

Q#	Points
Q1	19
Q2	10
Q3	20
Total	49

Midterm Exam, 24/4/2018, Time: 90 min. Full mark 60. No. of Questions 3

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Section:

**Q1: (25 marks) Choose only the most correct answer (one only) out of the given choices for the following:**

**1. Stress is**

- a) The applied loads
- b) Material deformation
- c) Internal Resistance of the material
- d) None of the above

**2. Workability as defined**

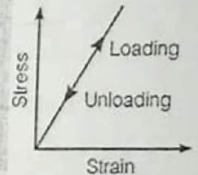
- a) Is difficult to measure
- b) Can be measured by slump test
- b) can be determined by visual inspection
- d) None of the above

**3. Calcareous Rocks**

Such as clay contain  $\text{CaCO}_3 > 75\%$  are the main source of silica oxides.  such as limestone contain  $\text{CaCO}_3 > 75\%$  are the main source of calcium oxides.

Such as clay contain  $\text{CaCO}_3 < 40\%$  are the main source of silica oxides. such as marl contain  $\text{CaCO}_3 < 40\%$  are the main source of calcium oxides.

**4. The shown diagram illustrate the stress strain relationship for**

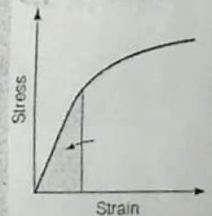


- a) Plastic material
- b) Elastic material
- c) Elastic-plastic material
- d) Hard material

**5. The single most important factor governing the workability of concrete**

- a) aggregate type and grading
- b) fineness of cement
- c) presence of admixtures
- d) water content

**6. The shaded area in the graph shown represents**



- a) Ductility
- b) Toughness
- c) Elastic modulus
- d) Modulus of resilience

**7. In preparation of raw materials for cement the Wet process compared with dry process is**

- a) More economical
- b) Less economical
- c) Preferable in cold countries
- d) Needs smaller kiln

8. The following physical material properties are of greatest concern to civil engineers

- a) Strength
- b) Density
- c) Thermal properties, and surface characteristics
- d) b and c

9. Select the wright statement from the following

- a) Elongated and flaky particles have high ratio of volume to surface area.
- b) Flaky particles enhance the durability and strength of concrete
- c) The higher the angularity number of aggregate the more rounded the aggregate
- d) The angularity of aggregate can be estimated from the proportion of voids among particles compacted in a prescribed manner.

10) Coefficient of softening describes

- a) Material resistance to wearing
- b) Material resistance to temperature change
- c) Material resistance to water
- d) Material resistance to load

11. Gypsum is added to cement to

- a) accelerate setting
- b) Enhance the binding of cement
- c) increase the heat of hydration
- d) Retarding the cement setting

12. In concrete Cement can be described as

- a) The filler
- b) The admixture
- c) The Paste
- d) The binder

13. Concrete is considered to be economical construction material as

- a) Excellent material for fire resistance
- b) Concrete can be cast to any desired shape
- c) Concrete properties may be tolerated for a specific application
- d) The raw materials are widely available in great quantities

14. Compactibility of fresh concrete is

- a) A function of the tensile stress.
- b) A function of the work done to compact the mix.
- c) A function of viscosity and wetness of the mix
- d) The ease with which the mix will flow

15. The durability of aggregates can be evaluated through

- a) soundness test
- b) relative density test
- c) petrographic test
- d) all of the above

16. The type of cement most suitable to be used where sulfates exist in soil or ground water is:

- a) Type I
- b) Type II
- c) Type V
- d) None of the above

17. Components of cement, which affect its strength properties significantly are:

- a)  $C_3S + C_4AF$
- b)  $C_3S + C_2S$
- c)  $C_3S + C_3A$
- d)  $C_2S + C_3A$

18. Rough texture of aggregate can improve:

- a) Friction between aggregate particles
- b) Adherence of particles with cement
- c) Gradation of aggregate
- d) a & b

19. The presence of clay lumps in aggregate will

- a) Increase compressive strength of concrete mixture.
- b) Decrease compressive strength of concrete mixture.
- c) Enhance the bond between cements and aggregate.
- d) a & c

20. In grain size analysis, well graded aggregates are:

- a) Those that have no deleterious materials, so it is well used in construction
- b) The aggregates that have high compressive strength.

c) The aggregates that have all sizes of aggregates in the sample

d) b&c

21) Excess amount of fines aggregates in concrete will:

- a) Increase the amount of required cement in concrete mixture
- b. Increase the compressive strength of concrete mixture.

c) Reduce the friction between aggregate particles.

d) a&c

22) Tilting drum mixer are suitable for

a) mixes of low workability

b) Wet mixes

c) Mixes containing large-size aggregate.

