MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

BCE CD 204: THEORY OF STRUCTURE I

DATE: 29/7/2019 **TIME: 2.00-4.00 PM**

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions.

1. a) A rectangular column 200mm wide and 150mm thick is carrying a vertical 100d of 120 KN at an eccentricity of 50mm in a plane bisecting the thickness. Determine the maximum and Minimum intensities of stress in the section.(5 marks)

   b) Give six assumptions made in Euler's theory. (12 marks)

   c) A steel joist, simply supported over a span of 6m carries a point load of 50KN at 1.2M from the Left hand support. Find the position and magnitude of the maximum deflection.

   Take EI = 14 x 10^{12} N/mm^2.

   d) Differentiate between a long column and short column starting with an aid of a diagram the Mode of failure. (3 marks)

2. A horizontal steel girder having a uniform cross section is 14M long and is simply supported at it Ends It carried two concentrated loads as shown. Using Macaulay's method, calculate the deflections of the beam under the loads C and D.

   Take E = 200N/mm^2 and I = 160 x 10^6mm^6

3. a) A steel bar of rectangular cross-section 30x 50mm pinned at end is 2m long. Determine the buckling load when it is subjected to axial compression and also calculate axial stress using

   Euler's expression. Determine length for which Euler's equation may be valid.

Take proportionality limit as 250Mpa and (E = 2x 1 0^5 N/mm^2).

b) Calculate the net deflection at P and Q for the beam shown

Take the value of EI as 840N/mm^2. (10 marks)

4. A simply supported beam AB of span 4 metres is carrying a triangular load varying from zero at A to 5KN/m at B. Determine the maximum slope and deflection of the beam. Take EI as 1.25 x 10^{12} N/mm^2. (20 marks)

5. a) A hollow circular column having external and internal diameters of 300mm and 250mm respectively carries a vertical load of 200KN at the outer edge of the column. Calculate the maximum and minimum intensities of the stress in the section. (10 marks)

b) A simply supported beam of span 3m is subjected to a central load of 10KN. Find the maximum slope and deflection of the beam. Take I = 12 x 10^6 mm^4 and E = 200N/mm^2. (10 marks)

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DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
SECOND YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR
……
BCECD……: FLUID MECHANICS 1

DATE: **TIME:**

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions.

1. a) Explain the following types of pressure
   i. Atmospheric pressure
   ii. Gauge pressure
   iii. Absolute pressure (6 marks)

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

   c) A mercury manometer is used to measure in a pipe as shown below, the flowing liquid is water and manometer liquid is mercury.
   i. Calculate gauge pressure at A
   ii. If atmospheric pressure is 101.3KN/m^2 . Calculate absolute pressure at A. (5 marks)

   d) A siphon 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 3.6m below water level.
   Determine:-
   i. Velocity of flow
   ii. Discharge
   iii. Absolute pressure of crest level if atmospheric pressure is 10m of water (neglect losses due to friction). (15 marks)

2. a) with the aid of a diagram, derive the Bernoulli's' theorem expression. (15 marks)

b) Define the following terms giving their SI unit were applicable.

i) Adhesion

ii) Surface tension

iii) Capillarity

3. a) for the u-tube manometer shown below, determine the pressure difference between point A and B. (10 marks)

b) Explain the following types of flows

i) Turbulence flow

ii) Laminar flow

iii) Transcient flow (6 marks)

c) With the aid of a diagram describe micro-manometer. Pressure device. (4 marks)

4. a) Describe the following energy heads

i) Potential energy

ii) Kinetic energy

iii) Pressure energy

b) A manometer having a ratio of basin to rim area as 40 was used to determine pressure in pipe. Containing water as shown below. Determine the pressure in pipe and pressure in the manometer. (15 marks)

c) Water is flowing through a 200mm radius pipe with a velocity of 0.35m.s. Determine discharge in:-

i) M^3/s

ii) L/s

iii) Kg/s (5 marks)

5. Oil flows through a pipeline as shown below, the diameter at 'A' is 450mm and gradually Contracts to 300mm at 'B' and then forcer's one branch being 150mm diameter discharging at C and other branch 225mm diameter discharging at D. If the velocity at A 1.8m/s and D is 3.6 m/s,

Determine;

i) Discharge at C

ii) Discharge at D

iii) Velocity at B

iv) Velocity at C. (20 marks)

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SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

BCECD 304: REINFORCED CONCRATE AND MASONRY DESIGN

DATE: 30/7/2019 **TIME: 8.30-10.30 AM**

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions.

