MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERINGAND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FIRST SEMESTER THIRD YEAR EXAMINATIONS FOR DIPLOMA IN CIVIL ENGINEERING

BCECD 309: CIVIL ENGINEERING CONSTRUCTION II

DATE:2/6/2017 **TIME: 2.00-4.00 PM**

INSTRUCTIONS
Answer Question One and Any Other Two Questions

1. a) Describe **five** factors that will determine the choice of a type of dredging equipment. (10 marks)
   b) Give **two** functions for sleepers in railway (4 marks)
   c) Give **two** problems encountered during tunnel construction. (4 marks)
   d) Explain two methods used in the maintenance of dams. (4 marks)
   e) The rulling gradient is 1 in 200 on a section of B.G track. If the track is laid on that place in a curve of 5^{o}, determine the allowable rulling gradient on the curve. (2 marks)
   f) Explain what is meant by a water front structure. (2 marks)
2. a) With the aid of sketches, describe the following water front structures. (12 marks)
      i. Moles
      ii. Dry docks
      iii. Dolphins
   b) Give four reasons for reclamation. (8 marks)
3. a) Give five functional requirements of an ideal rail (10 marks)
   b) With an aid of a sketch, describe the cast iron pot type of chairs (4 marks)
   c) With an aid of a sketch, describe the sea wall water front structure. (6 marks)

4. a) With an aid of a sketch, explain any joint involved in rigid pavement construction. (4 marks)

b) Describe with sketches the following dredging equipments;

i. Cutter suction dredger

ii. Trailing suction dredger

c) With a sketch explain the heading and benching method of funnel construction.

d) Describe the following as in railways (6 marks)

i. Diamond crossing

ii. Super elevation

iii. Turn out

5. a) With a sketch, describe a fish plate fastening. (6 marks)

b) With the aid of sketches, differentiate bull leaded rails from double leaded rails. (6 marks)

c) Explain briefly the procedure involved during reclamation process (6 marks)

d) Explain what is meant by super elevation in rails (2 marks)

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SCHOOL OF ENGINEERING

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

BCECD 208: FLUID MECHANICS I

DATE: 5/8/2017 **TIME: 2.00-4.00 PM**

INSTRUCTIONS
Answer Question One and Any Other Two Questions

1. a) Explain two characteristics of liquids (4 marks)

