18-12

MAR THOMA RESIDENTIAL SCHOOL THIRUVALLA

Class: XI

SECOND TERMINAL EXAMNATION

Marks: 70

PHYSICS

Time: 3 hrs

(Candidates are allowed additional 15 minutes for only reading the paper. They must NOT start writing during this time.)

All questions are compulsory.

SECTION A

QUESTION 1 (1*12=12)

A. (i) Which of the following is not a basic force.

(a) Gravitational force (b) Nuclear force (c) Electromagnetic force (d) Elastic force

(ii) The coefficient of restitution for perfectly elastic collision is

(a) 1 (b) ½ (c) 0 (d) -1

(iii) A body is projected with an initial velocity of $10\sqrt{3}$ ms^{-1} making an angle of 30^0 with the horizontal. The velocity of the particle at the highest point of trajectory is

(a) 15m/s (b) $5\sqrt{3}$m/s (c) 0 (d) $10\sqrt{3}$m

(iv) The S I unit of compressibility is

a) Nm^{-2} b) $N^{-1}m^{-2}$ c) $N^{-1}m^{2}$ d) Nm^{2}

(v) The dimensional formula for coefficient of viscosity is

a) MLT^{2} b) MLT^{-1} C) $ML^{-1}T^{-1}$ d) MLT^{-1}

B. (i) State impulse- momentum theorem.

(ii) Define angle of repose . Write the relation connecting angle of repose and coefficient of friction.

(iii) A light body and a heavy body have the same momentum. Which one has greater kinetic energy? Explain.

iv) Car tyres are made with synthetic rubbers .why?

v) Why is mercury used in barometers?

vi) Glass windows may be broken by far away explosion?

vii) A wire is fixed at the upper end stretches by a length l by applying a force F. What is the work done in stretching the wire?

SECTION B

QUESTION 2

(i) Define time of flight and horizontal range of a projectile.

(ii) Find the angle of projection for which the maximum height and horizontal range are equal. (2)

QUESTION 3

A force $\vec{F}=3\hat{i}+4\hat{j}-\hat{k}$ displaces a body through $\vec{S}=2\hat{i}-3\hat{j}-4\hat{k}$.Calculate the work done by the force. (2)

QUESTION 4

Distinguish between conservative and non conservative forces. Give two examples for each.

QUESTION 5

(a) State the laws of static friction.

OR

(b) Friction is a necessary evil. Comment on it.

QUESTION 6

(i) State Newton's law of gravitation.

(ii)What will be the acceleration due to gravity on a planet whose mass is 8 times that of earth and whose radius is twice that of earth? (g on earth is $9.8 m/s^2$).

QUESTION 7

(i)Define elastic potential energy. Write the expression for it.

(ii)Draw a graph showing the variation of force applied and the elongation of spring. What does the slope of the graph represent?

QUESTION 8

i) Draw stress –strain curve for a loaded wire.Mark

a)Hooke's limit b)Proportional limit

c)Yield point c) Breaking point

QUESTION 9

(i) What is elastic hysteresis?

(ii) Derive an expression for energy stored in a wire due to an extension?

QUESTION 10

(i) What is meant by simple harmonic motion?

(ii) Write any two examples of simple harmonic motion .Write its differential fo

QUESTION 11

(i) State law of equipartion of energy .

(ii) Using the law of equipartion of energy determine C_V and U for specific heat water.

OR

(i) Using kinetic theory prove that average kinetic energy of a gas molecule is directly proportional to the absolute temperature

QUESTION 12

(i) Atmosphere pressure is nearly 100 KPa. How large the force does the air in a room exert on the inside of a window pan that is 40cm * 80 cm ?