1. a) Determine the area of tension reinforcement (A_s) required for the section shown in the figure 1, which resists an ultimate design moment of 185KNM.
   F_y = 460 N/mm^2, f_{cu} = 30N/mm^2. (5 marks)

   b) A simple reinforced concrete beam of effective span 7m and overall depth 500mm is reinforced with 4 NO Y25 tension bars. Calculate the maximum imposed loads that the beam can carry, assuming that the load is
   i. uniformly distributed
   ii. Occurs at a point load at midspan
   F_{cu} = 30 N/mm , f_y = 460 N/mm^2 , cover = 30 mm (15 marks)

   c) Differentiate between a one-way spanning slab and a two-way spanning slab. (4 marks)

   d) Describe the following as in columns
   i. Short and slender columns
   ii. Braced and unbraced columns. (6 marks)

2. A simple supported reinforced concrete flow subject to an imposed load of 3.5KN/m^2 spans between walls as shown assuming the following material strengths.
   F_{cu} = 35'N/mm ^{2}, f_y = 460 N/mm^2 (20 marks)

3. A cross-section of a simply supported rectangular beam is as shown in the figure below. Given data, determine the area of the reinforcement required to resist an applied ultimate bending moment of 150KMN.

   F_{cu} = 40N/mm ^{2},

   f_y = 460 N/mm^2

   Express condition = Moderate

   Fire resistance = 2 hours (20 marks)

4. A 250mm thick simply supported R.C slab spans 5m. Design a suitable slab using grade 40 concrete and high yield reinforcement to support the following characteristic loads.

   i. Imposed loads = 4 KN/m^2

   ii. Finishes = 0.5 KN/m ^{2}

   iii. Concrete density = 24 KN/m^3 (24000 Kg/m^3)

   The slab will be exposed to mild situation. (20 marks)

5. Design an isolated footing for a rectangular column 250mm by 800mm that carries an unfactored dead load of 780KN and life load of 440KN. Design data: - Allowable soil pressure = 125KN/m^2

   - F_{cu} = 20N/mm^2
   - f_y = 460N/mm^2 (20 marks)

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SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

…….. YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

BCECD ……: ENGINEERING SURVEYING II

DATE: **TIME:**

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions.

1. a) Define the following terms as used in surveying

   i. Centering

   ii. Swinging

   iii. Face left

   iv. Face right

   v. Changing face

   vi. Line of collimation

   vii. Axis of the telescope

   viii. Horizontal axis

   ix. Vertical axis

   x. Axis of the telescope

   b) Differentiate between a back bearing (B.B) and fore bearing F.B). (4 marks)

   c) Differentiate between an open traverse and a closed traverse. (4 marks)

   d) State two instruments use in tacheometry (2 marks)

2. The following bearing were observed during a compass traverse exercise where local attraction was suspected.

Line	F.B	B.B
AB	$124^{o}30^{1}$	$304^{o}30^{1}$

BC	$68^{o}15^{1}$	$246^{o}00^{1}$
CD	$310^{o}30^{1}$	$135^{o}15^{1}$
DA	$200^{o}15^{1}$	$17^{o}45^{1}$

i. At which station did local attraction occur?

ii. Calculate the corrected bearings and the included angles. (20 marks)

3. a) Determine the values of included angles in a clockwise closed compass traverse ABCD. Given the respective FB angles.

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Line	**F.B**
AB	40^{o}
BC	70^{o}
CD	210^{o}
DA	280^{o}

b) Explain briefly temporary adjustments done to a theodelite (10 marks)

4. The following observations were made using a tacheometer fitted with unnatical lense which had a multiplying constant K = 100

Inst.Stn	Height of instrument HI(M)	Staff Station A	WCB $30^{o}30^{1}$	Vertical angle $4^{o}30^{1}$	Hair reading 1.155,1.755 2.355	Remarks RL_0=150.00 M
		B	$75^{o}30^{1}$	$10^{o}15^{1}$	1.250,2.000 2.750	

i. Determine distance AB

ii. Find RLS of A and B

iii. Gradient/fall of the line AB. (20 marks)

5. a) Explain briefly any three permanent adjustments done to a theodelitre (10 marks)

b) The following are bearing taken in a closed traverse line

Line	**F.B**	**B.B**
AB	$S27^{o}30^{1}$ E	$N34^{o}30^{1}$W
BC	$S43^{o}15^{1}$W	$N44^{o}15^{1}$ E
CD	$N73^{o}00^{1}$ W	$S72^{o}15^{1}$ E
DE	$N12^{o}45^{1}$E	$S\ 13^{o}15^{1}$ W
DA	$B60^{o}00^{1}$E	$S59^{o}00^{1}$W

Compute the interior angles and correct them for observation. (10 marks)

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…….. YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

BCECD ……: SOIL MECHANICS II

DATE: **TIME:**

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions.