   b) Define the following as in fluid mechanics

   i. Compressibility

   ii. Viscosity

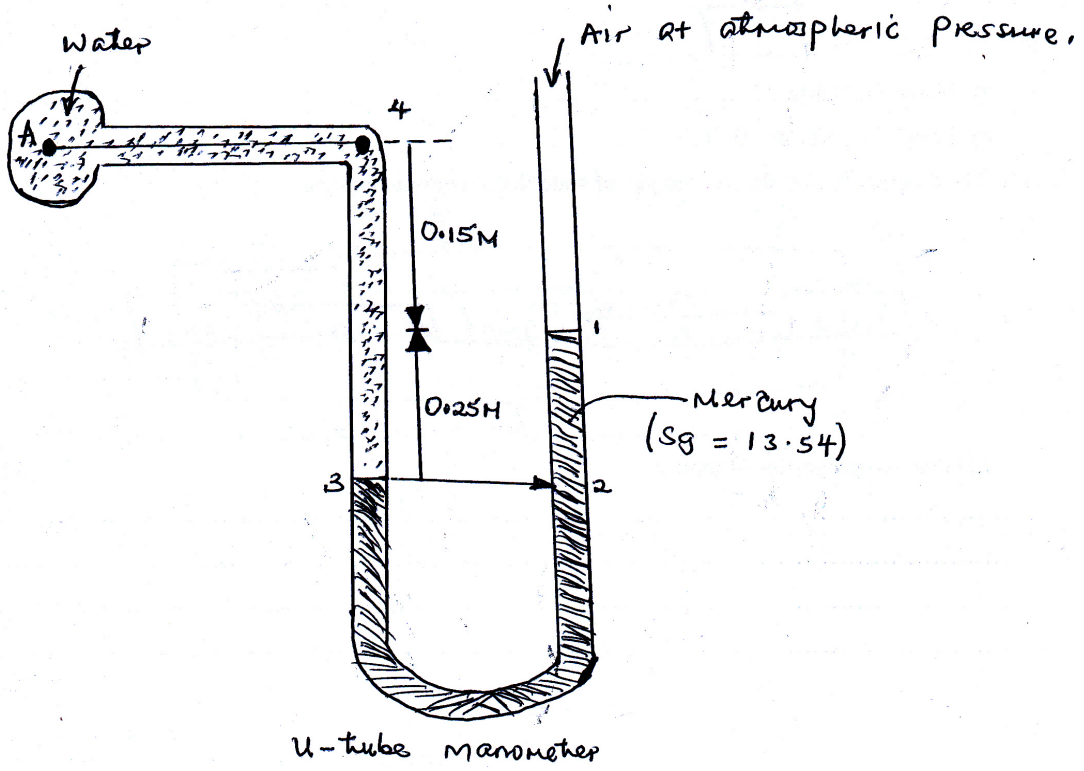
   iii. Absolute pressure

   iv. Gauge pressure (8 marks)

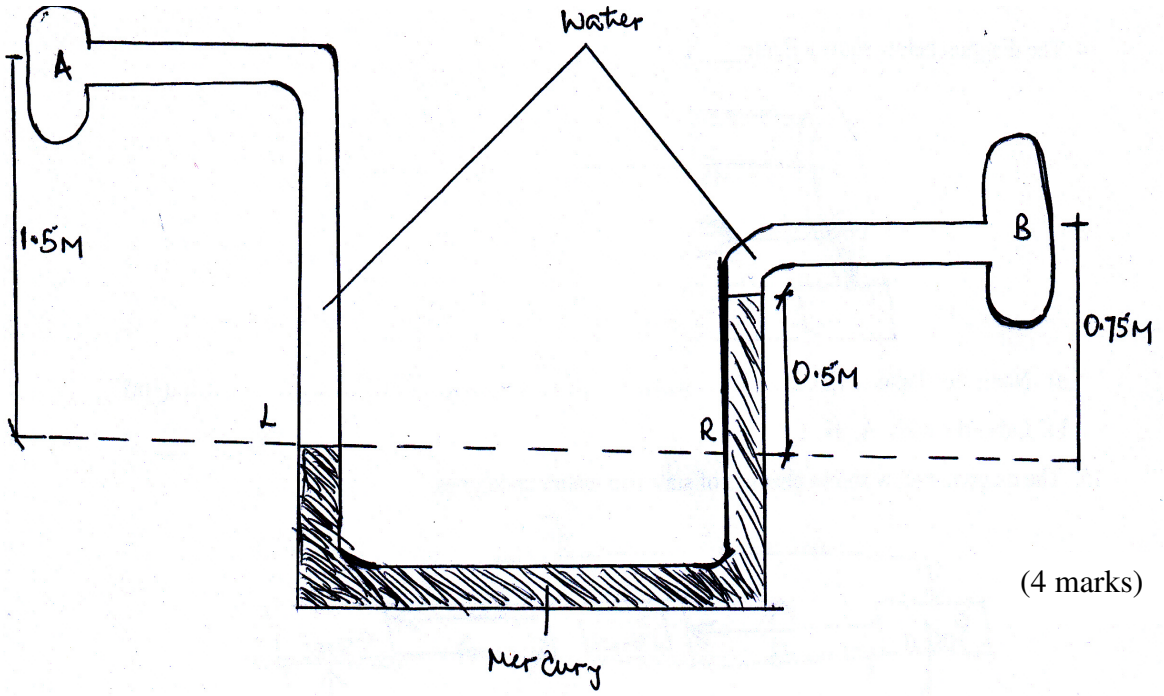
   c) Below is a diagram of a u-tube manometer, calculate;

   i. The pressure at A

   ii. The gauge pressure at A



d) For the u-tube differential manometer show below, determine the pressure between point A & B.



