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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2013/2014**

COURSE NAME : STATIC AND DYNAMIC  
COURSE CODE : BFC 10103  
PROGRAMME : 2 BFF  
EXAMINATION DATE : JUNE 2014  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER **FOUR(4)** QUESTIONS  
ONLY

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

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- Q1** (a) Define the difference between scalar and vector. (4 marks)
- (b) Three forces are applied to an eye bolt as shown in Figure **Q1(a)**. Determine the magnitude of the forces and the angle between the line of action of the resultant and the x-axis. (8 marks)
- (c) The cylinder cube as shown in Figure **Q1(b)** is supported by a system of cables. Determine the tension in cable A, B and C if the cube has a mass of 75 kg. (13 marks)
- Q2** (a) Discuss **THREE (3)** common types of support to joint a built structure to the foundation. (6 marks)
- (b) Figure **Q2(a)** shows two 50 N forces are applied to the corners B and D of a rectangular plate. Determine the moment of the couple formed by the two forces by resolving each force into horizontal and vertical component and adding of the two resulting couples. Use the result obtained to determine the perpendicular distance between lines BE and DF. (8 marks)
- (c) Determine the tension cables A and B and the x, y, z components of reaction at the ball and socket joint at C in Figure **Q2(b)**. (11 marks)
- Q3** (a) What are the difference between centroid of a body and centre of gravity (4 marks)
- (b) Determine the centroid of the composite area as shown in Figure **Q3** and with the aid of sketching, shows the location of centroid. (8 marks)
- (c) Determine the second moment of the shaded area shown in the same Figure **Q3** with respect to x-axis and y-axis. (13 marks)

DR. MOHD HAZWAN BIN WAN IBRAHIM  
 Ketua Jabatan  
 Jabatan Kejuruteraan Struktur & Bahan  
 Fakulti Kejuruteraan Awam & Alam Sekitar  
 Universiti Tun Hussein Onn Malaysia

- Q4** (a) Explain briefly the term:
- (i) Acceleration (2 marks)
  - (ii) Speed and velocity (2 marks)
  - (iii) Displacement and distance (2 marks)
- (b) A car bumper is designed to bring a 18000 kg car to a stop from a speed of 2.23 m/s at 150 mm displacement. Assuming the constant deceleration, determine the average force on the bumper when it stop. (9 marks)
- (c) A 25 kg force act on a 75 kg block placed on inclined plane as shown in Figure **Q4**. The coefficient of friction between the block and the plane are  $\mu_s = 0.25$  and  $\mu_k = 0.2$ , respectively. Determine:
- (i) Whether the block is in equilibrium (6 marks)
  - (ii) The value of the friction force (4 marks)
- Q5** (a) Draw free body diagram of three dimension rigid body for
- (i) Roller (1 mark)
  - (ii) Cable (1 mark)
  - (iii) Ball and socket (3 marks)
- (b) Figure **Q5(a)** shows a truss structure. Replace the loading system acting on the structure by an equivalent force and couple moment at point C (ignore the reaction at A and B) (10 marks)
- (c) Three small sphere A, B and C with a mass of 3 kg, 4 kg and 7 kg respectively are arranged a line as shown in Figure **Q5(b)**. Initially, the sphere B is placed in the static condition, while the sphere A is moving with a velocity  $4u$  collides towards sphere B and collides. Then, sphere C move to the right direction with a velocity  $u$ . The elastic coefficient between sphere A and B is  $3/4$  and between B and C is  $1/2$ . Determine:

- (i) The velocity of sphere A and B after the first collision. Explain the condition of both sphere. (4 marks)
- (ii) The lost of energy from the first collision between sphere A and B. (2 marks)
- (iii) The velocity of sphere B and C after the second collision. Explain the condition of both spheres. (4 marks)

