



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

Department of Building & Civil Engineering

UNIVERSITY EXAMINATION FOR DIPLOMA IN:

DIPLOMA IN CIVIL ENGINEERING

DBCE/May 2015/S-FT

EBC 2205: SOIL MECHANICS I

END OF SEMESTER EXAMINATION

SERIES: MAY 2016

TIME ALLOWED: 2 HOURS

Instruction to Candidates;

You should have the following for this examination;

- *Answer booklet*
- *Pocket calculator*

This paper consists of FIVE questions. Answer ANY THREE questions.

Use neat, large and well labelled diagrams where required

Maximum marks for each part of a question are as shown

This paper consists of FOUR printed papers.



SGS ISO 9001:2008 Certified

QUESTION ONE

- (a) Explain the term 'soil' as used in construction. **(4 marks)**
- (b) A soil sample has a volume of 160cm^3 and weighs 304 g. Dry mass and particle specific gravity of the soil are 265g and 2.65 respectively. Use a soil model to determine the following;
- (i) Void ratio (ii) Porosity (iii) Degree of saturation (iv) Saturated density **(16 marks)**

QUESTION TWO

- (a) Explain the following:
- (i) Plasticity index
 - (ii) Coefficient of curvature
 - (iii) Coefficient of permeability **(9 marks)**
- (b) The following results were obtained from a liquid limit test in which the Casagrande method was used on a soil of plastic limit 23%:

Test number	1	2	3
Mass of wet soil +container (g)	22.9	21.7	18.5
Mass of dry soil +container (g)	17.9	17.7	15.7
Mass of container	8.3	8.3	8.3
Number of blows	17	30	40

- (i) Determine the liquid limit, using figure 1.
- (ii) Use figure 2 to classify the soil tested on the British soil classification system. **(11 marks)**

QUESTION THREE

- (a) (i) Define coefficient of permeability
- (ii) Explain the effect of stratification on the permeability of a soil **(5marks)**
- (b) Outline **FOUR** factors that affect permeability **(11 marks)**
- (c) A permeability test was carried out on a fine soil of diameter 76 mm and length 152 mm. The diameter of the standpipe used was 12.2 mm. Initially, the level of the water in the standpipe was 508 mm above the free surface of the overflow chamber. It then decreased to 254 mm after 19.6 seconds. The test was then continued for a 127 mm decrease in the water level, which took 19.4 seconds. Determine the average coefficient of permeability. **(4 marks)**



QUESTION FOUR

- (a) Outline Casagrande method used to determine liquid limit for a soil. **(7 marks)**
- (b) Briefly explain the term 'Coefficient of uniformity' and its use. **(5 marks)**
- (c) Outline laboratory falling head method used in determination of permeability. **(8 marks)**

QUESTION FIVE

- (a) State **FIVE** factors affective soil compaction. **(5 marks)**
- (b) The following results were obtained from a standard compaction test done on a soil of particle specific gravity $G_s = 2.69$.

Sample number	1	2	3	4	5
Compacted sample volume (m^3) $\times 10^{-4}$	0.82	0.78	0.74	0.76	0.72
Mass of wet sample (Kg)	0.157	0.168	0.163	0.166	0.153
Mass of dry sample (Kg)	0.146	0.152	0.146	0.146	0.131

- (i) Calculate the bulk density, Moisture content and dry density for each sample using
- (ii) Draw a compaction curve
- (iii) Determine compaction parameters. **(15 marks)**

The British Soil Classification System (Extract)		
Description of typical soils	Sub-group Symbol	L.L (%)
Slightly Silty Or Clayey GRAVEL	GW GP GP _U GP _g	
Silty GRAVEL Clayey GRAVEL	GWM GPM GWC GPC	
Very Silty GRAVEL Very clayey GRAVEL	GML etc GCL GCI GCH GCV GCE	<35 35-50 50-70 70-90 >90
Slightly silty Or Clayey SAND	SW SP SP _U SP _g	
Silty SAND Clayey SAND	SWM SPM SWC SPC	
Very silty SAND Very clayey SAND	SML etc SCL SCI SCH SCV SCE	<35 35-50 50-70 70-90 >90
Gravelly SILT Gravelly CLAY	MLG etc CLG CIG CHG CVG CEG	<35 35-50 50-70 70-90 >90
Sandy SILT Sandy CLAY SILT (M-soil) CLAY	MLS etc CLAY etc ML etc CL CI CH CV CE	<35 35-50 50-70 70-90 >90
ORGANIC SOILS	Descriptive letter 'O' suffixed to any Group or Sub-group symbol	
PEAT	Pt	

PLASTICITY CHART

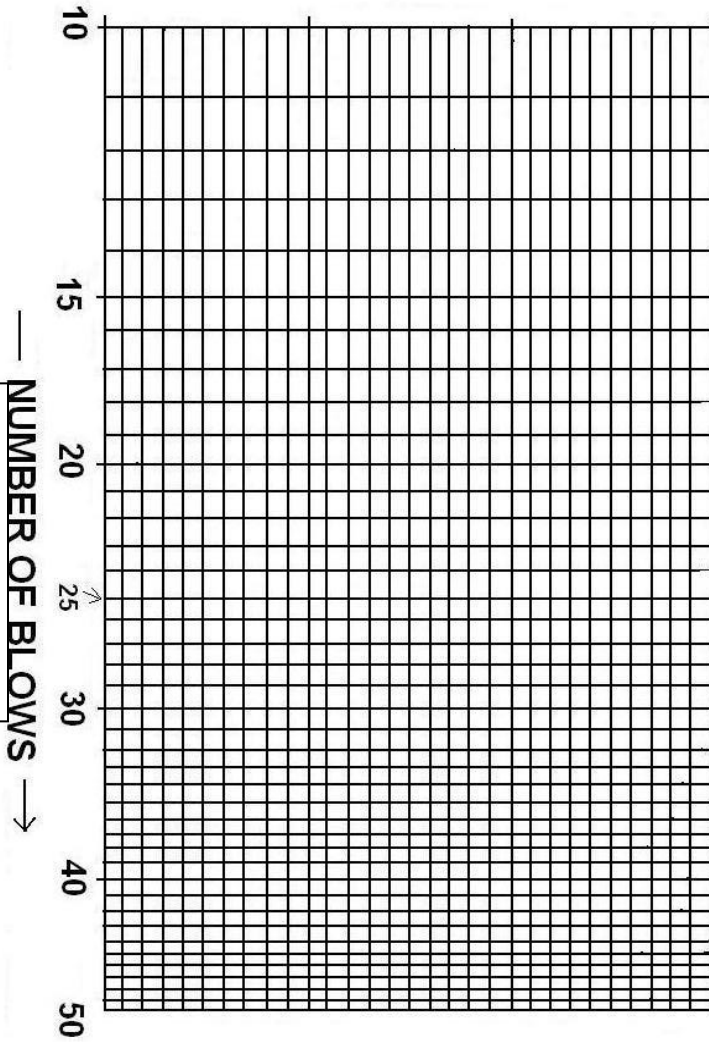
Y-axis: Plasticity Index (%)

X-axis: Liquid limit (%)



To be handed in together with the Answer Booklet

— MOISTURE CONTENT (%) →



— NUMBER OF BLOWS →

Detach along this line

