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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

Second Semester

Electrical and Electronics Engineering

CE 1161 — FLUID AND SOLID MECHANICS

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Poisson's ratio.

2. What are different types of Beams?

3. In a tensile test, a test piece of 25 mm diameter 200 mm gauge length is stretched by 0.0975 mm under a pull of 50 kN. In torsion test, the same rod is twisted by 0.025 radians over a length of 200 mm when a torque of 400 kNm was applied. Find the Young's modules.

4. Differentiate between closed and open coiled helical springs.

5. State Newton's law of viscosity. How are fluids classified based on this law?

6. Calculate Reynolds number of oil of specific gravity 0.92 and viscosity 0.03 poise moving at the rate of 2500 lit/s through a 1.2 m diameter pipe.

7. List the various minor losses encountered in pipe flow.

8. Differentiate between an hydraulic gradient line and energy gradient line.

9. What is meant by reaction turbine?

10. Define cavitation.

PART B — (5 × 16 = 80 marks)

11. (i) Show that deformation due to suddenly applied load is twice as great as that restrained when load is applied gradually. (8)

(ii) The maximum stress produced by a pull in a bar of length 1 m is 150 MN/m^2. The length is show in figure. Calculate the strain energy stored in the bar if E = 200 GN/m^2, section 1, 2, and 3 have a cross-section area of 200 mm^2, 100 mm^2 and 200 mm^2 respectively.

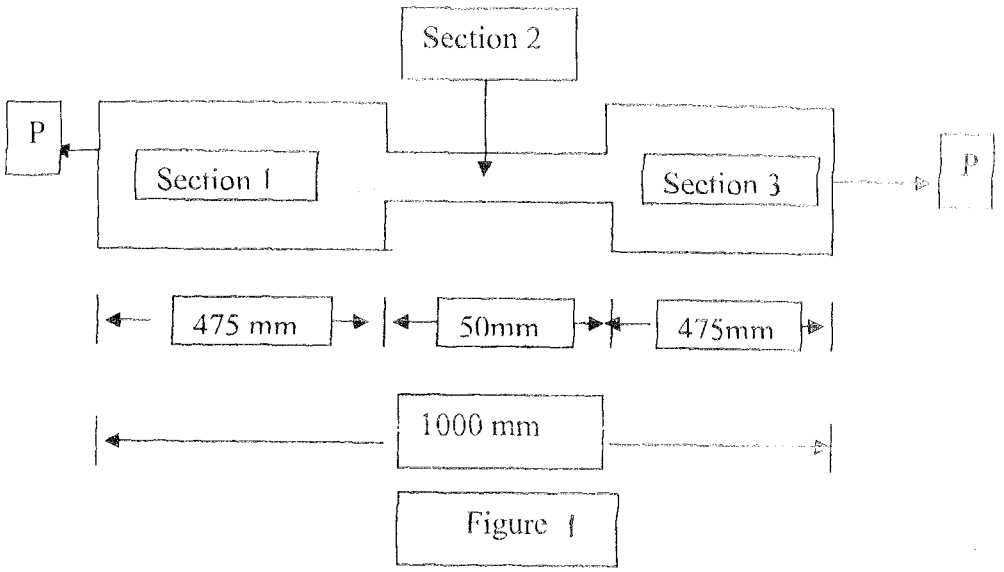

Figure 1

12. (a) (i) A solid shaft is to transmit 400 kW at 100 rpm. If the shear stress is not to exceed 80 N/mm^2, find the diameter of the shaft. If this shaft were to be replaced by a hollow shaft of same material and length with an internal diameter of 0.6 times the external diameter what percentage saving in weight is possible? (10)

(ii) What are Leaf spring? Where are they commonly used? (6)

Or

(b) Derive an expression for proof load and deflection for a semi elliptic leaf spring.

13. (a) A concrete dam of trapezoidal section having water on vertical face is 12 m high. The base of the dam is 8 meters wide and top 2 meters wide. Find the resultant thrust on the base per metre length of dam, and the point where it intersects the base. Take the specific weight of masonry as 240 kN/m^3 and water level coinciding with the top of the dam.

Or

(b) (i) Define the term capillarity. (4)

(ii) Derive an expression to estimate capillary rise of water in glass tube. (6)

(iii) Write a brief note on capillary inversion. (6)

14. (a) (i) With a neat sketch explain the working of a venturimeter. (8)

(ii) Derive an expression to find discharge using a venturimeter. (8)

Or

(b) In a pipe of diameter 350 mm, length 75 m water is flowing at a velocity of 2.8 m/s. Find the head lost due to friction using :

(i) Darcy–Weisbach formula; (8)

(ii) Chezy's formula for which C = 55. (8)

Assume kinematic viscosity of water as 0.012 stoke.

15. (a) A reaction turbine runner of 0.5 m diameter has been designed to work under a given head and power output. The velocity of flow is 6 m/s and the inlet blade angle has been computed at 600 for rpm for the generator, what change may have to be effected in the inlet blade angle?

Or

(b) (i) Explain the working of a reciprocating pump with a neat sketch. (8)

(ii) Write briefly about characteristic curve of a pump, what are its uses. (8)