d) a&c

23. In Transit-mixed Ready-mixed Concrete

a) Concrete is partially mixed at the plant to shrink then completed in the truck mixer

b) Mixing is done at a central plant and then the concrete is transported in an agitator truck.

c) The materials are batched at a central plant but are mixed in the truck

d) b&c

24. Concrete mixes suitable for pumping shall

a) Be harsh or sticky

b) Have too little percentage of fines

c) The ratio of the maximum size of the coarse aggregate to the smallest inside pipe diameter should not exceed 0.9

d) Have a continuous grading curve near the middle of the limit range

25. As a general rule, the ratio of 7-day to 28-day strength

a) 2.3 - 2.5

b) .59 - .77

c) 1.5

d) none of the above

Q2: (15 points) Decide whether the following statements are true or false (T/ F)

✓ T	Mixing water that include <u>sulfate</u> can cause expansive reactions and <u>deterioration</u> of concrete in addition to mild effect on <u>corrosion</u> of steel in concrete *
✓ T	Water not fit for drinking may often also be satisfactorily used in making concrete
✓ F	Calcination is the formation of calcium silicates at 1400–1500°C.
✓ T	<u>Aggregate/cement</u> ratio is an important factor influencing <u>workability</u> . The higher the aggregate/cement ratio, the leaner is the concrete as less quantity of paste is available for providing lubrication.
X T	The contamination of aggregates by <u>salt</u> will affect the setting properties and ultimate strength of concrete. Additionally a <u>severe</u> corrosion of reinforcement may also result
✓ F	The transition zone has <u>less</u> un hydrated cement; large oriented crystals of calcium hydroxide; and greater concentration of ettringite which make it <u>stronger</u> than the hydrated paste further away from the aggregate.
✓ F	The use of <u>rough</u> and <u>angular</u> crushed aggregate in concrete mixes leads to cracking at <u>lower</u> stresses than when <u>smooth</u> gravel aggregate are used.
X T	One of the main disadvantages of vibrators is that they are not suitable for use with wet concrete as it can cause segregation. ?
✓ T	A low water–cement ratio increases concrete resistance to <u>weathering</u> and provides a good bond between concrete and steel reinforcement.
X T	Bogue's equations can be used to determine the weight percentages of different oxides in the cement mix. ?
X F	The <u>clay</u> , <u>silt</u> and fine <u>dust</u> contents of fine aggregate can be determined by the <u>sedimentation</u> method, whilst a wet-sieve method can be used for coarse aggregate. ✓
✓ F	<u>Abrams</u> law state that strength of concrete can be taken to be inversely proportional to the <u>water/cement</u> ratio <u>irrespective</u> to any other factor.
X T	Amount of gypsum added to the clinker is crucial, and depends upon the <u>C<sub>3</sub>S</u> content and the alkali content of cement, in addition to cement fineness. ✓
✓ T	Both compaction by hand and compaction by vibration can produce good quality concrete, with the right mix and workmanship
✓ T	In general, concrete containing a <u>calcareous coarse</u> aggregate performs better under fire exposure than a concrete containing quartz or <u>siliceous</u> aggregate

(10)

Q3: (20 marks) Fill in the blanks with the missing sentences, paragraphs or diagrams

a) The presence of free lime in cement can result in undesirable effects such as

1. Volume expansion.
2. Increase of the setting time.
3. Reduce of the strength.

b) The main Advantages of vibrators are

1. it's give us good quality, strength of low workability mixed.
2. it's necessary for heavily reinforcement.
3. it's necessary where poor shape of aggregate so the workability will be lower unless amount of cement and water added.

c) Workability is defined as:

the amount of internal force necessary to produce cohesive and full compaction concrete, and internal force is the amount of energy required to overcome of friction between aggregate.

d) In consequence of hydration, the mix water takes one of three forms:

1. gel water.
2. combined water.
3. Capillary water.

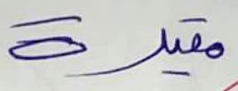
e) As a hydration product  $\text{Ca(OH)}_2$  is not a desirable product in the concrete mass because:

1. it's soluble in water so it's make the concrete porous
2. it reacts with sulphate, and cause deterioration of concrete known as sulfate attack.

However it's only advantage is that

it maintain the value of pH around 13 so it's reduction the amount of corrosion of reinforcement steel.

f) A concrete cubical test specimen usually fail in conical shape due to:

due to it ~~is~~  between the plate of the machine, so there are lateral compression on it cause the conical shape.

g) Explain why the actual tensile strength of the hydrated cement paste is very much lower than the theoretical strength

because in theoretical we considered that the concrete is homogenous and flawless, but in actual the <sup>and</sup> <sup>heterogeneous</sup> concrete have multij cracks and flaws, so the actual less than theoretical by 1000 times.

h) Compressive strength of concrete is defined as

the maximum resistance of the concrete to the axial ~~applied~~ load after 28-days and it's measure by (MPa).