1. a) Explain the term soil conservations. (2 marks)

   b) Explain with the aid of a diagram , the following types of soil field tests.

      i. Plate load test

      ii. The standard penetration test

      iii. The cone penetrometer test

      iv. Shear vane test (15 marks)

   c) Describe the following sample results

      i. Disturbed sample

      ii. Representative sample

      iii. Unrepresentative sample (8 marks)

   d) Give five reasons for soil exploration. (5 marks)

2. a) Explain briefly the stages involved before soil exploration exercise. (6 marks)

   b) Explain the following soil boring augers with a sketch.

      i. Helical auger

      ii. Post hole boring

      iii. Percussion boring

      iv. Rotary drilling

c) Differentiate between a trial pit and test pit. (4 marks)

3. a) Explain the two main types of soil erosion. (6 marks)

b) Describe briefly the consequences of soil erosion. (4 marks)

c) Explain two drivers of soil erosion. (6 marks)

d) With the aid of diagram, describe any two types of slope failures in soil (4 marks)

4. a) Describe three types of shear failure in soil (6 marks)

b) A masonry retaining wall with a vertical back to retain to a backfill of 6m height behind it .

Ground level is horizontal at the top . Assume unit weight of backfill soil = 17 KN/M^3, C = 0), Q = 30 ^{o} . Calculate the horizontal earth pressure on the wall, if.

i. The wall move away from backfill (active)

ii. Wall moves toward the backfill (passive) (14 marks)

5. a) With the aid of diagram, show where slope failure occurs at finite slopes. (10 marks)

b) With the aid of a diagram, show the shearing strength parameters of;

i. Cohesionless soil

ii. Cohesive soil

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…….. YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

FLUID MECHANICS II

DATE: **TIME:**

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions.

1. a) With the aid of a sketch, differentiate between a large orifice and small orifice (4 marks)

   b) A 60mm diameter orifice is discharging water under a head of 9metres. Calculate the actual discharge through the orifice in litres per second and actual velocity of the jet in metres per second at Vena Contract, if cd=0.625 and cv=0.98 (6 marks)

   c) A rectangular gate 3mx7m high is introduced across an irrigation canal. The water level on the upstream side(us) is1.2m.Compute the rate of flow if the gate is raised by 0.4m above the bottom level, cd=0.6.Compute the percentage increase in discharge if the velocity of approach is 1.2m/s. (10 marks)

   d) An orifice in one side of a large tank is rectangular in shape, 2 metres broad 1 metre deep. The water level on one side of the orifice is 4metres above the top edge. The water level on the other side of the orifice is 0.5m metres below its top edge as shown (10 marks)

Calculate the discharge through the orifice per second if cd=0.63

2. a) i) Give the theoretical velocity of the jet a vena contracta

ii) Give the relation among coefficient of discharge (cd), coefficient of velocity (cd) and coefficient of contraction(Cc)

iii) Give the coefficient of velocity if determined experimentally (6 marks)

b) A large rectangular orifice cd=0.65 of width 0.5m has the following particular:-
floor level=+100m
u/s water level=+102.3 when the gate is raised by 0.6m
D/s water level =100.4m. Compute the rate of the flow (14 marks)

3. a) A jet of water oozing from a sharp edged orifice under a constant head of 10m at a certain point has a horizontal and vertical coordinates measured from a vena contracta as 20 and 10.5 respectively. Find the value of cv and cc if cd=0.6 (5 marks)

b) A rectangular gate 2.5m wide by 6.0m deep is introduced across a channel. The sill is placed at +1500.0m and the water level on the upstream side is constant at +1505.0m. it is required to raise the gate to deliver a discharge of 480m3/min. Calculate the height through which the gate must be raise (15 marks)

4. a) A large rectangular orifice cd=0.63 of width 0.5m has the following particulars
Floor level=+100.0m
u/s water level=+102.3m when the gate is raised by o.6m
d/s water level=100.4 (15 marks)

b) The head of water over the centre of an orifice of diameter 20mm is 1m. the Qa=0.85litres . Find the coefficient of discharge (5 marks)

5. a) With the aid of a diagram, describe the following types of orifices

i. Internal moth piece
ii. External mouth piece
iii. Sharp crested orifice
iv. Round crested orifice
v. Mouth piece running full
vi. Cylindrical mouth piece
vii. Convergent mouth piece
viii. Convergent-divergent mouth piece (18 marks)

b) Give two application areas of large orifice (2 marks)