DATE 22 DAY 06 MONTH 2020 YEAR

Highway & Traffic Engineering. Ihtisham Fida.
Marks:- 50.
Instructor:- Dr. Nadeem Anwar. I-d # 7209.

Question #01.

Part #C:- What is the difference b/w asphalt & bitumen.

Ans:- Bitumen is actually the liquid binder that holds asphalt to geather. A Bitumen Sealed road has a layer of bitumen Sprayed & then covered with an aggregate. This is then repeated to give a two-coat Seal.

Asphalt is Produced in a Plant that heats, dries & mixes aggregate, bitumen & Send into a composite mix.

Part # B: what is the Advantages of water bound over wet mix macadam?

Ans:- Advantages of water Bound over a mix macadam:

1)= water bound macadam is superior in quality because the materials are carefully graded & the resulting mass is almost void less compacted mass

2)= The interlocking of aggregate Particals impact adequate Strength of the materials Selected for filling the voids. These ensure non-entry of the Plastic materials of the sub-grade into the voides.

3)= water bounds macadam is less costly as compared to bituminous base Course.

Part # A:- What is the different b/w Flexiable & rigid

Ans:- Flexiable Pavement	Rigid Pavement.
1)= Grain to gain load transfer	1)= Slab action take Place.
2)= Initial Cost is low.	2)= initial Cost is high.
3)= joints are not required	3)= Joints are required.
4)= Durability is less.	4)= Durability is high.
5)= Good Subgrade is required	5)= Good sub-grade is not required.
6)= Life time is short.	6)= Long life span.
7)= Repair work is easy.	7)= Repair work is tough.
8)= Maintance cost is high.	8)= Maintance cost is low.
9)= Required less curing time.	9)= Required much Curing time.
10)= Poor night visible	10)= good night visibility.
11)= No glare due to sunlight.	11)= High glare due to Sunlight.
12)= ~~Design~~ Thickness is more	12)= Thickness is less.
13)= Design depends on Sub-grade.	13)= Design not depends on sub-grade
14)= IRC-37.	14)= IRC-58.

Question #04: What are the different Pavement distresses? Explain in detail.

Ans:- The common types of Pavement distresses include; cracking, distortion, disintegration, skidding hazards, & Surface treatment distresses.

Some of the typical causes of pavement deteoriorat-ion include ~~the typical causes of pavement~~ traffic loading, environmental or climate influences, drainage deficiencies, materials quality Problems, construction deficiencies ~~materials quality Problems~~ & external contribution such as utility cuts.

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a) = Cracking :-

Several different types of cracks can develop in asphalt pavements. The repair depends on the types of crack, some cracks are load-related & some are attributable to temprature or enviroment. There are many types of craking such as;

- Fatigue Cracking.
- Block Cracking.
- Edge Cracking.
- Longitudinal Cracking.
- Transverse Cracking.
- Reflecting Cracking
- Slipping Cracking.

b) = Distortion :-

Distortion ~~is~~ a in an asphalt pavement are caused by in stability of an asphalt mix or weakness of the base or subgrade layers. These distresses may include rutting, shoving, depressions, swelling & patch failures.

c) = Disintegration :-

Disintegration is the backup of a pavement into small pieces that are lost with time & traffic. Raveling & Potholes are the most common types of disintegration.

d) = Skidding Hazards :-

Skidding Harzards are caused by water on the surface of the Pavement, polished

aggregates or excess asphalt or other lubricants on the Pavement & Surface. Maintaining a Pavement which allows water to flow off the Pavement is a basic Consideration. Skidding Hazards have two main types which are as;

1) = Polished Aggregate.
2) = Bleeding.

e) = Surface Treatment Distress:-

Surface treatment Distress can experience their own distresses. These include loss of cover aggregate & streaking. Surface Treatment Distress is also a part of loss of cover Aggregates & Streaking.

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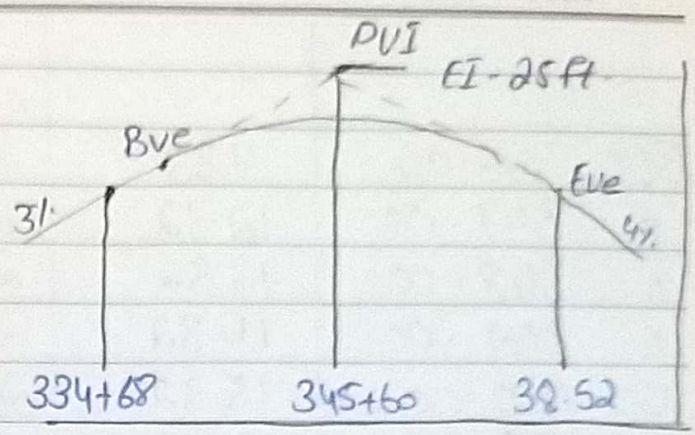
Question #02



Solution:-

For a design speed of 75 m/h. , K = 512.