(4 marks)

e) Water is flowing through a 200mm radius pipe with a velocity of $0.35ms^{-1}$
Determine the discharge. (2 marks)

f) Give two assumption of Bernoullis equation. (2 marks)

g) A siphons has a circular hole of 75mm diameter and consist of a pipe with a crest 1.8m above water level discharging in atmosphere at a level of 3.6m below water level.
Determine;
i. Velocity of flow
ii. Discharge
iii. Absolute pressure at crest level if atmospheric pressure is 10m of water (neglect losses due to friction. (6 marks)

2. a) Explain the following as in Bernoullis's equation.
i. Potential energy
ii. Kinetic energy
iii. Pressure energy (6 marks)

b) Differentiate between a liquid and gas (2 marks)

c) A certain liquid has specific gravity of 0.8, determine the following;
i. Mass density
ii. Specific weight of the liquid
iii. Volume of 350gms of the liquid (8 marks)

d) Differentiate between specific gravity and specific weight. (4 marks)

3. a) Define the following terms and give their SI unit.
i. Cohesion
ii. Adhesion
iii. Surface tension
iv. Capillarity
v. Vapour pressure (10 marks)

b) Explain Pascal's Law and give the SI unit. (4 marks)

c) State three assumptions of bernoullis's equation. (6 marks)

4. a) Differentiate between turbulence flow and laminar flow (4 marks)

b) Give three areas where bernoullis's equation is application. (6 marks)

c) With the aid of diagram, describe a siphon parts. (6 marks)

d) A hydraulic cylinder must be able to exert a force of 38.8KN. The piston diameter is 40mm. Compute the required pressure of the oil. (4 marks)

5. a) A venturimeter is filled to a 450mm diameter and has a throat of 200mm diameter. Find the quantity of water flowing when the venturi head is 175mm of water. Take CD = 0.96 (6 marks)

b) Describe briefly a piezometer with the aid of a diagram. (6 marks)

c) Vinegar has a density of 1080Kg/M^3. Calculate its specific weight and its specific density. (6 marks)

d) Describe a differential u-tube manometer. (2 marks)

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DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FIRST YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

BCECD 119: STRENGTH OF MATERIALS 1

DATE:6/6/2017 **TIME: 2.00-4.00 PM**

INSTRUCTIONS
Answer Question One and Any Other Two Questions

1. a) Differentiate between stress and strain. (2 marks)

