Name	Jamal Faraz
ID	7832
Dept	Be (civil), "6th Simister"
To	Eng. Farhan Saib
Subject	Transpotation (II) Theory
Exam	Final Term
Date	22 June, 2020

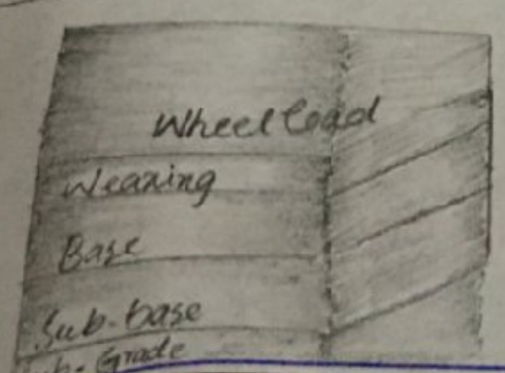
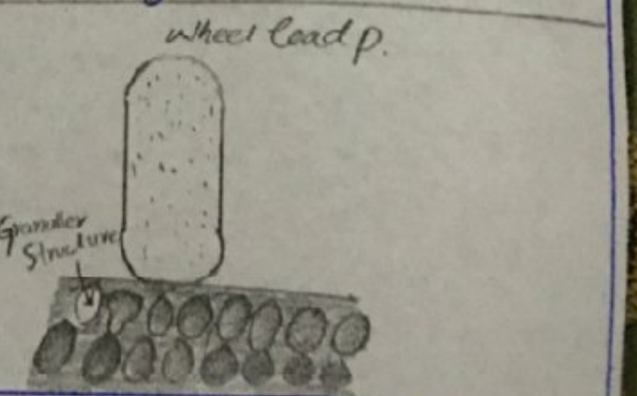
Scanned with Cam

Q. NO. 1 Part A

(+3.33)

Answer:-

Comparison of flexible vs Rigid Pavement

Flexible Pavement	Rigid Pavement
1) Bituman is used a binder in flexible pavement.	1) Cemene is used as a binder in rigid pavement.
2) Deformation of in the Sub Grade is transfered to the upper Layer.	2) Deformation in the Sub-Grade is not transferred to Subsequent Layers.
3) Load is transferred by Grain to grain contact.	3) No Such phenomena of grain to Grain load transfer exists.
4) Flexible Pavement have low initial construction costs but have high maintenance cost.	4) Rigid Pavements have low maintenance cost but have high initial construction costs.
5) Road can be used for traffic within 24 hours.	5) Road can't be used Unill 14 days of Curing.
	

Scanned with Cam

Q. NO. 1:-
Part B:-

* Ans:-
Advantage of water Bond over wet mix mecadam:-

* Main advantage:- * The main advantage of wet mix mecadam over water bound mecadam is that it is composed of well Graded mixture. This ensure good interlock and high stability.

* Addition of water while mixing facilites the handling of the mixture the operation of laying is much Simpler then that of water bond mecadam. where the Screening and the binding material have to be added in Stages and forced into voids. if a Crusher Run material is used there is no possibility of plastic fines entering into the mixture.

* The Compaction is greatly facilited by the moisture added which Lubricates the individual Particales

* The Aggregates for wet mix macadam will have to be Crusher Run whereas the aggregates for water bond mecadam are Generally hand broken.

* Main Advantage:- The main advantage is its Composed of well Graded mixture.

Scanned with Cam

Q.NO.1# Part C:-

Ans:-

*. Difference b/w Asphalt and Bituman:-

Bituman:-

- Bituman is a liquid binder.
- It hold asphalt togather.
- A bituman Sealed Surface is a Layer of bituman Sprayed and then covered with an aggregade.

Asphalt:-

- Asphalt is produced in plant.
- It produced in plant that heats, dries and mixes aggregate, bituman and Sand into a Composite.

Benifits of Asphalt:-

1) Minimal noise.

2) Reduced wear and tear on vehicale and tires.

3) Safe then most Pavement option.

Benifits of Bituman:-

1) Cheap to install Compared to Asphalt.

2) Can be recycled instead of Going to Land Fill.

Scanned with Ca

Q.NO # 2 :-

Ans:-

Required Data:-

Calculate the elevation of Intermediate points on the Curve at the whole Stations=?

Solution:-

As we Know

For Designed Speed of 75 mi/h, K= 312

From table.

