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CERTIFICATE EXAMINATIONS  
for  
DAY VOCATIONAL COURSES, 1966

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MECHANICS AND HEAT

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WEDNESDAY, 15th JUNE - 2.30 to 4.30 p.m.

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INSTRUCTIONS

Four questions to be attempted.  
All questions carry equal marks.  
Sketches should be neat and clear.

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1. Describe, with diagram, an experiment to show the linear expansion of a metal rod when heated.  
Define coefficient of linear expansion. A metal rod 70 cm. long at  $15^{\circ}\text{C}$ . is heated to  $75^{\circ}\text{C}$ . If the coefficient of linear expansion of the metal is  $0.000017$ , find the increase in the length of the rod.
2. (a) Draw a diagram of a domestic hot water supply system and explain how it works.  
(b) Sketch a Thermos flask and explain how it can keep a liquid warm for a long period of time.
3. Answer each of the following:-
  - (i) Why must the bore of a thermometer be uniform ?
  - (ii) Why does the temperature of a liquid boiling in an open vessel remain constant although heat is being supplied ?
  - (iii) How does the addition of anti-freeze to the water in a car radiator prevent the water from freezing ?
  - (iv) How would you show that water is a poor conductor of heat ?
  - (v) The maximum density of water occurs at  $4^{\circ}\text{C}$ . How does this explain why ponds and rivers freeze downwards from the surface ?
4. State the law of the spiral spring and describe an experiment to verify it.  
A spiral spring is 25 cm. long when a load of 10 gr. is suspended from it and 30 cm. long when the load is increased to 60 gr. What is the length of the spring when unloaded ?
5. State the Triangle of Forces.  
A load of 30 lbs. is suspended by two cords, 4 ft. and 6 ft. long from two points at the same level and 8 ft. apart. Find the tension or pull in each cord.
6. What do you understand by the terms (a) Work, (b) Potential Energy, (c) Kinetic Energy ? How is work measured ? Give examples of potential energy and kinetic energy.  
An effort of 40 lbs. will raise a load of 840 lbs. in a lifting machine. If the efficiency of the machine is 75% what is its velocity ratio ? When the load is raised a height of 9 ft. calculate (i) the distance the effort moves, (ii) the work done by the effort.
7. Define Moment of a Force.  
A uniform horizontal beam, AB, 15 ft. long weighing 100 lbs. rests on two supports C and D. C is 2 ft. from A and D is 3 ft. from B. Loads of 80 lbs. and 120 lbs. are suspended from A and B respectively. Determine the reactions of the supports.