COMBINED BANK

Post: Senior Officer (Civil)

Date: 2023

Exam Taker-BIBM

Combined Bank (Civil) 2023

Assistant Engineer (Civil)
Job ID: 10151
Exam Date: 09/06/2023
Exam Taker: Bangladesh Institute of Bank Management (BIBM)

This Exam was taken in two parts. One is preliminary and another is written. Preliminary and written exams were held together for long three hours.

1. **Part 01: Preliminary**
2. **Part 02: Written**

1. Preliminary Part: (MCQ)

Total Marks = 100

General:
Bangla, English, Math, and General Knowledge = 32*1.25 mark = 40 Marks

Departmental:
Civil Engineering =48*1.25=60 Marks

2. Written Part

Departmental = 170 Marks

01. What is Slump? What does it mean shear failure and collapse failure in slump test

Solution:

Definition:
Concrete Slump Test is a measurement of concrete's workability, or fluidity. It's an indirect measurement of concrete consistency or stiffness. A slump test is a method used to determine the consistency of concrete. The consistency, or stiffness, indicates how much water has been used in the mix. The stiffness of the concrete mix should be matched to the requirements for the finished product quality

Types Of Concrete Slump

The slumped concrete takes various shapes, and according to the profile of slumped concrete, the slump is termed as;

Diaphragm walls, or "D" walls as they are more commonly known, are a type of perimeter wall that provides a foolproof answer to any problem that may arise during underground building. D walls are ideal for controlling groundwater movement and maintaining stable earth retention. Because of its capacity to support the building's superstructure can be used even before the substructure is finished, speeding up construction. The top-down approach is useful for large-scale, deep-digging projects like building a metro system, a tunnel, or an underground parking garage. It could be the solution in cases when it is desirable to limit soil movement, but no tieback installation is available.

Advantages Of Top-Down Construction

1. Early restoration of the superstructure is possible even before the completion of the building and the structures above ground can be carried out simultaneously with the structures below ground. This greatly reduces the time for construction.

2. Concrete diaphragm walls are more cost-effective when they can simultaneously function as a groundwater cut-off and temporary soil retention system during the excavation phase of the project and then as permanent underground walls with load-carrying capabilities for the finished structure.

3. Easier and more economical construction of roof since it can be cast on prepared grade rather than using bottom forms.

4. The structural slab act as internal bracing for the support of excavation, thus reducing the number of tiebacks required.

5. The virtually vibration-free operation minimizes the potential for ground movement and its resulting detrimental settlement.

6. It requires less width for the construction area. Reduced environmental pollution associated with pre-construction earthworks.

7. Eliminates the need to underpin adjacent structures.

compaction is compared with the compacting effort of using 2.5kg (or 4.5kg) rammer in laboratories. In case the compaction test results indicate values exceeding 100%, it only means that the in-situ compaction is more than that being carried out in laboratories which is treated as the basic criterion for satisfactory degree of soil compaction. Therefore, the soil results are acceptable in case compaction test results are over 100%. However, excessive compaction poses a risk of fracturing granular soils resulting in the reduction of soil strength parameters.

04. What are the advantages of assigning the central pier and the abutment as fixed piers

Solution:

(i) For abutment pier to be assigned as fixed pier while the bridge is quite long, the longitudinal loads due to earthquake are quite large. As the earthquake loads are resisted by fixed piers, the size of fixed piers will be large and massive. In this connection, for better aesthetic appearance, the selection of abutment as fixed piers could accommodate the large size and massiveness of piers. Normally abutments are relatively short in height and for the same horizontal force, the bending moment induced is smaller.

(ii) (ii) For the central pier to be selected as the fixed pier, the bridge deck is allowed to move starting from the central pier to the end of the bridge. However, if the fixed pier is located at the abutment, the amount of movement to be incorporated in each bearing due to temperature variation, shrinkage, etc. is more than that when the fixed pier is located at central pier. Therefore, the size of movement joints can be reduced significantly

05. What Is Top-Down Construction? Advantages Of Top Down ConstructionTop-Down Construction:

Solution:

Top-down construction is a process in which, permanent structures are built from the ground up, beginning with a deep basement excavation. This method is the inverse of the more common bottom-up approach. This method involves constructing the basement levels in layers as the excavation continues. The concrete floors in basements act as lateral bracing for the surrounding walls. Slabs for the ground floor and basement are poured into the excavation holes. Since all subsequent below-grade levels have been completed, the floors can now act as lateral bracing for the perimeter walls.