1) Minimum lenght = $312 \times [3-(-4)] = 2184 ft.$

2) Station of BVC = $(345+60) - \left(\frac{21+84}{2}\right) = 334+68$

3) Station of EVC = $(334+68)+(21+84) = 356+52$

4) Elevation of BVC = $250 - \left(0.03 \times \frac{2184}{2}\right) = 217.248$

* The remainder of the computation is efficiently done using the format show in table graph.

Scanned with CamScanner

Station	Distance from BVC (x) (ft)	Tangent Elevation (ft)	Offset $\left[Y = \frac{Ax^2}{200L}\right]$ (ft)	Curve Elevation (Tangent Elevation − offset) (ft)
BVC 334+68	0	217.24	0.01	217.24
BVC 335+00	32	$217.24 + \frac{32}{100} \times 3 = 218.20$	0.02	218.18
BVC 336+00	132	221.20	0.28	220.92
BVC 337+00	232	224.20	0.86	223.34
BVC 338+00	332	227.20	1.77	225.43
BVC 339+00	432	230.20	2.99	227.21
BVC 340+00	532	233.20	4.54	228.66
BVC 341+00	632	236.20	6.40	229.80
BVC 342+00	732	239.20	8.59	230.61
BVC 343+00	832	242.20	11.09	231.11
BVC 344+00	932	245.20	13.92	231.28
BVC 345+00	1032	248.20	17.07	231.13
BVC 346+00	1132	251.20	20.54	230.66
BVC 347+00	1232	254.20	24.32	229.88
BVC 348+00	1332	257.20	28.43	228.77
BVC 349+00	1432	260.20	32.86	227.34
BVC 350+00	1532	263.20	37.61	225.59
BVC 351+00	1632	266.20	42.86	223.52
BVC 352+00	1732	269.20	48.07	221.13
BVC 353+00	1832	272.20	53.79	218.41
BVC 354+00	1932	275.20	59.82	215.38
BVC 355+00	2032	278.20	66.17	212.03
BVC 356+00	2132	281.20	72.84	208.36
BVC 356+52	2184	282.76	76.44	206.32

Scanned with Cam

Q.NO#3

Solution:-

Ans:- Draw a line joining the relability level of 99% and the overall-standard divation (So) of 0.49 and extend line to intersect the first (TL) line at point (A).

Step#2:- Draw a line joining point A to the ESAL of 2×10^6 and extend this line to intersect the first TL line at point B.

Step#3:- Draw a line joining point B and resilent Modulus (MR) of base course and extend this line to intersect the design Servicability loss chart at point C.

Step#4:- Draw a horizental line from Point C to intersect the design Serviciability loss (PSI) curve at Point D. on this Problem $\boxed{\Delta PSI = 4.5 - 2.5 = 2.0}$

So the Structure number required to protect the base course and to find the thickness D_1 of the Surface course is 2.6

Scanned with CamScanner

Step#58-

Determine the appropriate Structure layer co-efficient for each construction material Resilient value of Asphalt - 450,000 lb/in², Therefore $a_1 = 0.44$

Thickness of Surface course (D_1):-

By Formula $D_1 = SN_1^* / a_1$

$= \frac{2.6}{0.44}$ $= 5.9'' \approx 6''$

As thickness should be taken to nearest 0.5", So the thickness of the surface course is 6"

Now, $SN_1^* = D_1 \times a_1$

$= 6 \times 0.44$

$SN_1^* = 2.64$

Thickness of Base course (D_2):-

By formula $D_2 = \frac{SN_2 - SN_1^*}{a_2 m_2}$

$= \frac{3.8 - 2.64}{0.14 \times 0.80}$ $\Rightarrow D_2 = 10.36''$

Rounding D2 to nereast whole no, 12"

∴ The thickness of Base course is 12"

$SN_2^* = 0.14 \times 0.80 \times 12 + SN_1^*$

$= 1.34 + 2.64 \Rightarrow 3.98$

$SN_2^* = 3.98$

Scanned with CamScanner

Thickness of Sub-Base course (D_3):-

$$\Rightarrow D_3 = \frac{SN_3 - SN_2^*}{a_3 \; m_3} = \frac{4.4 - 3.98}{0.10 \times 0.80}$$

$$D_3 = 5.25$$

We take 6" instead of 5.25" $\Rightarrow D_3 = 6"$

$$\Rightarrow SN_3^* = 2.64 + 1.34 + 6" \times 0.10 \times 0.80$$

$$SN_3^* = 4.46$$

$$As = 4.46 > 4.4 \rightarrow \textbf{OK}$$

Final Design:-

⇒ Surface Course = 6"
⇒ Base Course = 12"
⇒ Sub Base = 6"
⇒ Total Pavement thickness = 24"