Mixinum length = $312 \times [3-(-4)] = 2184$ ft

Station of Eve = $[334-68) + (21+84) = 356+52$

Elevation of Bve = $250 - \left(0.05 \times \frac{2184}{2}\right) = 217.24$ ft

The remainder of the computation is effeciely done lesing the format shown in table.

Station	Distance BVC(in) (ft)	Tangent Elevation (ft)	offset $\left(r = \frac{Ax^2}{200L}\right)$ ft	curve elevation tanget 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
" 339+00	432	230.20	2.99	227.21
" 340+00	532	233.20	4.54	228.66
" 341+00	632	236.20	6.40	229.86
" 342+00	732	239.20	8.59	230.61
" 343+00	832	242.20	11.09	231.11
" 344+00	932	245.20	13.92	231.25
" 345+00	1032	248.20	17.07	231.13

BVC	346.00	1132	251.20	20.54	230.66
〃	347.00	1232	254.20	24.32	229.88
〃	348.00	1332	257.20	28.43	228.77
〃	349.00	1432	260.20	32.86	227.34
BVC	350.00	1532	263.20	37.61	225.59
〃	350.00	1632	266.20	42.68	223.052
〃	352.00	1732	269.20	48.07	221.15
〃	353.00	1832	272.20	53.79	218.41
〃	354.00	1932	275.20	59.82	215.38
〃	355.00	2032	278.20	66.17	212.05
〃	356.00	2132	281.20	72.84	208.36
EVC	356.52	2184	282.76	76.44	206.32

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Question # 03:-

Answer:-Step#01 Draw a line Joining the relicability level of 99 % & the over all - Standard divation so of 0.49 & extend line to intersect the first TL line at Point A.

Step#02:-

Draw a line Joining Point A to the ESAL of 2 x 10 & extend this line to intersect the first TL line at Point B.

Step#03:-

Draw a line Joining Point B & resistions modules (Mr) of base course & external thie line to intersect the design reviceablity loss chart at Point C.

Step#04:-

Draw a horizontal line from Point-C to intersect the design rervicabitity.

→ loss (PSI) Curve at Point D, So here

$\Delta PSI = 4.5 - 2.5 = 2.$

Step#05:-

The Structure number require to Protect the base curvge & to find the their Ds of the Surface Coarse is 2.6.

Step #06:-

Determine the appropriate structure longer co-efficient for rock construction material resilient value of asphalt = 450,000 lb/in².

therefore,

$a_1 = 0.044$.

$D_1 = SN_1 / a_1$

$= 2.6 / 0.44 = 5.92$.

Thickness should be taken to the nearest 0.5 inch, So the thickness of the surface course 136"

$SN_1 = D_1 \times a_1$

$= 6 \times 0.44 = 2.64$.

⇒ Now find SN_2 & D_2 (Base course) find the value of a_2 from layers co-efficient table & M_2 from drainage co-efficient table.

⇒ Thickness of base course (D_2)

$D_2 = (SN_2 - SN_1) / a_2 M_2$.

$D_2 = (3.8 - 2.64) .14 \times 0.80$.

$D_2 = 10.36"$.

Use 12"

So, the thickness of base course is 12"

$SN_1 = 0.14 \times 0.80 \times 12 + SN_1$.

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$SN_1 = 0.14 \times 0.80 \times 12 + SN_0$.

$SN_2 = 1.34 + 2.64$.

$SN_2 = 3.98$.

=> Finding SN_2 & D_3 (sub-base course) & also layer co-efficient a_3 & drainage co-efficient M_2 from their respective table,

$D_3 = (SN_3 - SN_2) / 9.3 M_2$.

$D_3 = (4.4 - 3.98) / 0.10 \times 0.80$.

$D_3 = 5.24''$

We will use 6" as a sub-base.

$SN_3 = 2.64 + 1.34 + 6'' \times 0.10 \times 0.80$.

$SN_3 = 4.46 > 4.4$ ok!.

Final Design:-

-> Surface course = 6"
-> Base course = 12"
-> Sub base = 6"
-> Total Parameter thickness = 24".