FWC

G.C.E. A/L Examination June - 2016

Conducted by Field Work Centre, Thondaimanaru
In Collaboration with
Zonal Department of Education Jaffna.

Grade :- 13 (2016)	Physics - II	*Three :- Three hours*

Part - II A

Structured Essay

Answer all four question on this paper itself

1) .

a) When a rigid object is taken far away from the Earth's surface, will there be a change in its center of gravity and center of mass?

Center of gravity – .....

Center of mass – .....

b) Figure (I) shows a uniform cylinder of length l and diameter d. Denote the centre of gravity G, of this cylinder.

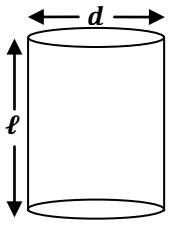

Fig - I

c) The cylinder is kept on a rough surface. The surface is slowly inclined. Consider that slipping does not occur.

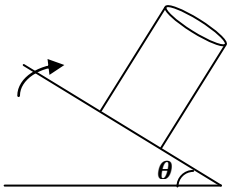

Fig - II

i) Figure (II) shows the position when the cylinder is about to tilt. Draw the line of action of gravitational force at this instant.

ii) Find θ in terms of l and d, for the instant when the cylinder tilts.

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d) The leaning tower of Pisa, shown in figure (III) can be roughly considered as a cylinder. The height of this tower is 56m and the diameter of its base is 16m. This tower is gradually approaching a state which will cause it to fall. Upon reaching which value of θ will this tower fall?

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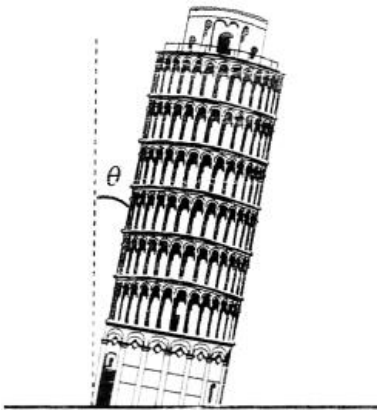


Fig - III

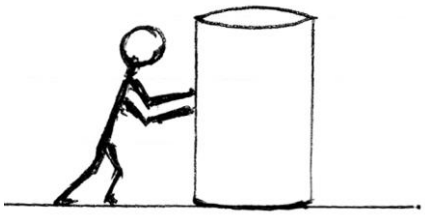
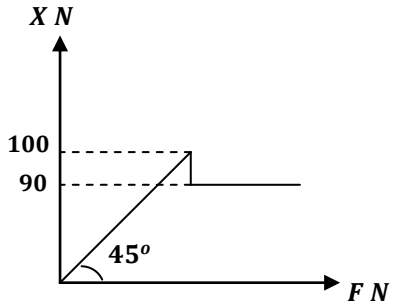
e) 

Fig - IV

Figure (IV) shows a man horizontally pushing a 40kg cylinder placed on a rough, horizontal surface.

i) Denote the horizontal forces acting on the cylinder and man, separately on the figures.

ii) The graph between the force, F, applied to the cylinder by man and the frictional force, X, acting on the cylinder, was plotted as shown below.



Find the coefficients of static and dynamic friction between the cylinder and the surface.

Coefficient of static friction – .....

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Coefficient of dynamic friction – .....

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iii) For the man to continuously push the cylinder without slipping, what should be his least weight? (Consider that the coefficient of friction between the man's legs and the surface is 0.2, and that the cylinder moves with a constant velocity)

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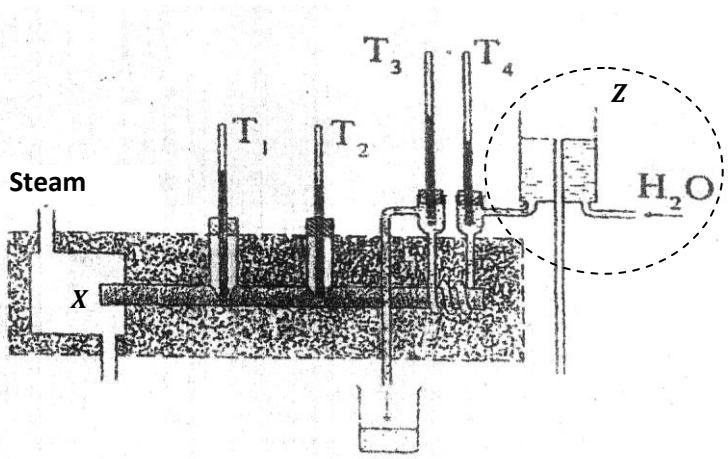
2)



a) Why is a steam generator used to heat the end X?

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b) Should steam be sent in from above or below? Give reason.