   b) Illustrate a graph of stress-strain relationship and show the following:-

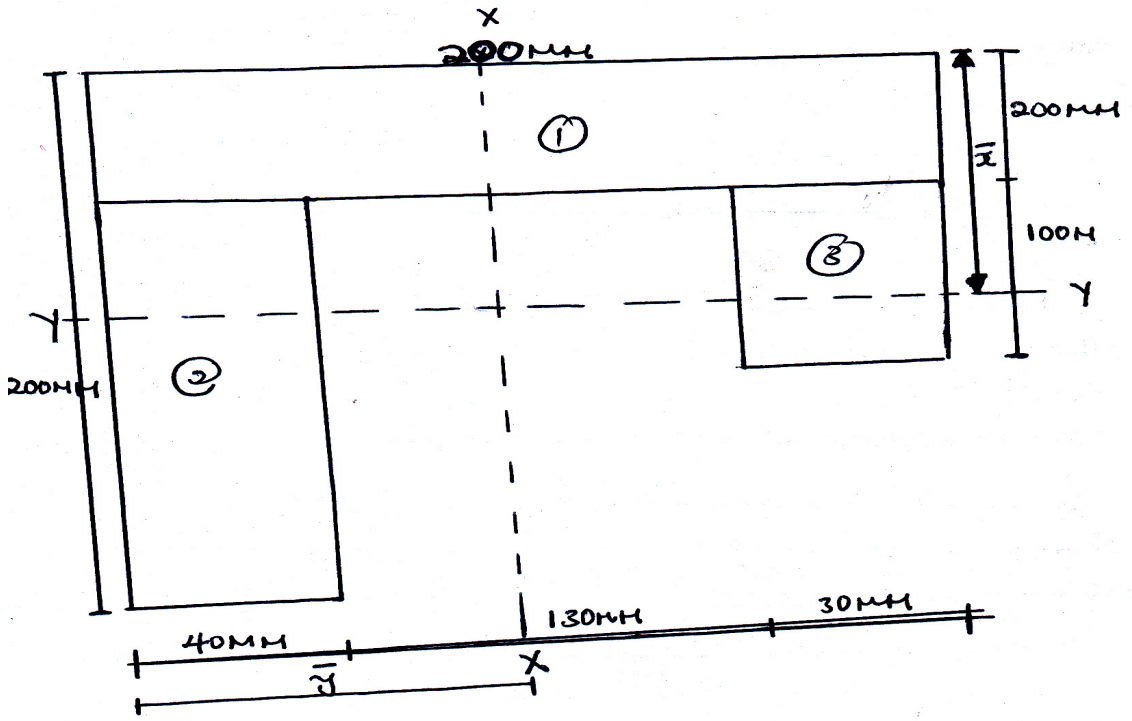
      i. Elastic limit

      ii. Limit of proportionality

      iii. Upper yield point

      iv. Stress at failure (8 marks)

   c) Determine the second moment of area I_{xx} and I_{yy} for the compound second shown.



(8 marks)

d) Give **four** assumptions of the theory of simple bending. (4 marks)

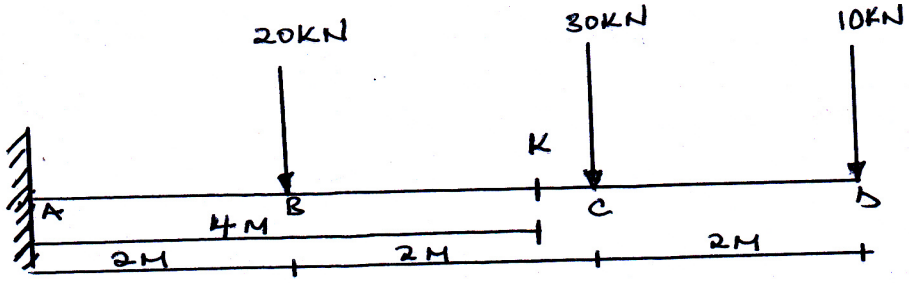
e) In the figure shown below, calculate;

i. The reactions at supports.

ii. Draw the shearing force diagram

iii. Draw the bending moment diagram

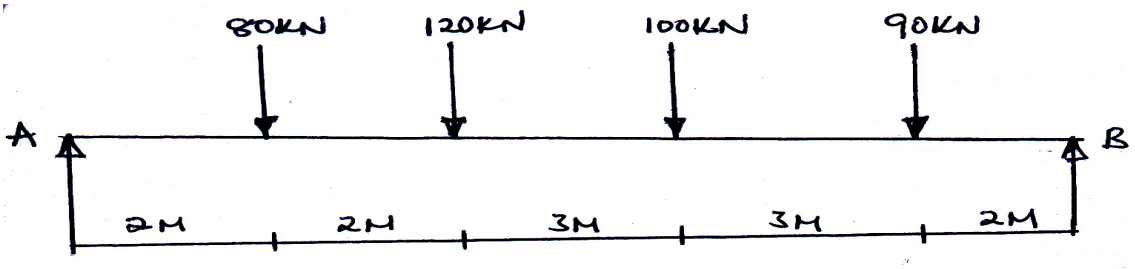
iv. Determine the position and magnitude of the maximum bending moment.



(8 marks)

2. a) Define hooke's law. (2 marks)

b) In the figure below, determine the following;



i. The reactions at supports

ii. Draw the shearing force diagram

iii. Draw the bending moment diagram. (14 marks)

c) With the aid of a diagram, show a uniformly distributed lead on a beam of span LM (4 marks)

3. a) Describe any three types of loads. (6 marks)

b) A mass concrete pier of rectangular, cross-section 600mm x 800mm and 2.20m long carries an axial compressive load of 2.5MN.

Determine;

i. The stress in the concrete at the base of the pier.

ii. The amount of shortening that will occur in the pier.

Take – Density of concrete = 2500Kg/m^3 Young's modulus = 13KN/mm^2 (8 marks)

c) With the aid of a diagram show the following loading systems.

