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CONFIDENTIAL

SET A

UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION

SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FVB21503**
SUBJECT TITLE	:	**ENGINEERING SCIENCE 2**
LEVEL	:	**BACHELOR**
TIME / DURATION	:	**3.30 PM – 6.00 PM (2.5 HOURS)**
DATE	:	**08 JANUARY 2015**

INSTRUCTIONS TO CANDIDATES

1. **This is an OPEN BOOK examination.**
2. **Please read the instructions given in the question paper CAREFULLY.**
3. **This question paper is printed on both sides of the paper.**
4. **Please write your answers in the answer booklet provided.**
5. **Answer should be written in blue or black ink except for sketching, graphic and illustration.**
6. **This question paper consists of (6) questions. Answer FIVE (5) questions only.**

THERE ARE 5 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer FIVE (5) questions only.

Total Marks = 100

Question 1

(a) The force F acting on the frame shown in *Figure 1* has a magnitude of 500 N and is to be resolved into two components acting along members AB and AC. Determine the angle θ, measured below the horizontal, so that the component F_{AC} is directed from A toward C and has magnitude of 400N.

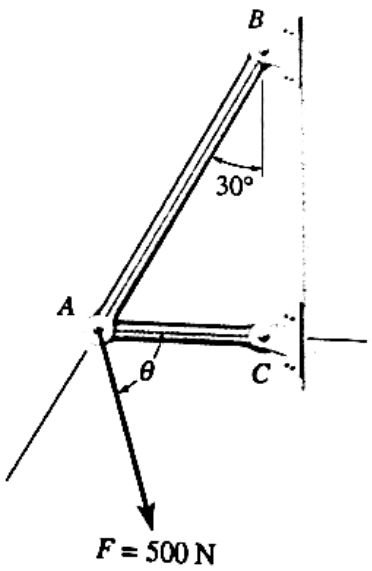

Figure 1

(5 marks)

(b) The granular material exerts the distributed loading on the beam as shown in *Figure 2*. Determine the magnitude and location of the equivalent resultant of this load.

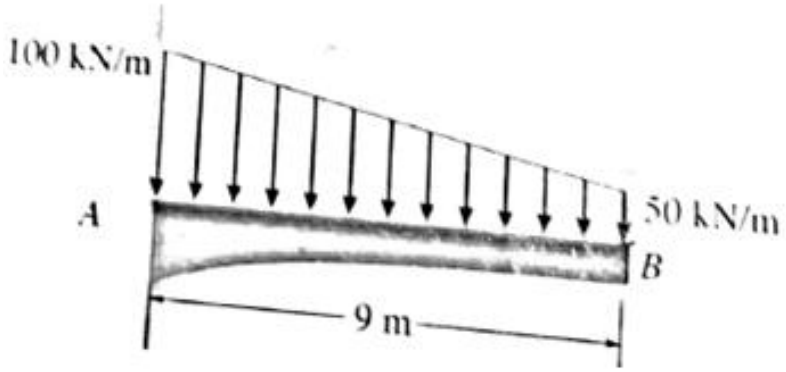

Figure 2 (15 marks)

Question 2

(a) Determine the resultant moment of four forces acting on the rod shown in *Figure 3* of point O.

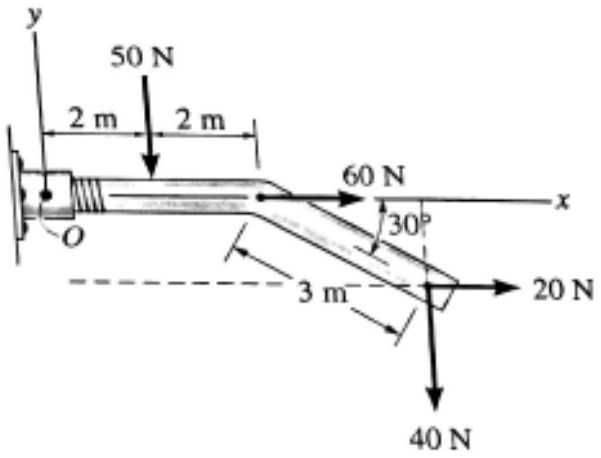

Figure 3

(5 marks)

(b) Consider the loaded truss structure, as shown in Figure 4, which is supported by a pin at joint ***A*** and a roller at joint ***I***.