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c) Holes are made in the rod, a little mercury is poured into them, and then the thermometers are kept. What is the reason for this?

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d) Which property of mercury enabled it to be chosen for the action mentioned in part (c)?

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e) What is the name of the part denoted by Z (shown within broken lines)? What is its use?

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f) Why is cool water sent in the opposite direction to the heat flow?

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g) The cool water tube is removed and an ice-water mixture is attached at that point. At stable state, the ice dissolves at a rate of $30g$ per minute. (The latent heat of fusion of ice is $3 \times 10^5\ Jkg^{-1}$) The readings of the thermometers T_1 and T_2 are 86^oC and 61^oC, respectively. The distance between these two thermometers is $5cm$. The cross sectional area of the rod is $180\ cm^2$. Find the thermal conductivity of the material of the rod. (Neglect the heat loss to the environment)

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3)

a) What type of waves forms on a violin string? To which type do the sound waves reaching our ears belong?

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b) Even though the same not is played on a violin and a flute, the ear can distinguish them separately. Which property of sound is identified here?

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c) What causes this difference?

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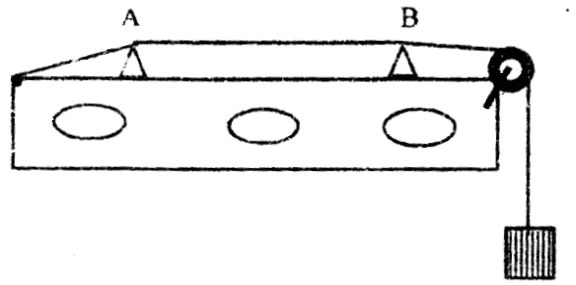

d) The figure shows a sonometer. The center point of the wire AB is vertically plucked. Is the wave formed on the wire longitudinal or transverse?

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e) How does the air in the sonometer box gain the energy to vibrate?

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f) On the figure given below, draw the wave form of a wave that will have the maximum possible wavelength on wire AB.

g) If a tuning fork has been given to you, explain how you will make the wire vibrate without plucking it.

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h) Give the equation for the wire's fundamental frequency, f, in terms of tension (T), length (l), and mass per unit length of the wire (m).

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i) If the mass of the wire $m = 1gm^{-1}$, tension in the wire $T = 40N$ and the fundamental frequency of the wire $f = 500Hz$, then find the length l of the wire.

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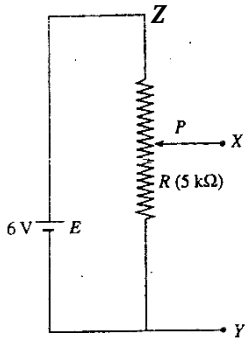
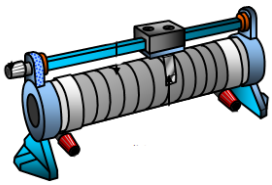
4) The potential divider shown in the figure supplies varying potential (V_{XY}) across its terminals X and Y. R is a 5kΩ variable resistor with a sliding contact P. E is a 6V electric cell with negligible internal resistance.



a) To verify Ohm's law by using the above potential divider, the following equipments are given. An ammeter with negligible internal resistance, a voltmeter with 10MΩ internal resistance and a 60Ω resistor.

i) Complete the circuit using the equipments given above, and denote the positive terminals of the ammeter and voltmeter using the (+) symbol.

ii) A rheostat is given instead of the 5kΩ resistor. Denote the terminals of the rheostat as X, Y and Z in the given space.



iii) Suggest a suitable value for the full scale deflection of the ammeter.

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iv) What is the advantage of using an ammeter which has the full scale deflection that you mentioned above?

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v) Draw the rough sketch of the graph that you would expect from this practical.

vi) Will there be any change in the value calculated for R, if the internal resistance of the ammeter is not zero? Explain.

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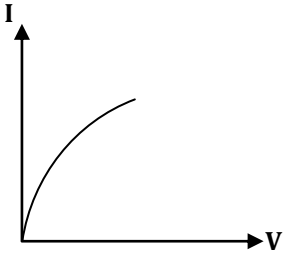
vii) If the ammeter has internal resistance, draw the rough sketch of the graph you would expect in the same graph, and mark it as A_1.

b) If a torch bulb was used instead of the 60Ω resistor, the given $V\ vs\ I$ graph was obtained.



i) What is the reason for the $I - V$ characteristics of the filament bulb to deviate from the Ohm's law?

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ii) A torch bulb has been rated as 6V, 0.36W. When the bulb operates as rated, calculate the resistance of the filament.

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iii) If a semiconductor is used instead of a filament, draw the $I - V$ curve for this situation on the same graph and mark it as A_2.