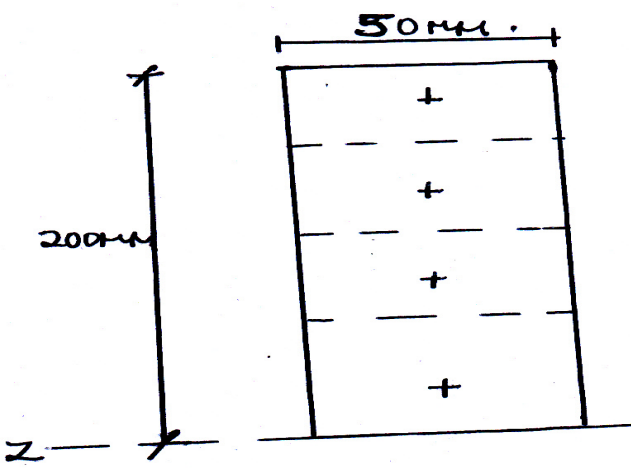
i. Concentrated load

ii. Line load

iii. Uniformly distributed load. (4 marks)

4. a) Explain a compound bar. (2 marks)

b) Determine the second moment of area of the rectangle shown in the figure about z-z axis.



(8 marks)

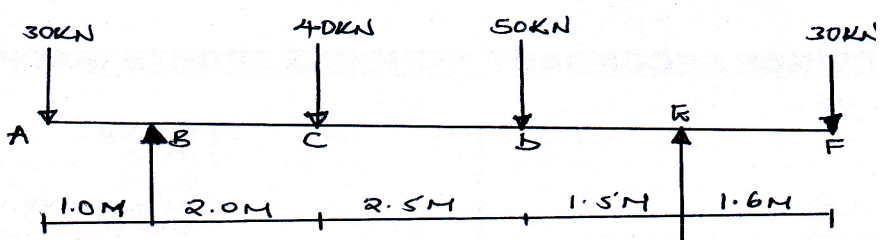
c) A short reinforced concrete column is 450mm square and contains four steel bars of 25mm diameter. Determine the stresses in the steel and the concrete when the

total load on the column is 1.5MN. Young's moduli: steel = 210KN/mm^2, concrete = 14KN/mm^2. (2 marks)

5. a) Determine the variation in stress in fully restrained steel members resulting in ambient temperature.

Coefficient of linear expansion for steel, ∂ = 12 x 10^{-6}per Co. Young's modulus of elasticity of steel, € = 205KN/mm^2

b) Calculate the following in the figure below (5 marks)



i. Reactions at supports

ii. Draw the shear force diagram

iii. Draw the bending moment diagram

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DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR FIRST SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

BCECD 204 THEORY OF STRUCTURES I

DATE:30/5/2017 **TIME: 8.30-10.30 AM**

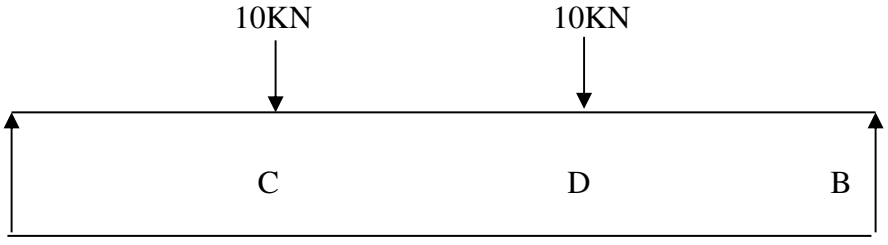
INSTRUCTIONS
Answer Question One and Any Other Two Questions

1. a) Differentiate between the following;
   i. Short column
   ii. Long column (4 marks)

   b) With the aid of a diagram, derive an expression to show that ryy = b/√12 (2 marks)

   c) A horizontal girder having uniform cross-section is 14m long and is simply supported at its ends.
   It carries two concentrated loads as shown. Calculate the deflection of the been under the loads C and D. Take E=200 N/MM^2 and I = 160 x 10^6 mm^4.

c)



(21 marks)

   d) With a sketch, illustrate how a long column is bound to fail. (3 marks)