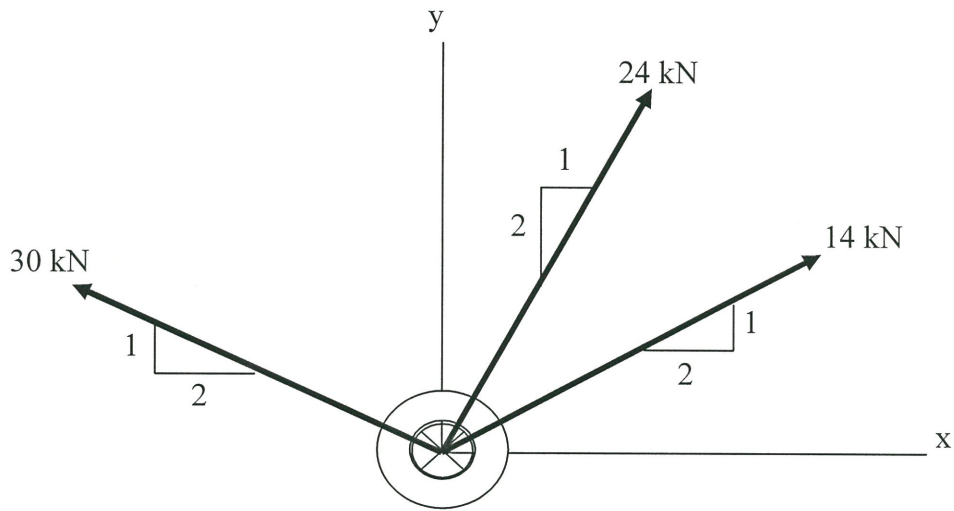
**- END OF QUESTION -**

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KELAS LABORATORIUM  
DR. MOHD HAZWAN BIN WAN IBRAHIM

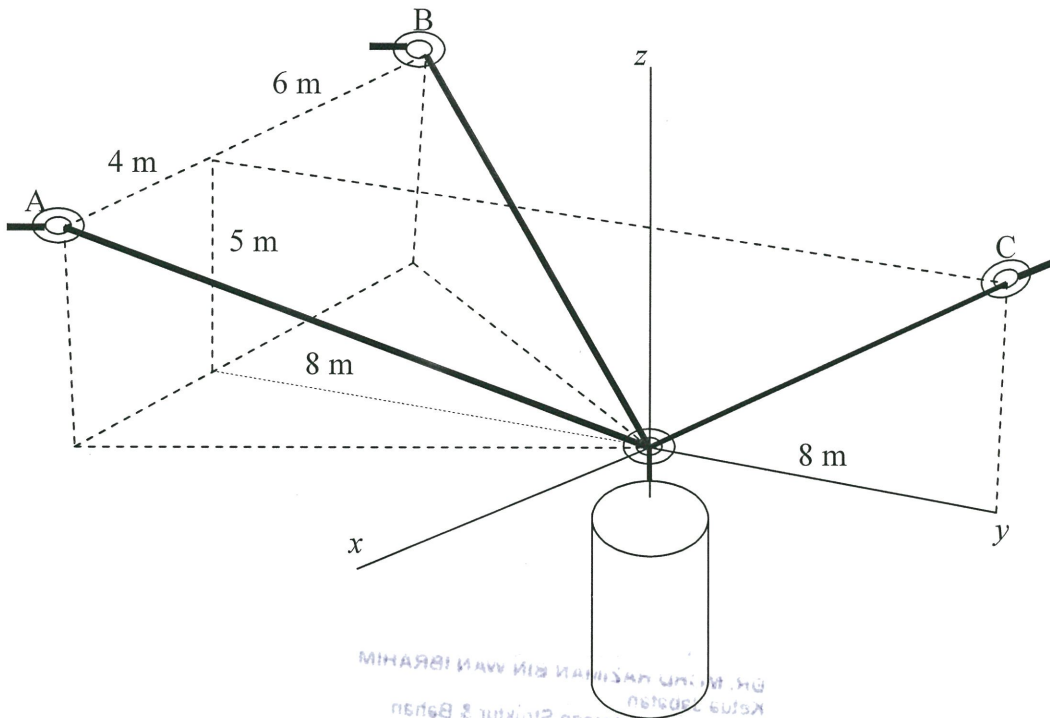
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**FIGURE Q1(a)**