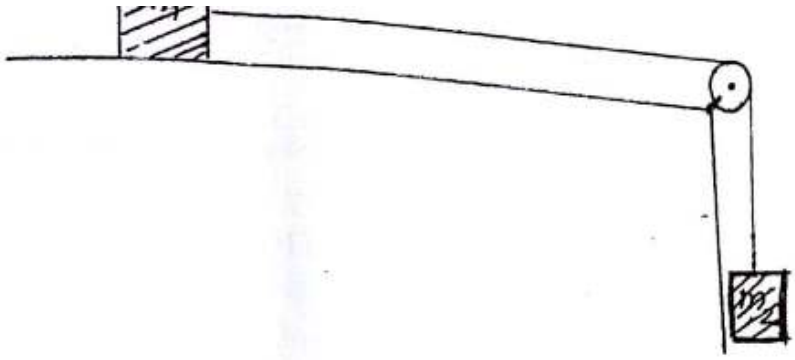
QUESTION 13

SECTION C

(a) A body of mass m_1=10kg is placed on a smooth horizontal plane. It is connected to a string which passes over a frictionless pulley and carries at the other end a body m_2=5kg.

(I)What acceleration will be produced in the bodies?

(ii) What will be the tension in the string? ($g=9.8 m/s^2$)



QUESTION 14

(a) State and prove the law of conservation of linear momentum using Newton's third law of motion.

OR

(b) A lift of mass 400kg is hung by a wire. Calculate the tension in the wire when the lift is (i) at rest (ii) moving upwards with a constant velocity of 10m/s (iii) moving upwards with an acceleration of $2m/s^2$.($g=10m/s^2$). (3)

QUESTION 15

A bucket containing water is revolved fast in a vertical plane, the water does not fall even when the bucket is completely inverted. Obtain the expressions for minimum velocities at the lowest and highest points of the circular path. (3)

QUESTION 16

(a) Derive an expression for the kinetic energy and potential energy of a simple harmonic motion. Hence show that the total energy is conserved with the help of graph?

OR

b)Water is filled in a flask upto a height of 20 cm.The bottom of the flask is circular with radius 10 cm. If the atmosphere pressure is $1.013*10^5$ Pa,find the force exerted by the water on the bottom.Take $g=10m/s^2$ and density of water=$1000kg/m^3$. (3)

QUESTION 17

Draw graphical representation of simple harmonic motion . Showing the

a) Displacement –time curve

b) Velocity –time curve

c)Acceleration-time curve. (3)

QUESTION 18

(i) Show that the pressure exerted by a liquid column is directly proportional to its height?

(ii) Pressure of a gas is a closed cylinder is expressed in the following way :

$P = P_a + h\rho g$.

Derive the expressions for:

a)Absolute pressure of the gas.

b) Gauge pressure of the gas. (3)

QUESTION 19

(i) What is elastic after effect?

(ii) Explain why should the beam used in the construction of bridges have
depth?

(iii) Derive the expression for the velocity of the particle executing Simple
motion?

SECTION D

Question 20

(a)(i)What do you mean by banking of roads?

(ii) With the help of a diagram, obtain the expression for the maximum possible velocity of a car on a banked road.

(i) Calculate the maximum speed at which a car can turn a curve of radi a level road if the coefficient of friction between the tyres and the roa ($g=10m/s^2$)

OR

(b) Prove that in head on elastic collision, the relative velocity after collision and opposite to the relative velocity before collision. Hence obtain the ex for velocities after collision.

QUESTION 21

(a) (i) Obtain the formula for the variation of acceleration due to gravity at a 'h' above the surface of earth.

(ii)What will be the acceleration due to gravity at a depth

(1) half the radius of earth.

(2) Equal to the radius of earth.

OR

b) i) Define buoyancy and viscosity?

ii) State and prove Archimedes's principle?

iii)A gas bubble of diameter 2 cm rises steadily at the rate of 2.5 mm/s th solution of density $2.25g/cm^3$ .Calculate the coefficient of viscosity of liquid. Neglect the density of the gas .

QUESTION 22

a) i)What is simple pendulum?

ii) Show that the motion executed by the bob of the pendulum in simple ha motion. Derive an expression for its time period?

iii)A body oscillates with SHM according to the equation,

$x=(5.0m)\cos((2\pi f \text{ rad } s^{-1})t+\pi/4)$

At t=1.5s,Calculate a)displacement b) speed c)acceleration of the body

OR

b)i) Define average speed, mean square speed and most probable speed?

ii) Derive an expression for the pressure exerted by an ideal gas on the basis kinetic theory?

ii)Using the law of equipartion of energy, derive the relation between the de freedom f and the specific heat ratio Υ of a polyatomic gas.