SUBJECT CODE : PH/AC/PM13

B.Sc. DEGREE EXAMINATION NOVEMBER 2009
BRANCH I - MATHEMATICS
FIRST SEMESTER

REG. No._____

COURSE   :   ALLIED – CORE
PAPER   :   PHYSICS FOR MATHEMATICS – I
TIME   :   30 MINS.   MAX. MARKS : 30

SECTION – A

TO BE ANSWERED IN THE QUESTION PAPER ITSELF

ANSWER ALL QUESTIONS: (30 x 1 = 30)

I   CHOOSE THE CORRECT ANSWERS:

1. Compound pendulum is used to determine
    a) mean acceleration due to gravity at the place   b) radius of gyration
    c) moment of inertia of the experimental rod   d) all of the above

2. Unaccelerated reference frame in uniform motion of translation relative to one
    another is called.
    a) intertial frames   b) non-inertial frames
    c) Cartesian frames   d) none of these

3. Special theory of relativity discusses with
    a) relative motion and not absolute motion
    b) absolute motion and not relative motion
    c) both absolute and relative motion
    d) neither absolute motion nor relative motion

4. If c is the velocity of light in vacuum, which of the following equation is correct with
    regard to relativity
    a) c + c = 2c   b) c – c = 0
    c) c x c = c^2 d) c + c = c

5. The frequency of oscillation of bifiliar pendulum about a vertical axis passing through
    its C.G. is

    a) $\gamma = \dfrac{1}{2\pi}\sqrt{\dfrac{mga^2}{Il}}$ b) $\gamma = \dfrac{1}{2\pi}\sqrt{\dfrac{mg^2a}{Il}}$ c) $\gamma = 2\pi\sqrt{\dfrac{mga^2}{Il}}$ d) $\gamma = 2\pi\sqrt{\dfrac{mg^2a}{Il}}$

6. Which of the following material is most elastic?
    a) steel   b) glass
    c) rubber   d) water

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7. The dimensional formula of modulus of elasticity is
   a) $ML^{-2}T^{-1}$
   b) $ML^{-2}T^{-2}$
   c) $ML^{-1}T^{-2}$
   d) MLT^{-2}

8. The work done per unit volume of the wire is
   a) ½ x stress x strain
   b) stress x strain
   c) ½ x stress / strain
   d) stress / strain

9. Lead shots are made spherical by using the property of
   a) viscosity
   b) gravity
   c) elasticity
   d) surface tension

10. The disorderly motion of the liquid takes place when the pressure difference between the ends of the tube is
    a) large
    b) small
    c) zero
    d) infinitesimal

11. Bi-cycle tyre bursts very often during hot sunny day, it is explained by
    a) Zeroth law of thermodynamics
    b) First law of thermodynamics
    c) Second law of thermodynamics
    d) Third law of thermodynamics

12. Entropy is a measure of
    a) perfect order   b) available energy   c) unavailable d) disorder

13. Which is regarded as temperature of un-attainability?
    a) 0° C
    b) 0° K
    c) -273° K
    d) none

14. If the velocity of sound at 0° c is 330 ms^{-1}, the wave-length of ultrasonic wave of frequency 330 KHz is
    a) 1 mm
    b) 1 cm
    c) 1 m
    d) 1 km

15. In piezo electric method, the ultrasonic frequencies as high as
    a) 500 MHz can be generated
    b) 600 MHz can be generated
    c) 750 MHz can be generated
    d) 250 MHz can be generated

II   FILL IN THE BLANKS:

16. The unit of entropy _____

17. Ultrasonics are _____ sound waves

18. The unit of surface tension is _____

19. Galilean transformation equation from S to S^{1} frame is X^{1} = _____

20. In Lorentz transformation, the velocity of light is _____

III   STATE WHETHER TRUE OR FALSE:

21. There is no change of entropy in all reversible adiabatic process.

22. The differential form of First law of thermodynamics is dU = dQ + dW.

23. Strain produced in a object is a dimensional less quantity but is a vector quantity.

24. Ultrasonic waves cannot kill bacteria but however kills humans.

25. The critical velocity decides whether the flow of liquid is turbulent or streamline.

IV   ANSWER BRIEFLY:

26. What is time dilation?

27. Define surface Tension.

28. State the Third Law of thermodynamics.

29. What is a bifilar pendulum?

30. Define critical velocity.

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SECTION – B
ANSWER ANY FIVE QUESTIONS: **(5 x 6 = 30)**

1. Using Lorentz transformation equations, explain time dilation

2. At what speed should a clock be moved so that it may appear to lose 1 minute in each hour?

3. Calculate the change in entropy when 5 kg of water at 100° C is converted into steam at the same temperature.

4. A steel bar is suspended in a horizontal position by a vertical wire attached to its center. A horizontal torque of moment 5 Nm twists the bar horizontally through an angle 12° . When the bar is released it oscillates like a torsion pendulum with a period of 0.5 s. Determine the moment of Inertia.

5. Show that for values of v << c. Lorentz transformation reduces to the Galilean transformation.

6. 100 drops of water falling down a tube of external diameter 3.5 mm are collected under coconut oil of specific gravity 0.8. Calculate the interfacial surface tension between water and oil if the water collected weighs 12.35 gm.

7. Define stream line flow. Derive Euler's equation of continuity of flow.

SECTION – C
ANSWER ANY TWO QUESTIONS: **(2 x 20 = 40)**

8. Derive the Lorentz space – time transformation.

9. Explain how ultrasonic waves are produced by piezo – electric oscillator. Discuss the applications of ultrasonics.

10. Explain the term bending moment. Derive the expression for the bending – moment of a thin uniform bar of rectangular cross –section.

11. Describe the drop-weight method to determine the surface tension of a liquid. Discuss the variation of surface tension with temperature.

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