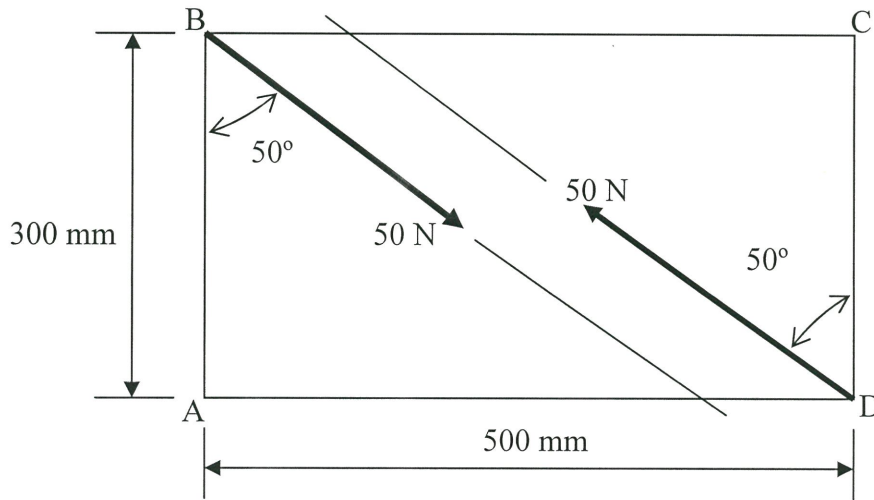


**FIGURE Q1(b)**

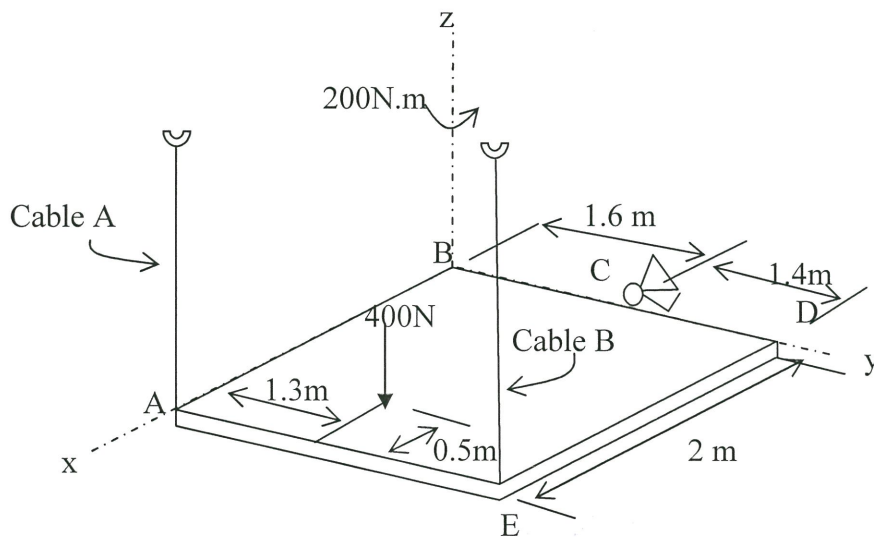
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**FIGURE Q2(a)**