(i) Determine the reactions at ***A*** and ***I***.

(ii) Using method of inspection, identify the correct zero-force members.

(iii) Use the method of sections to calculate the force in members ***BC*** and ***NC***.

(iv) Use the method of joints to calculate the force in members ***HI*** and ***IJ***.

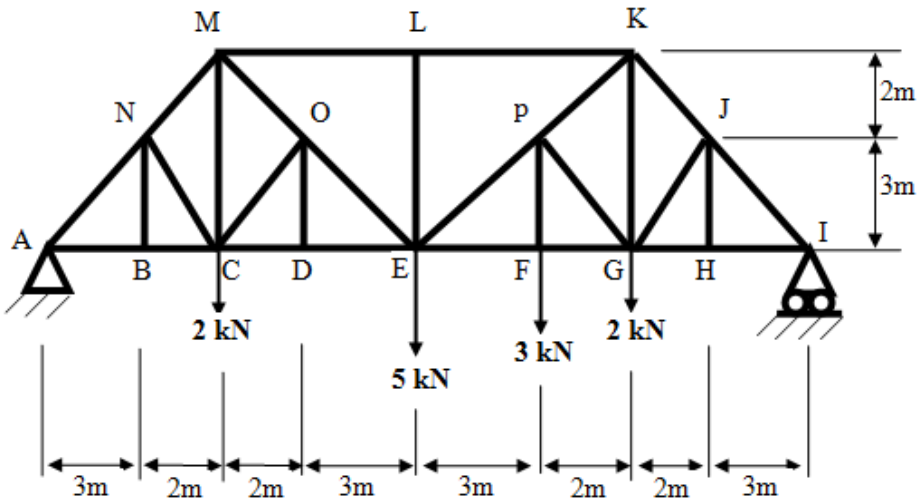

Figure 4 (15 marks)

Question 3

(a) A uniform wheel of 600 mm diameter, weighing 5 kN rests against a rigid rectangular block of 150 mm height as shown in *Figure 5*. Determine the least pull, through the center of the wheel, required just to turn the wheel over the corner of the block. Also determine the reaction on the block. Take all the surfaces to be smooth.

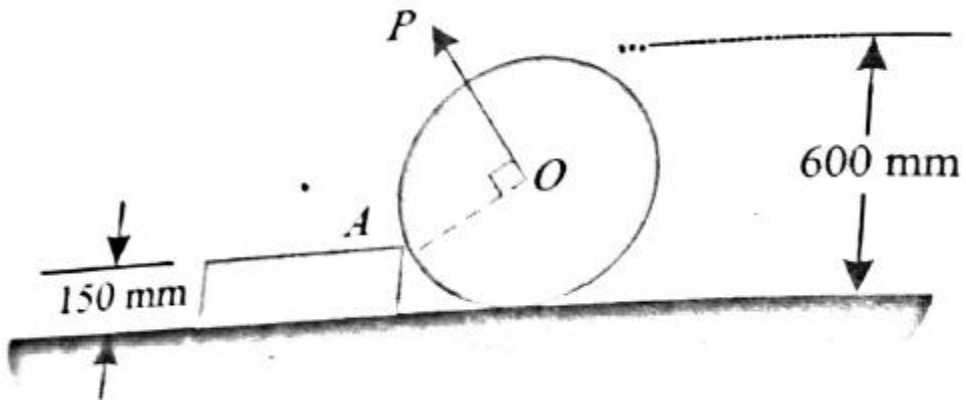

Figure 5

(5 marks)

(b) A machine component of length 2.5 meters and height 1 meter is carried upstairs by two men, who hold it by the front and back edges of its lower face. If the machine component is inclined at 30^0 to the horizontal and weighs 100 N, calculate how much of the weight each man supports.