2. a) A rectangular strut is 150mm and 120mm thick it carries a load 180KN at an eccentricity of 10mm in a plane bisecting the thickness. Find the maximum and minimum intensities of stress in the section. (10 marks)

b) State four assumptions of Euler's theory (8 marks)

c) Define what is meant by crippling load (2 marks)

3. a) A column of timber section 20 x 30 cm is 6 metres long both ends being fixed if young modules for timber = 17.5KN/MM^2

Determine;

i. Crippling load

ii. Radius of gyration (10 marks)

b) Determine the Euler's buckling load for a steel diameter 40mm if the length between the pin joints is 5m (E =210KN/MM^2)

c) Explain what is meant by slenderness ratio. (7 marks)

4. a) Determine the crippling load, when the given is used in the following conditions.

i. One end of the strut is fixed and the other is free

ii. Both the ends of the strut are fixed

iii. One end is fixed and other is hinged. (8 marks)

b) A hollow rectangular masonry pier is 1.2 x 0.8 m wide 4 and 140mm thick. A vertical load of 2MN is transmitted in the vertical plane bisecting 1.2m side and as an eccentricity of 100mm from geometric axis of the section.

Calculate the maximum and minimum stress intensities in the section. (12 marks)

5. a) A solid round bar 4m long and 5m in diameter is used as a strut with both ends hinged.

Determine the crippling load. Take E =2.0 x 10^5 N/MM^2 (7 marks)

b) A horizontal beam AB is freely supported at A and B, 8M apart and carried a uniformly distributed load of 15KN/M. A clockwise moment of 160KN/M is applied to the beam as a point C, 3m from the left hand support A. Calculate the slope of the beam at

C, if EF = 40 x 10KN^3/M^2 (13 marks)

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DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

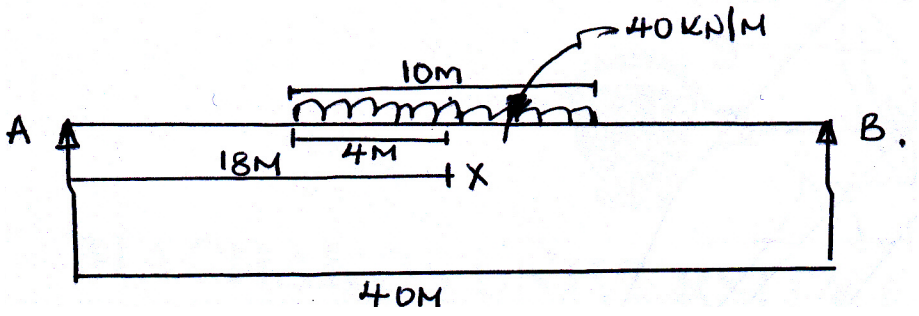
SECOND YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

BCE CD 213: THEORY OF STRUCTURES II

DATE:31/5/2017 **TIME: 2.00-4.00 PM**

INSTRUCTIONS
Answer Question One and Any Other Two Questions

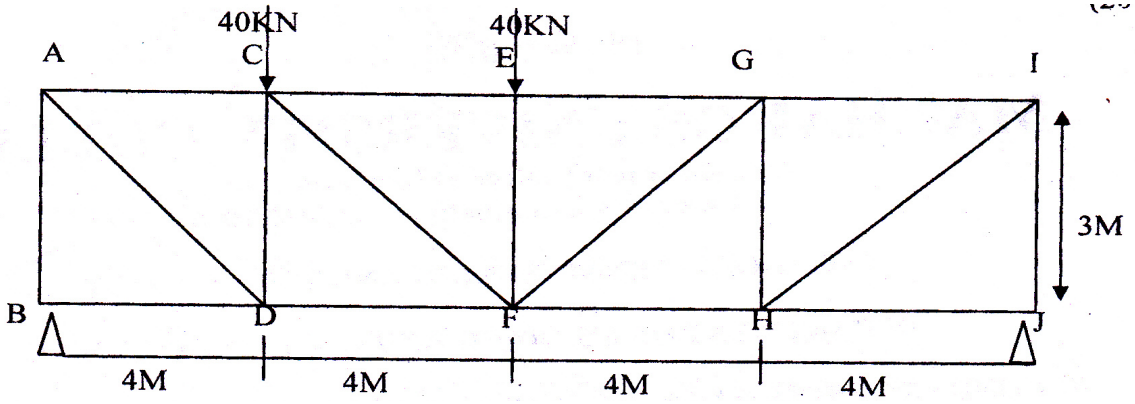
1. a) A uniformly distributed load 40KM/M of 10m length cross a girder of span 40m from left to right. With the help of influence lines, determine the values of sheer force and bending moment at a point 18m form the left support, the head of the load is 12m from the left support. (20 marks)



