

**Fourth Semester
Civil / CTM
Sixth Semester
PTDC Civil
Scheme July 2008
SOIL MECHANICS**

Time : Three Hours***Maximum Marks : 100*****Note :** i) Attempt total **five** questions out of **eight**.**Hb ArR>_§gonm àíZ hb H\$(OE&**

ii) In case of any doubt or dispute, the English version question should be treated as final.

{H\$gr ^r àH\$ma H\$ gXb AWdm{ddnK H\$ pñW{V ' | A§Or ^mfñH\$ àíZ H\$ma A§V' ' mZm Omñdk

1. a) Explain in brief the geological cycle of soil formation. 3
' Km H\$ Cen{Im go g§SYV ^y-dkñ(ZH\$ MH\$ H\$ g§ n ' | g' PnB¶
 - b) What are principal stresses? 3
' ¶| à{V~b 3¶m hnñohj?
 - c) Explain briefly the different types of water present in soil? 6
' Km ' | CnpñWV {d{^P àH\$ma H\$ nnZr H\$ g§ n ' | dUØ H\$(O¶
 - d) A vertical wall of 10m height is retaining sand whose level is horizontal. If unit weight of sand is 15 kN/m^3 and angle of internal friction is 30° , then calculate the total active earth pressure and its location. 8
EH\$ 10 ' r D\$Mr CüdmPa Xrdma H\$ nrNeaV ^ar h{j{OgH\$ gVh j {VO h\$ ¶X ' Km H\$ BH\$B^ma 15 {H\$.Y¶y/' r³ VWm AnV[aH\$ KfØ H\$HJ 30° hnñVñHb g{H\$¶| Xm- VWm CgH\$ pñW{V H\$ JUZm H\$(O¶
2. a) Draw a neat sketch of a core cutter instrument. 3
H\$ma H\$Oa CnH\$au H\$ma ndAN>(M) ~ZmAn
 - b) Why shrinkage and swelling of soil takes place? 3
' Km H\$ma 'bZm Ed§{gH\$Zm 3¶m hnñm hj?

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- c) Sketch a retaining wall with surcharge and show various forces acting on it. 6
 gaMnO^og{hV EH\$ [a0₁ZJ Xrdm₀ H\$_m{M} ~ZnB₁oEd§CgH₀ D\$na bJZ₀
 dm₀{d{^P ~b₁H\$_mXenB₁
- d) Name different types of bearing capacities. State interrelation between them. Also state factors affecting bearing capacity. 8
 {d{^YZ àH\$_m H\$ YmU j ' VmAn₁H₀ Zm {bI n Ed§CZH₀ ~rM g\$Y
 {bI n YmU j ' Vm H\$_mà^ndV H\$_aZodm₀H\$_mU ^r {bI n
3. a) State the objectives of soil investigation. 3
 ' Km AYdfU H₀ C0₁P {b{I P₁
- b) What is mechanical stabilization of soil? 3
 ' Km H\$_m P₁H\$ nWm₁H\$ U 3Pm hm/m h?
- c) Compare box shear test and triaxial shear test. 6
 -ng er₁a narj U Ed§O₁B₁e₁b er₁a narj U ' | VbZm H\$_m
- d) In a variable head permeameter, water level in the sample drops from h_1 to h_2 in t seconds and from h_2 to h_3 in T seconds. If
 $t = T$, then prove that : $h_2 = \sqrt{h_1 \times h_3}$. 8
 EH\$ n[adVu erf^onmaJaP₁Vm mnr Ünam {H\$gr ' Km H₀ Z' y₀ H\$_m narj U
 H\$_aZona Ob H\$_mVb h_1 go h_2 AnZo '| T g₁S>H\$_mg' P bJVmh& Ed§
 h_2 go h_3 VH\$ AnZo '| T g₁S>H\$_mg' P bJVmh& P(X t = T hmVm(g₀
 H\$₀O₁o{H\$ $h_2 = \sqrt{h_1 \times h_3}$.
4. a) Describe briefly a split spoon sampler. 3
 {d³V Ma' M à{Vxe^oH\$_mg' PnB₁
- b) Draw phase diagram for a saturated soil. 3
 {H\$gr g₁BV ' Km H\$_m àndñWm ad n{M} ~ZnB₁
- c) Explain Rankine's theory of earth pressure and its assumptions. 6
 ' Km Xm- H₀ aH\$BZ {g₀mV H\$_mg' PnH\$_a CgH\$ ' n₁P₁VnE+{b{I P₁
- d) Write the factors affecting compaction. Explain in short the procedure of compaction by sheep foot roller. 8
 g₁ZZ H\$_m à^ndV H\$_aZo dm₀ H\$_mH\$ {b{I P₁ ern ' J₀> amba Ünam
 g₁ZZ {H\$_m H\$_mg₁ n ' g' PnB₁

