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.*

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 Gs = 2.69.

Sample number	**1**	**2**	**3**	**4**	**5**
Compacted sample volume (m^3)x 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)**

To be handed in together with the Answer Booklet

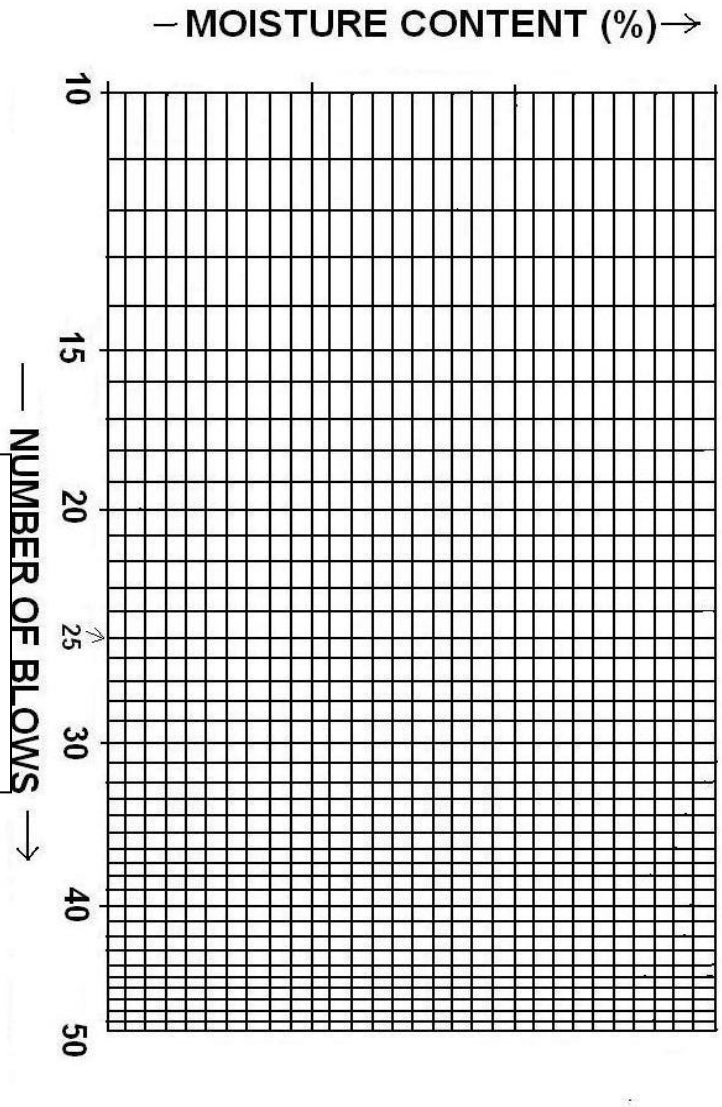

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FiG. 1

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	GWM GPM	
Clayey GRAVEL	GWC GPC	
Very Silty GRAVEL	GML etc	
Very clayey GRAVEL	GCL	<35
	GCI	35-50
	GCH	50-70
	GCV	70-90
	GCE	>90
Slightly silty Or Clayey SAND	SW SP SP_U SP_g	
Silty SAND Clayey SAND	SWM SPM SWC SPC	
Very silty SAND	SML etc	
Very clayey SAND	SCL	<35
	SCI	35-50
	SCH	50-70
	SCV	70-90
	SCE	>90
Gravelly SILT	MLG etc	
Gravelly CLAY	CLG	<35
	CIG	35-50
	CHG	50-70
	CVG	70-90
	CEG	>90
Sandy SILT	MLS etc	
Sandy CLAY	CLAY etc	
SILT (M-soil)	ML etc	
CLAY	CL	<35
	CI	35-50
	CH	50-70
	CV	70-90
	CE	>90
ORGANIC SOILS	Descriptive letter 'O' suffixed to any Group or Sub-group symbol	
PEAT	Pt	

PLASTICITY CHART

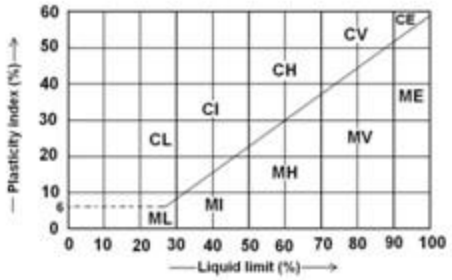

Fig. 2