02. What are the functions of bedding under storm water drains?

Solution:

Functions of Storm water Drain:

(i) To improve a uniform hold under pipes in order to decrease bending moment longitudinally;

(ii) To boost load-supporting strength of pipes;

(iii) For pipes with spigot and socket joints, it allows pipes to be supported all along pipe lengths in its place of pipe sockets. If not, irregular stress might be induced and it might damage pipes;

(iv) To provide platform for achieving correct placement and level during and after structure.

03. In Compaction test, field compaction results exceed 100%. Can engineer agree with it?

Solution:

Soil compaction is the process of increasing the soil density by reducing the volume of air within the soil mass.

Soil compaction depends mainly on the degree of compaction and the amount of water present for lubrication. Normally 2.5kg rammers and 4.5kg rammers are available for compaction in laboratories and the maximum dry densities produced by these rammers cover the range of dry density obtained by in-situ compaction plant.

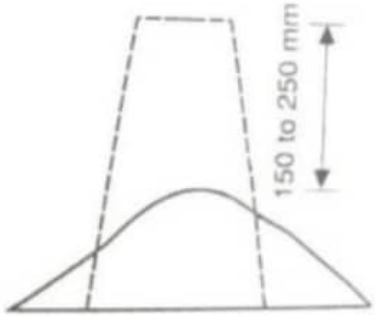
Regarding the second factor of water content, it affects the compaction in the following ways. In low water content, the soils are difficult to be compacted. When water content is increased gradually, water will lubricate the soils and this facilitates the compaction operation. However, at high water content, as an increasing proportion of soils is occupied by water, the dry density decreases with an increase in water content.

For soil compaction tests, the dry density obtained from compaction carried out in-situ by vibrating roller/vibrating plate is compared with the maximum dry density conducted in laboratories using 2.5kg rammer of compaction with similar soils. In essence, the in-situ

1. Collapse Slump
2. Shear Slump
3. True Slump

01.Collapse Failure

In a collapse slump failure the concrete collapses completely. A collapse slump will generally mean that the mix is too wet or that it is a high workability mix, for which slump test is not appropriate. It means the water-cement ratio is too high, i.e. concrete mix is too wet or it is a high workability mix, for which a slump test is not appropriate.

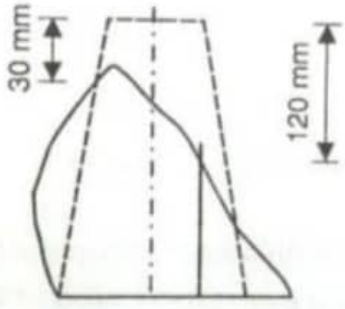


(c) Collapse

02. Shear Slump

In a shear slump the top portion of the concrete shears off and slips sideways or if one-half of the cone slides down an inclined plane, the slump is said to be a shear slump. The shear slump indicates that the result is incomplete, and concrete needs to be retested for valid results.

1. If a shear or collapse slump is achieved, a fresh sample should be taken and the test is repeated.
2. If the shear slump persists, as may the case with harsh mixes, this is an indication of lack of cohesion of the mix.



(b) Shear

it may not be considered a good substitute for concrete compression test.

Non-Department:

1. Technology is transforming in banking industry in Bangladesh. Explain
2. Essay on
"Social Networks and Trust Building"

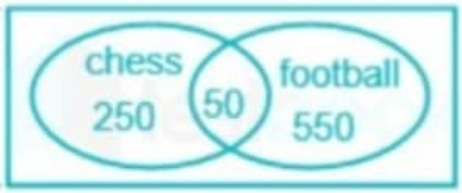
3. In a school of 1,000 students, 300 students play chess and 600 students play football. If 50 students play both chess and football, then what is the number of students who play neither?

The total number of students in school = 1000

Students who play chess = 300

Students who play football = 600

Students who play both chess and football = 50



Hence the total number of students playing sports = 250 + 50 + 550 = 850

∴ **The total number of students not playing any of the sports = 1000 – 850 = 150**

Saturated dissolved oxygen of river $(DO)_{mix}$
$=(DO)_W \times Q_W + (DO)_R \times Q_R Q_W + Q_R$
$=[8\times1000+2\times1001000+100]$
$=7.45mg/l$

∴ Immediate after mix $(DO)_{deficit}$
$=[(DO)_{sat}-(DO)_{mix}]$
$=[10-7.45]mg/lt$
$=2.55mg/lt$

09. A rigid pavement of length 5km, width 10ft, and thickness of 20 inch. Rigid pavement concrete mix ratio 1:2:4. Find quantity of cement in bags, sand, coarse and rebar in ton.