(15 marks)

Question 4

(a) A simply supported beam of span 4.5 m is loaded as shown in *Figure 6*. Determine the support reaction at A and B.

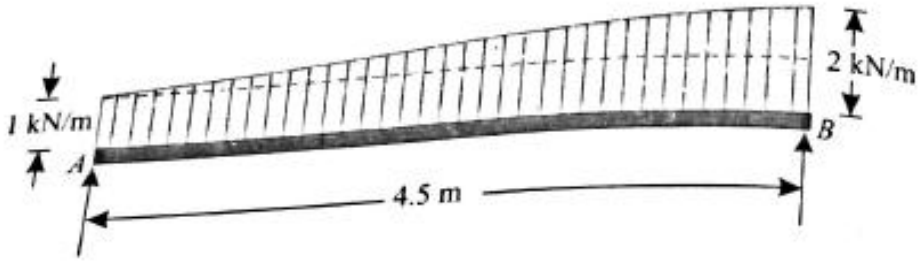

Figure 6

(5 marks)

(b) A built up section is made by needing two stables and too channel sections as shown in *Figure 7*. Calculate the moment of inertia of a built up section about X-X axis passing through center of gravity of the section.

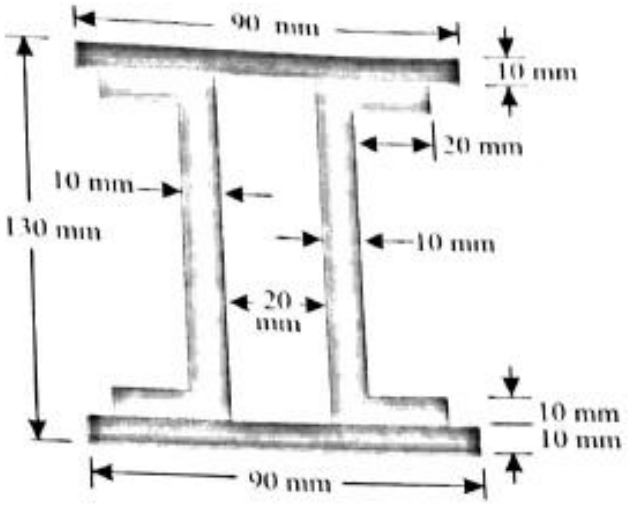

Figure 7

(15 marks)

Question 5

(a) A pile of negligible mass is driven by a hammer of mass 200 kg. If the pile is driven 500 mm into the ground, when the hammer falls from a height of 4 meters, determine the average force of resistance of the ground.

(5 marks)

(b) A body of mass 200kg is initially stationary on a 15^0 inclined plane. Calculate the distance along the incline must the body slide before it reaches a speed of 10 m/s? (*Take coefficient of friction between the body and the plane as 0.1*)

(15 marks)

Question 6

(a) A vehicle of mass 2 tones has a frictional resistance of 50N/tone. As one instant, the speed of this vehicle at the top of an incline was observed to be 36km/h as shown in *Figure 8*. Determine the speed of the vehicle after running down the incline for 100 seconds.

Figure 8

(5 marks)

(b) An industrial truck of total mass 8 tones has two pairs of wheels of 400 mm radius and each pair with axle has a mass of 1 tone. The radius of gyration of each wheel is 300 mm. the axles are 2.4 m apart and center of gravity of the truck is mid-way at a height of 1.5 m above the road surface. If the truck is moving with a tractive force of 5.4kN, acting through its center of gyration, calculate :

(i) Acceleration of the vehicle;

(ii) Frictional resistance; and

(iii) Reaction of the wheels.

(15 marks)

END OF QUESTION