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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

JULY 2010 SESSION

SUBJECT CODE	:	FMB 16303
SUBJECT TITLE	:	STRENGTH OF MATERIALS
LEVEL	:	BACHELOR
TIME / DURATION	:	9.00am – 11.30am (2.5 HOURS)
DATE	:	12 NOVEMBER 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 question paper consists of TWO (2) sections. Section A and B. Answer all questions in Section A. For Section B, answer three (3) questions only.
6. Answer all questions in English.

THERE ARE 3 PAGES OF QUESTIONS AND 1 PAGE OF FORMULA, EXCLUDING THIS PAGE.

SECTION A (Total: 40 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

A 200-mm long rod has a diameter of 20 mm. If an axial tensile load of 150 kN is applied, determine its change in length. Take Young's Modulus, E = 200 GPa.

(10 marks)

Question 2

Determine the absolute maximum shear stress in the shaft shown in Fig 1. JG is constant.

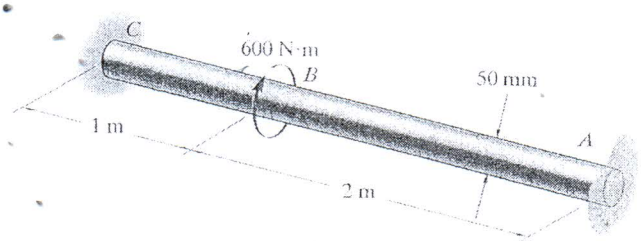

Fig 1

(10 marks)

Question 3

Determine the absolute maximum bending stress in the beam in Fig 2.

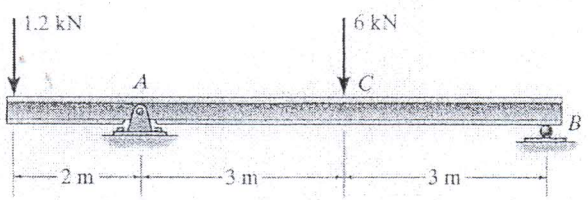

Fig 2

(10 marks)

Question 4

A 100-mm long rod has a diameter of 15 mm. If an axial load of 10 kN is applied to it, determine its change in diameter. Take Young's modulus, E= 70 GPa and Poisson's ratio, ν= 0.35.

(10 marks)

SECTION B (Total: 60 marks)

INSTRUCTION: Answer THREE (3) questions only.
Please use the answer booklet provided.

Question 5

The two rods in Fig 3 support the vertical force of P = 30 kN. Determine the diameter of rod AB if the allowable tensile stress for the material is σ_{allow} = 150 MPa.

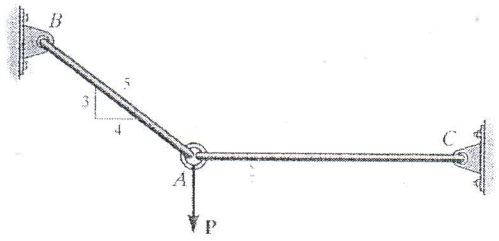

Fig 3

(20 marks)

Question 6

The beam in Fig 4 is supported by a pin at A and a link BC. Determine the resultant internal shear in the beam at D.

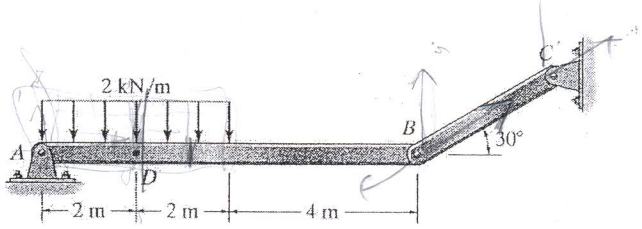

Fig 4

(20 marks)

Question 7

Determine the shear stress in the beam at point A , which is located at the top of the web as shown in Fig 5.

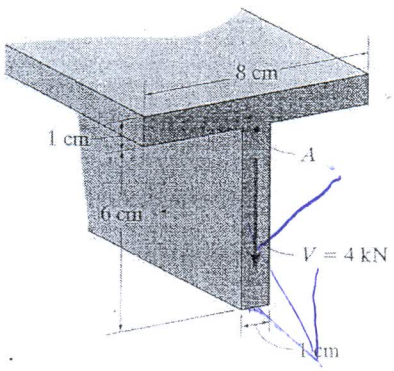

Fig 5

(20 marks)

Question 8

The column shown in Fig 6 is constructed from concrete and six steel reinforcing rods. If it is subjected to an axial force of 100 kN, determine the force supported by the concrete. Each rod has a diameter of 20 mm. Take E for concrete 30 GPa and E for steel 210 GPa.

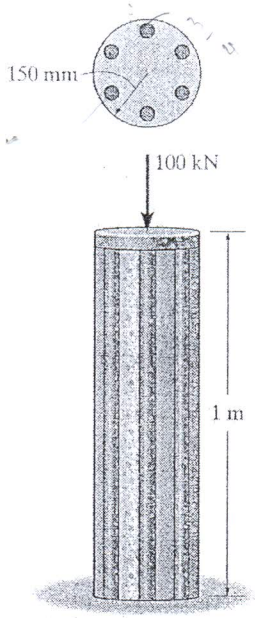

Fig 6

(20 marks)

END OF QUESTION

Formulae

$$\delta = \frac{PL}{AE}$$

$$\sigma = \frac{F}{A}$$

$$E = \frac{\sigma}{\varepsilon}$$

$$\frac{T}{J} = \frac{\tau}{c} = \frac{G\theta}{L}$$

Solid Shaft, $J = \frac{\pi}{2} c^4$

Tubular Shaft, $J = \frac{\pi}{2}(c_2^4 - c_1^4)$

Bending Stress, $\sigma = \frac{Mc}{I}$

Moment of Inertia, $I = \frac{1}{12} bh^3$

Centroid, $\bar{y} = \frac{\sum yA}{\sum A}$

$I = \sum(\bar{I} + Ad^2)$