Solution:

Volume of concrete we need = length x breadth x thickness
= L x b x t
= 5x1000x3.28 x 10 x 20/12
= 273,333 cft

Wet Volume = 27333x1.54
= 420,933 cft

Quantity of Cement = (1/7)x420,933 /1.22
= 50,000 bags

Quantity of Stone Chips = (2/7)
Quantity of Sand =

10. If concrete compression test fails, should schmidt hammer test be adopted as an alternative test to prove the concrete strength?

A Schmidt hammer, also known as a Swiss hammer or a rebound hammer or concrete hammer test, is a device to measure the elastic properties or strength of concrete, mainly surface hardness and penetration resistance.

This test is a Non-destructive testing method of concrete which provide a convenient and rapid indication of the compressive strength of the concrete. The rebound hammer is consisting of a spring-controlled mass that slides on a plunger within a tubular housing. When the plunger of

07. Wooden plank width is 8 times of thickness, and length of 10ft. flexural strength= 300psi. Uniform load 140 lb/ft. determine cross section.

Solution:

Let, Thickness = h
Width b= 8h

Area = bxb =8hx8h=64h^2

Q =Ay
= (64h^2) x h/2

M= WL^2/8
=0.3x100/8
=3.75 k-ft

I = bh^3/12
= 8h x h^3/12
=8h^4/12

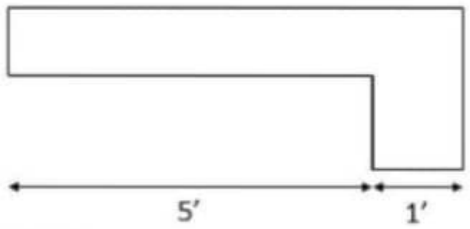
Flexural Stress =My/I
=> 300 = 3.75x0.5 h/ (8h^4/12)
=>

08. A river has a flow of 1000 million litres per day (MLD), BOD_5 of 5mg/litre and Dissolved Oxygen (DO) level of 8mg/litre before receiving the wastewater discharge at a location. For the existing environmental conditions, the saturation DO level is 10mg/litre in the river. Wastewater discharge of 100 MLD with the BOD_5 of 200mg/litre and DO level of 2mg/litre falls at that location. Assuming complete mixing of waste water and river water, the immediate DO deficit.

Solution

Given,
River flow discharge (Q_R)=1000MLD
Wastewater discharge (Q_W)=100MLD
(BOD_5)$_R$=5mg/lt
(DO)$_R$=8mg/lt
(BOD_5)$_W$=200mg/lt
DO)$_W$=2mg/lt
DO)$_W$=10mg/lt

06. A cantilever roof slab supporting a superimposed dead load and a live load of 60 psf. Design the cantilever slab as showed in the following figure according to ACI code and sketch rebar. If f'c is 3,000 psi and fy is 60,0000 psi



Solution:

Minimum total slab thickness, $h = \frac{L}{10} = \frac{5 \text{ x } 12}{10} = 6$ in

Effective depth, $d = 6 - 0.75(\text{cover}) - 0.25$ (estimated half diameter of bar size) $= 5$ in

Dead load, $DL = \frac{6}{12} \text{ x } 150 = 75$ psf

Live load, $LL = 60$ psf

$W_u = 1.4\,DL + 1.7\,LL = 1.4 \text{ x } 75 + 1.7 \text{ x } 60 = 207 \text{ psf} = 0.207 \text{ ksf}$

$M_u = \frac{W_u\,L^2}{2} = \frac{0.207 \text{ x } 5^2}{2} = 2.5875 \text{ k} - \text{ft}$

$M_u = \varphi\, A_s\, f_y\, (d - \frac{a}{2})$

$A_s = \frac{2.5875 \text{ x } 12}{0.9 \text{ x } 60 \text{ x } (5 - 0.085)} = 0.116 \text{ in}^2/\text{ft}$ (Assume, a $= 0.17$ in)

Check $a = \frac{A_s\, f_y}{0.85\, f_c'\, b} = \frac{0.116 \text{ x } 60}{0.85 \text{ x } 4 \text{ x } 12} = 0.172$ in

$\rho_{min} = \frac{200}{f_y} = 0.0033$

$A_{s,min} = \rho\, b\, d = 0.0033 \text{ x } 12 \text{ x } 5 = 0.198 \text{ in}^2/\text{ft}$

Using 10 mm bar $= \frac{0.11 \text{ x } 12}{0.198} = 6.66$ in

Provide 10 mm bar @ 6.5 in c/c

Transverse direction – Shrinkage and Temperature steel

$A_s = 0.0018\, b\, t = 0.0018 \text{ x } 12 \text{ x } 6 = 0.1296 \text{ in}^2/\text{ft}$

Use 10 mm bar @ 10 in c/c