**Q1** Provide thethree methods used to obtain representative sample from a stockpile.

***Answer (choose any three of theses)***

Methods of Taking Representative Field Samples: ■ Sampling from a Flowing Aggregate Stream (Bins or Belt Discharge):

 At least three approximately equal increments.

 Selected at random.

 All the increments are mixed to form a field sample.

■ Sampling from the Conveyor Belt:

 At least three approximately equal increments.

 Selected at random.

 Stop the conveyor belt.

 Insert two templates.

 scoop all material between the templates.

 All the increments are mixed to form a field sample.

■ Sampling from Stockpiles or Transportation Units:

 At least three approximately equal increments.

 From the top third, at the mid-point, and at the bottom third.

 A board shoved vertically into the pile just above the sampling point aids in preventing segregation.

 For fine aggregate, the outer layer should be removed.

 For fine aggregate, sampling tubes may be inserted into the pile at random locations to extract a minimum of five increments.

 All the increments are mixed to form a field sample.

Methods of Taking Small Samples out of Field Samples include: Quartering and Splitting.

**Q2** Define the following terms:

* Bulk specific gravity [2marks].
* Apparent specific gravity [2marks].
* Effective specific gravity [2marks].

Specific gravity is the ratio of the mass of a unit volume of a material at a stated temperature to the mass of the same volume of gas-free distilled water at a stated temperature.

Bulk Specific Gravity (Gsb): The volume measurement includes the overall volume of the aggregate particle as well as the volume of the water permeable voids. The mass measurement only includes the aggregate particle. Since it includes the water permeable void volume, bulk specific gravity will be less than apparent specific gravity.

Apparent Specific Gravity ( Gsa): The volume measurement only includes the volume of the aggregate particle; it does not include the volume of any water permeable voids. The mass measurement only includes the aggregate particle. Apparent specific gravity is intended to only measure the specific gravity of the solid volume; therefore it will be the highest of the aggregate specific gravities.

Effective Specific Gravity (Gse): Volume measurement includes the volume of the aggregate particle plus the void volume that becomes filled with water during the test soak period minus the volume of the voids that absorb asphalt. Effective specific gravity lies between apparent and bulk specific gravity.

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| [Figure 1. Dry aggregate.](http://pavementinteractive.org/index.php?title=Image:Aggregate_dry.jpg)  Figure 1. Dry aggregate. | [Figure 2. Wet aggregate.](http://pavementinteractive.org/index.php?title=Image:Aggregate_wet.jpg)  Figure 2. Wet aggregate. |

**Q3** Why do we need to assess the specific gravity of aggregates? [1 mark].

We will need it when designing an asphalt concrete mixture.

**More for you to know on Specific gravity**

There is no specification for bulk specific gravity, but it is used to calculate other specified parameters when designing Hot-mix Asphalt. We will revisit this section latter.

Bulk Saturated Surface Dry (SSD) Specific Gravity: Volume measurement includes the overall volume of the aggregate particle as well as the volume of the water permeable voids. The mass measurement includes the aggregate particle as well as the water within the water permeable voids.

Gsa ≥ Gse ≥ Gsb

Bulk (SSD) specific gravity ≥ Gsb

**C:\Program Files\Microsoft Office\MEDIA\CAGCAT10\j0252349.wmfUseful Links on aggregates**

Check the following useful WebPages.

<http://training.ce.washington.edu/wsdot/Modules/03_materials/03-2_body.htm>

http://www.dot.ca.gov/hq/esc/Translab/pubs/Ontario\_Gradation.pdf

<http://pavementinteractive.org/index.php?title=Bulk_Specific_Gravity> <http://www.iowadot.gov/erl/archives/Apr_2003/im/content/301.pdf>