's time dependent equation.

31. Derive the Lorentz transformation equations.

$(2 \times 8 \text{ marks} = 16 \text{ marks})$

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