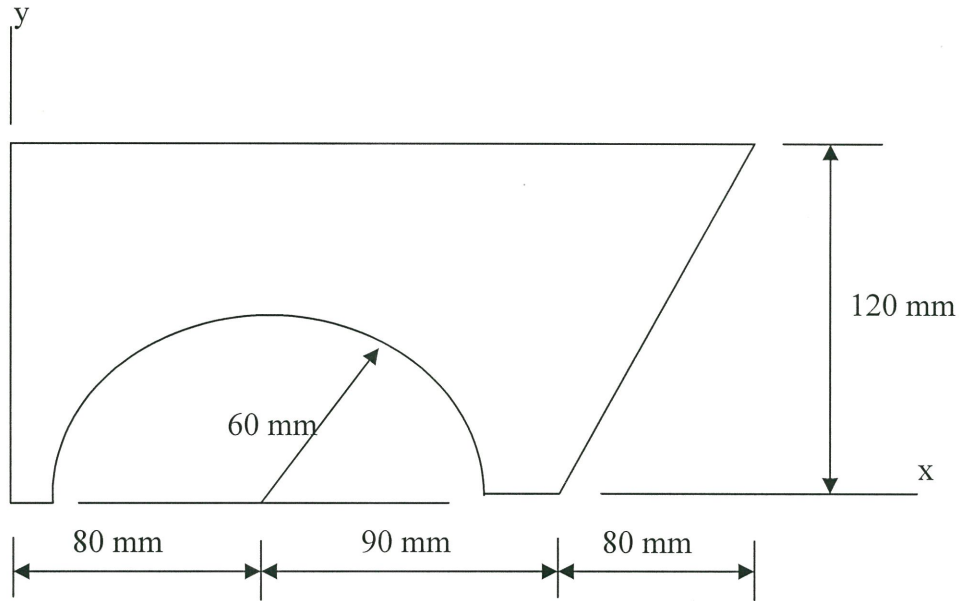
**FIGURE Q2(b)**



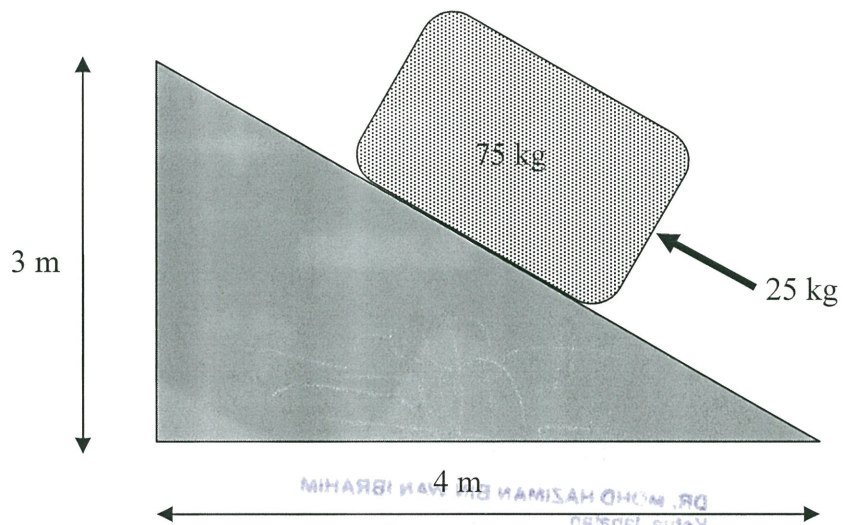
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**FIGURE Q3**

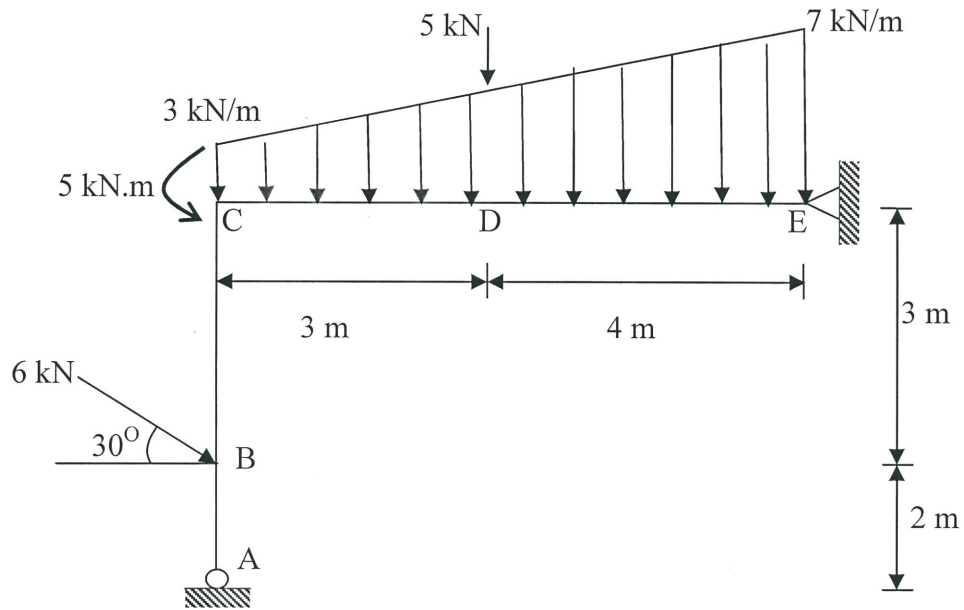


**FIGURE Q4**

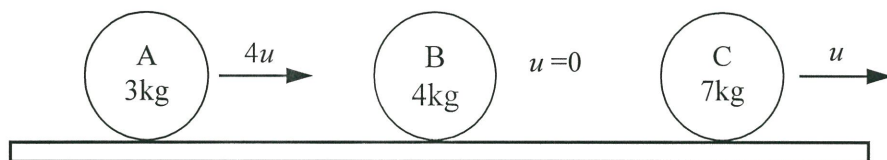
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**FIGURE Q5(a)**



DR. MOHD HAZWAN BIN WAN IBRAHIM  
 Ketua, Pusat Penyelidikan & Riset  
 Fakulti Kejuruteraan Awam & Alam Sekitar  
 Universiti Tun Hussein Onn Malaysia

**FIGURE Q5(b)**