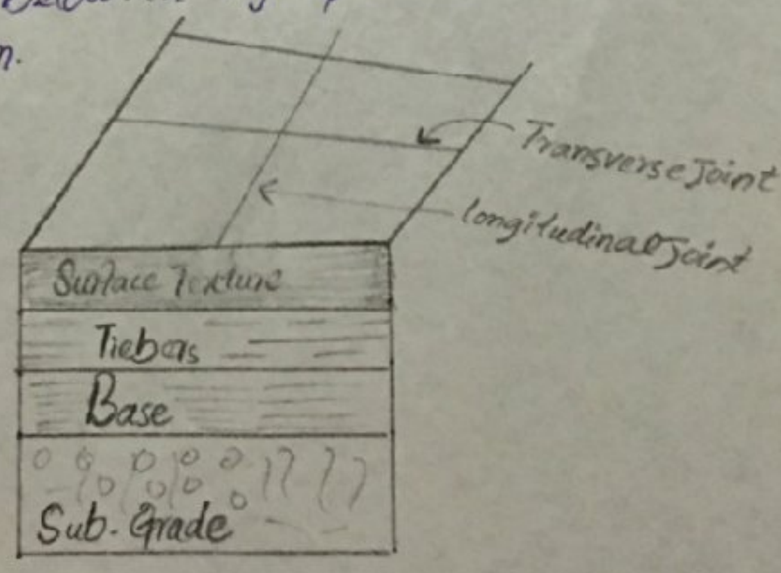
Scanned with CamScanner

Q.NO#4:-

Ans:- **Different Pavement Distresses:-**

Introduction:- A Highway Pavement a structure of Consisting Super imposed Layers of processed materials. The Pavement Structure should be able to provide a Surface of acceptable riding quality, Adequate Skid resistence favourable Light reflecting characteristic and low noise pollution.

Rigid Pavements- Rigid Pavement have Sufficient Flexural Strenght to transmit the wheel load Stresses to a wider area below. In Rigid Pavement, load is distributed by Slab Action.



Scanned with CamScanner

Factored Affecting Pavement Performance:-

* Traffic. contact Pressure, wheel loading, Axle configuration Moving load.
* Structural model. Layer elastic model
* Material Characterization.
* Environmental Factor. Temparature, Moisture.

Common Rigid Pavement Distresses:-

1) Spalling
2) Faulting
3) Cracking
4) Longitudinal Crack
5) Slab Cracking
6) Durability Crack
7) Polished Aggregat
8) Pumping and water Bleeding.
9) Shrinkage Cracking.

Scanned with CamScanner

Details:-

1) Spalling at the Joints:- Cracking, breaking or chipping of Joints/crack edges. Usually occures with in about 0.6m (2ft) of Joint/Crack edge.

* It caused by infiltration of incompresible material and subsequent expension (can also cause blowsups).

2) Faulting:- A difference in elevation across a joint or Crack usually associated with undowled JPCP. usually the approch slab is higher then the leave slab due to pumping.

3) Longitudinal Cracking:- Longitudinal Cracks not associated with corner breaks or blowups that extend across the entire slab into two or four pieces.

4) Corner Cracking:- A slab that intersect the pcc slab joint near the corner with in about 2m (6ft) or so. A corner extends through the entire slab and caused by high corner stresses.

Scanned with CamScanner

5) Rutting:-

Surface depression in a wheel path are particulary evident after a rain when they are filled with water.

Cause:-

1) insufficient Compaction.
2) Sub-grade routing.
3) Improper mix-design.

Repairs-

1) Slight ruts ($\frac{1}{3}$ inch deep).

6) Bleedings-

. loss of SKid resistence when wet.

Cause:-

. Excessive asphalt binder in the HMA
. Excessive application of Asphalt binder during BST aplication.

7) Polished Aggregade:-

Causes- Repeated traffic aplication. This can be occure quicker if the aggregate is Susceptible to abrasion.

Scanned with CamScanner

8) Alligator:-

Cause:- Overloading, Poor Construction.

Repair:-

1) Crack Sealing is an effective.
2) Dig out and replace area of Subgrade.

9) Block Cracking:-

Allow moisture infiltration.

Cause:-

HMA Shrinkage.
Asphalt binder aging.

10) Pumping and Bleeding Water:-

The movement of water or material Underneath the Slab or ejection of material from Underneath the Slab as a result of water Pressure. Water accumulation underneath a PCC Slab will Pressurized when the Slab defects under load.

Scanned with Cam