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5. a) Why semi - log graph paper is used to draw flow curves for determining liquid limit. 3
 Ðd gr'm knV H\$aZohWàdrh {M} ~ZnZoH\$ {bPloAY©bKwUH\$¶ Jm \$ nma H\$m hr Cn¶m 3¶m {H\$}m On/m h?
 b) State the limitations of a plate load test. 3
 BbØ>bn>narj U H\$ gr'mE {bI m
 c) An undisturbed soil sample has a volume of 0.02m^3 and weight 0.30 kN. On oven drying, the weight is reduced to 0.27 kN. If specific gravity of the grain is 2.6, find its :
 i) Water content
 ii) Void ratio 6
 ' Km H\$ EH\$ Aj wY à{VXe©H\$m Am|VZ Ed§ ^ma, H\$' e: 0.02 ' r³ Ed§ 0.30 {H\$.Y¶y h& AmZ ' | al Zo H\$ níMmV Bg à{VXe©H\$m ^ma 0.27 {H\$.Y¶y nmJ¶m J¶m h& ¶{X H\$Um H\$m {d{e}i> JeEd 2.6 hm Vm {ZaZ{b{I V knV H\${O¶&
 i) nmZr H\$ ' m m
 ii) [a{³V AZmmV
 d) Explain C.B.R. test with neat sketch and state its applications. 8
 gr.-r.Am. narj U H\$m g{M} dUZ H\$a BgH\$ Cn¶m H\$^r {b{I ¶&
6. a) Differentiate residual and transported soil. 3
 Ad{e}i> Ed§ n[ad{hV ' Km ' | A¶a nnr> H\${O¶&
 b) State the situations where soils of high permeability are used? 3
 CZ pñW(V¶m H\$ {bI mOhmCAM nnaJa¶Vm dñor ' Km Cn¶m hn/r h?
 c) A dry sample of sand was tested in a triaxial apparatus. Value of angle of internal friction was found to be 30° . If value of minimum principal stress is 3N/mm^2 , then calculate the value of major principal stress. 6
 EH\$ eñH\$ aV H\$ Z' ZñH\$ {l A j r¶ CnH\$aU Ünam ' nmZo na ' Km H\$m AmV[aH\$ H\$m U 30° ànBV hñAm & ¶{X Y¶zV' ' ¶¶ à{V~b H\$m ' mZ 3 Y¶y{' r² hm Vm A{YH\$V' ' ¶¶ à{V~b H\$m ' mZ knV H\${O¶&

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- d) Explain the constant head permeameter method of determining the coefficient of permeability of soil in the laboratory. 8
à¶nlenbm' | ' KmH\$mnnaJa¶VmJUnf\$ {ZH\$mbZoH\$ pñWa erf¶nnaJa¶Vm {d{dY H\$m dUZ H\${O¶}
7. a) State any three factors affecting the consolidation of soil. 3
' KmH\$ gKZZ H\$ à^ndV H\$aZo dmbo H\$B©VrZ H\$naH\$ {b I n
b) Explain briefly the method of collecting undisturbed sample. 3
Aj iY ' Km Z' ZoH\$ EH\$ H\$aZoH\$ {d{Y H\$m g§ n ' | dUZ H\${O¶
c) Explain various field identification tests of soil. 6
' Km H\$ nWbr¶ nhMnZ hVw{H\$}o OnZo dmbo narj Un H\$m dUZ H\$an
d) State and explain Stoke's law. How is it used in grain size analysis of soil? 8
nOab\$ H\$m {Z¶} {b I H\$a g' PnAn ' Km H\$ H\$U n[a' m dJuH\$aU ' |
BgH\$m Cn¶m {H\$}m àH\$na {H\$}m OnVm h?
8. a) State why void ratio is more useful than porosity? 3
g§Vm H\$ Anj m [a{³V AZmV ³¶n A¶nkm Cn¶mr h?
b) State different ways by which bearing capacity of soil can be increased? 3
' Km H\$ YnaU j 'Vm ~TzZoH\$ {d{^P Cn¶m {b I n
c) Explain 'Optimum moisture content' and Maximum dry density with the help of a compaction curve. 6
g§ZZ dH\$ H\$ ghmVm go 'AZmboV' Obm' Ed§ 'A{YH\$V' eñH\$ KZEd' H\$m g' PnB¶
d) An embankment is constructed of soil whose shear parameters are $\phi = 20^\circ$, $c = 3.5 \text{ kg/cm}^2$. Calculate the shear strength of soil on a horizontal plane at 7m below the top of embankment. Assume the bulk unit weight as 2.2 gm/cc. 8
' Km{OgH\$ H\$VØ n[a' {V $\phi = 20^\circ$ Ed§c = 3.5 {H\$/gør² h, goEH\$
' Km V0>Y ~ZmVm J¶m h, ' Km V0>Y H\$ gVh go 7 'r. JhanB©na
j {VO Vb na Anê\$nu gmt i¶cKmV H\${O¶ ' Km H\$m nWb KZEd
2.2 Jm/gør³ h

