



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JANUARY 2010 SESSION

SUBJECT CODE : FMD 20102
SUBJECT TITLE : STRENGTH OF MATERIALS
LEVEL : DIPLOMA
TIME / DURATION : 9.00am – ^{11.30am}~~11.00am~~
(2.5 HOURS)
DATE : 07 MAY 2010

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. Please write your answers on the answer booklet provided.
4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
5. This questions paper consists of TWO (2) sections. Section A and B. Answer ALL questions in section A. For sections B, answer TWO (2) questions only.
6. Answer all questions in English.

THERE ARE 3 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total : 60 marks)

INSTRUCTIONS: Answer ALL three (3) questions.

Please use the answer booklet provided.

Question 1

Explain the following mechanical properties by using a simple example:-

- (a) Brittle materials
- (b) Torsional shear stress
- (c) Modulus of Rigidity
- (d) Coefficient of linear thermal expansion

(20 marks)

Question 2

A rectangular bar 5 cm by 8 cm and 2000 mm long is loaded with a compressive axial force of 1 GN. Taking $E = 300 \text{ GPa}$ and $\mu = 0.33$, determine the values of the following:-

- (a) Stress (6 marks)
- (b) Strain (7 marks)
- (c) % change in cross-sectional area (7 marks)

Question 3

A steel circular punch press 5 m in diameter used for industrial applications exerts a 25 GN force on a 50 cm thick, 10 m by 10 m brass reinforced plate. Assuming the ultimate tensile strength of the plate is 25 GPa and its modulus of rigidity is 300 GPa, calculate the:-

- (a) shear stress (8 marks)
- (b) strain (8 marks)
- (c) give some reasonable comments on your answers from part (a) and (b). (4 marks)

SECTION B (Total : 40 marks)

INSTRUCTIONS: Answer only TWO (2) questions.

Please use the answer booklet provided.

Question 4

Assume that two rods (steel, aluminum) are rigidly fixed together and further constrained between two concrete walls. Both the rods initially have a temperature of 25 °C. The rods then undergo a temperature decrease to 7 °C. Note that both the rods have different values of cross-sectional area, length, Coefficient of linear thermal expansion and Modulus of Elasticity respectively as follows:-

Steel :- 1.55 m², 10 m, 9 x 10⁻⁶/°C, 22 x 10⁶ N/m²
Aluminum :- 0.85 m², 7 m, 13 x 10⁻⁶/°C, 18 x 10⁶ N/m²

- (a) Find the thermal strain in both the rods. (8 marks)
- (b) Calculate the force exerted by the rods on the concrete walls. (12 marks)

Question 5

A hollow circular copper shaft is 500 cm long and has an inner and outer diameter of 60 cm and 75 cm respectively. The shaft is loaded with a 270 MN.m torque. Determine the:-

- (a) torsional shearing stress (8 marks)
- (b) outer diameter needed for a 600 MN.m torque assuming all the other parameters of the shaft are the same. (12 marks)

Question 6

The 17 m length beam in Figure 1 is subjected to a few loads as shown below.

- (a) Determine the reaction forces at the supports. (6 marks)
- (b) Draw the shear force diagram for the beam. (7 marks)
- (c) Draw the bending moment diagram for the beam. (7 marks)

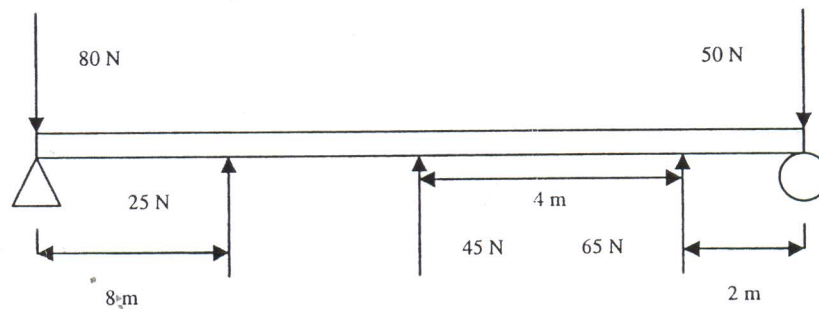


Figure 1

END OF QUESTION