b) Explain three importance of studying influence lines. (6 marks)

c) State four statically determinate structures (4 marks)

2. Find the forces in AB, AD, AC and equilibrium EF,FG and FH on the right hand side A (20 marks)

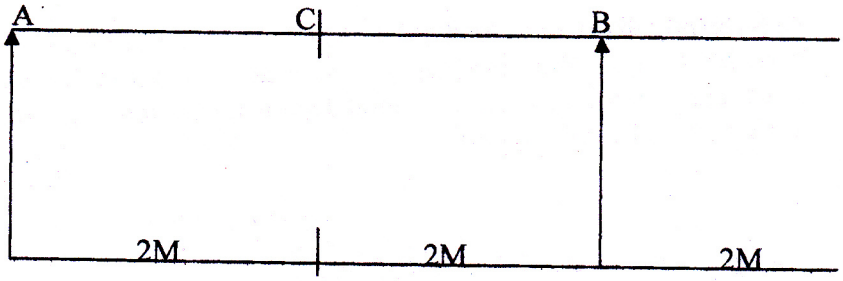


1. a) Construct the influence line for:-

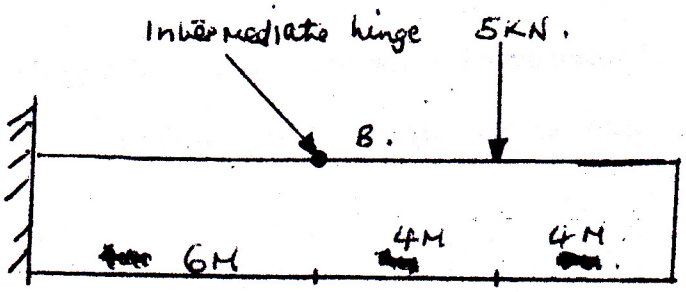
   i. Reaction of A and B

   ii. Shear at point C

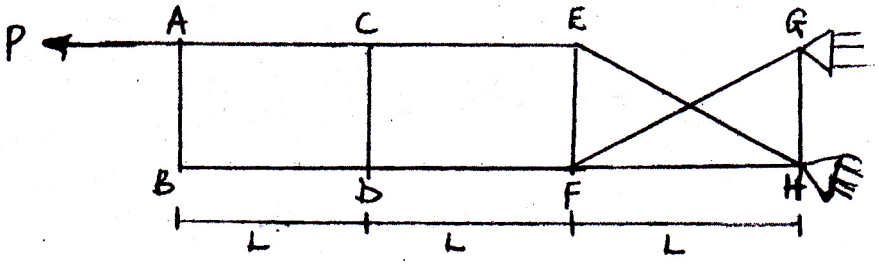
   iii. Bending moment at point C in the following figure. (10 marks)



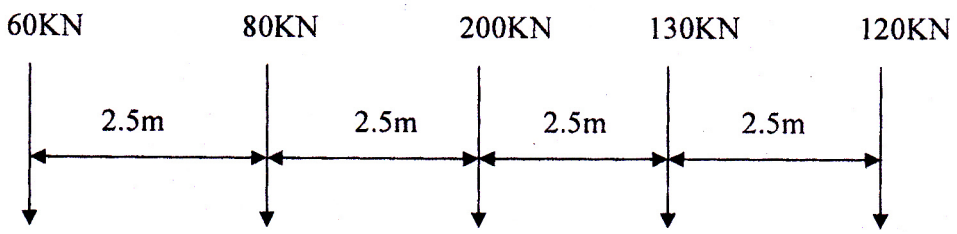
   b) Obtain the internal force diagrams (SFD and BMD) for the beam. (10 marks)



