16U314 (Pages: 2) Name: ……………………

Reg. No……………………

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2017

(Regular/Supplementary/Improvement)

(CUCBCSS – UG)

CC15U PH3 B05- MECHANICS

(Physics - Core Course)

(2015 Admission Onwards)

Time: Three Hours Maximum: 80 Marks

I .Answer ***all*** questions. Each question carries one mark (Answer in a word or phrase)

1. What is Frame of reference?
2. The region of constant potential in a potential energy curve is called-----------------------
3. The potential energy is given by $U = A + Bx + x^2$, the force constant is --------------------
4. Time symmetry leads to Law of conservation of ---------------
5. If the total energy of the particle is negative, but not minimum, then the path is -----------
6. Write down the relation between angular momentum and torque.
7. What is proper time?

Questions 8 to 10: State whether True or False

8. In Centre of Mass Frame, two colliding particles approaches as well as separate with equal and opposite momentum.
9. Foucault's pendulum provides a direct experimental evidence that earth is a non-inertial Frame.
10. A collision is said to be elastic if the kinetic energy is conserved.

(10 x1 = 10 marks)

II Answer ***all*** questions. Each question carries 2 marks. (Answer in two or three sentence)

11. What are generalized coordinates? What is the advantage of using them?
12. Two photons approach each other, what is their relative velocity?
13. Write down the expression for coriolis force and explain its symbols.
14. Distinguish between elastic collision and inelastic collision.
15. What is D' Alembert' s Principle?
16. Distinguish between Newtonian Mechanics and relativity.
17. What are the conclusions do you draw from Michelson-Morley experiment?

(7 x2 = 14 marks)

III. Answer ***any five*** questions. Each question carries 4 marks. (Answer in a paragraph)

18. Explain conservation Laws and symmetry properties.
19. Establish mathematically Einstein's mass energy relation $E = mc^2$
20. State the Law of conservation of angular momentum. Give one example of its application.
21. Deduce Law of conservation of momentum from Galilean principle of invariance.
22. Derive the Hamiltonian function from Lagrangian.
23. What is Orbital velocity of a satellite? Derive an expression for time period of a satellite.
24. Show that electrostatic force between two charges is conservative.

(5 x 4 = 20 marks)

IV. Answer any ***four*** questions. Each question carries 4 marks.

25. Estimate the potential energy of a mass of 1kg on the surface of earth assuming potential energy is zero at infinity. Given the radius of earth $=6.4\times10^6$m, mass of earth $=6\times10^{24}$kg.
26. The length of a spaceship is measured to be exactly half its proper length. What is the speed of space ship relative to the observers frame?
27. If earth suddenly contracts 1/3 of its present radius, by how much would the day be decreased?
28. A 2kg stone attached to a 1m long string makes 3 rev/s. Calculate the forces on the stone as measured in an inertial frame and in a frame rotating with the string.
29. Set up the Lagrangian of Simple pendulum and obtain equation of motion of the Pendulum.
30. A body of mass 1kg initially at rest explodes into three fragments of masses 1:1: 3. The two pieces of equal mass fly off perpendicular to each other with a speed of 30m/s each. What is the velocity of heavier fragment?
31. An electron and a positron practically at rest come together and annihilate each other. Calculate the energy released in MeV.

(4 x4 =16 marks)

V. Answer any two questions. Each question carries 10 marks.

32. What is the basic principles of a Rocket Propulsion. Derive an expression for final velocity of Rocket.
33. Derive an expression for the relativistic variation of mass with velocity.
34. Discuss a) work -energy theorem and energy function.
    b) Draw potential energy curve and explain stable and unstable equilibrium.
    c) Briefly explain Potential well.
35. State Kepler's Laws of Planetary motion and show how they can be deduced from Newton's Law of gravitation .

(10 x 2 =20 marks)

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