2. a) Find the forces in all members in the figure (10 marks)



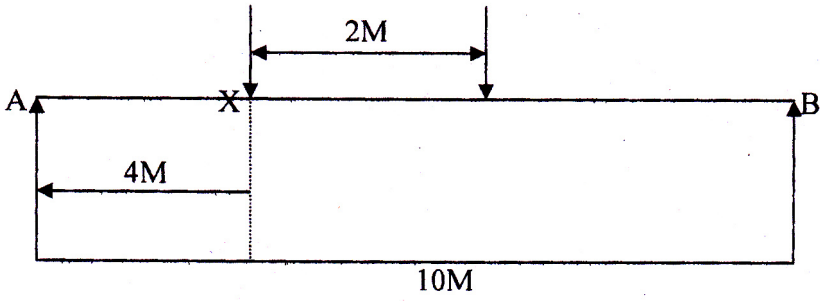
b) A train of 5 wheel-loads as shown crosses a simply supported beam of span 22.5 metres



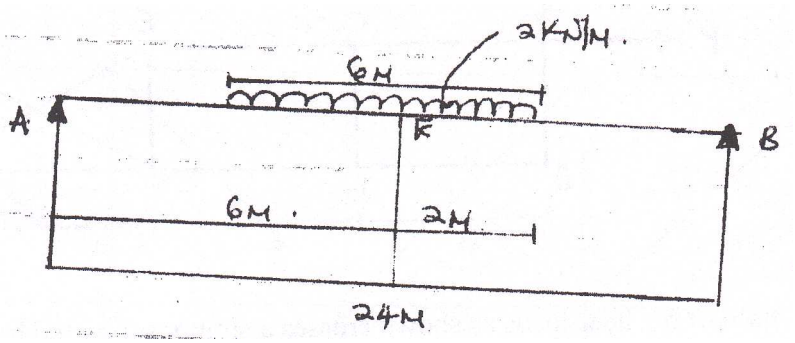
Calculate the maximum negative and positive shear force values of the centre of the span and the absolute maximum bending moment anywhere in span.

(10 marks)

5. a) Two point loads of 80KN and 160KN spaced 2m apart, cross a girder of span 10m with the 80KN load leading form left to right. Draw the influence lines for sheet force and bending moment and find the value of maximum shear force and bending moment at a section 4m fro and left end support. (10 marks)



b) In the following diagram, udh of 2KN/M, 6m long crosses a girder of span 24m. Determine the values of S.F and BM at a point E. (10 marks)



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DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL ENGINEERING

BCE CD 215: ENGINEERING GEOLOGY

DATE:2/6/2017 **TIME:8.30-10.30 AM**

INSTRUCTIONS
Answer Question One and Any Other Two Questions

1. a) Describe three physical characteristics of the following minerals;
   i. Diamond
   ii. Apatite
   iii. Calcite (9 marks)
   b) Differentiate between foliation and exfoliation. (3 marks)
   c) Explain six roles of a geologist in construction industry. (6 marks)
   d) Give three geological importance of faulting (6 marks)
   e) Explain three agents of metamorphism. (6 marks)

2. a) Describe with sketches any three types of faults (9 marks)
   b) Describe with sketches two methods of tunnel construction. (4 marks)
   c) With sketches, describe three types of folds. (7 marks)

3. a) Explain five geological problems in dam construction. (10 marks)
   b) Explain five physical properties of igneous rocks. (10 marks)

4. a) Explain the term protolith (4 marks)

b) Describe three types of foliation in metamorphic rocks giving an example in each. (8 marks)

c) Explain four factors affecting metamorphic rock textures. (8 marks)

5. a) Describe the three processes in physical weathering. (6 marks)

b) Give two advantages of constructing a tunnel as opposed to an open cut. (4 marks)

c) Describe two types of metamorphic rocks. (4 marks)

d) Give four factors affecting the choice of site of a dam construction. (4 marks)

e) Give two examples of bio-chemical weathering rocks. (2 marks)