Final Term Exam

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Section "A"

Semester 6th

Subject Highway and Trabbic Engineering

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Q NO 01 (A) What is the difference between flexible and Rigid Pavement

Flexible Pavement	Rigid Pavement
1) Bitument is used a binder in Flexible Pavement	1) Cement is used as a binder in Rigid Pavement
2) Deformation in the Sub grade is transfeerd to the upper layer	2) Deformation in the subgrade is not transfeerd to sub-sequent layer
3) load is transferred by grain to grain contact	3) No such Phenomenon of grain to grain load transfer exist
4) Flexible Pavements have low initial contruction ~~con~~ costs but have high maintenance cost	4) Rigid Pavement have low maintenace cost but have high initial construction cost
5) have low life span usually 10-15 year	5) life span is more as compare to flexible Usually 30+ year

6) Surfacing can not be laid directly on the sub grade but a ~~stab~~ sub base is needed	6) Surface can be directly laid on the sub grade
7) In flexible pavement strength of road highly dependent on strength of sub grade	7) Strength of road less dependent on strength of sub grade in rigid pavement
8) Road can be used for trafic with in 24 hrs	8) Road can, not be used until 14 days of curing

Q No1 (b) What are the advantage of water bound over wet mix macadm

Advantage of W.B.M over W.M.M:-

1) The water bound Macadm construction of base coarse is less costly then the wet mix macadm as its specification do not involve the use of mixing Plant and Power

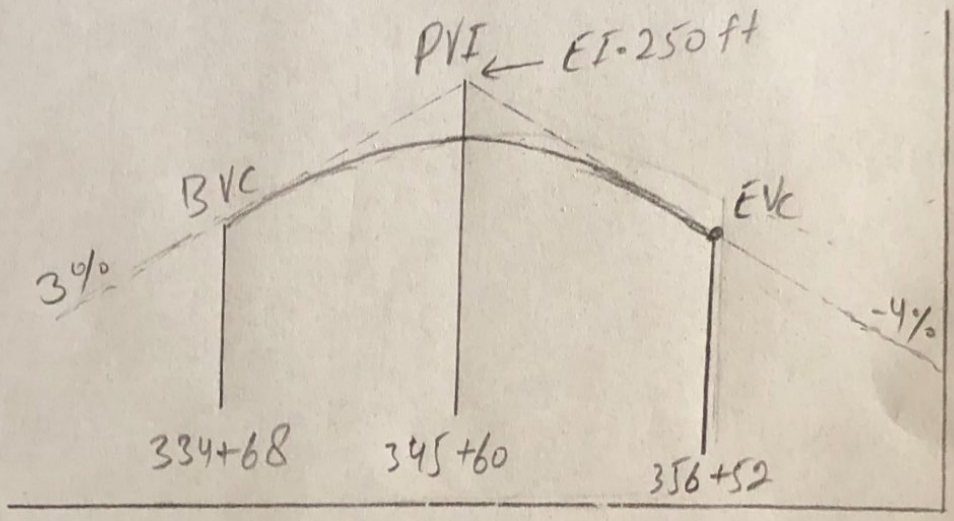
2) Water bound macadm required more time for construction

3) water mix macadm road are superies the water bound macadm in all aspect but the WBM is old method of construction having low construction cost becuse it has been traditionally a labour oriented specification.

Q No 01 (c) What is the difference between asphalt and bitumen?

Bitumen is the liquid binder that holds asphalt together. A bitumen sealed surface is a layer of bitumen sprayed and then covered with an aggregate this is then repeated to give a two coat seal Asphalt is produced in a plant that heats, dries and mix aggregate bitumen and ~~sen~~ sand into a composite

QNo 2 A crest vertical curve joining a +3 percent and -4 percent grade is to be designed for 75 mi/h if the tangent intersect a station (345+60.00) at an elevation of 250 ft Determine the station and ~~eve~~ elevation of the BVC and EVC Also calculate the elevation of intermediate point on the curve at the whole station



Sol for the design speed of 75 mi/h

$K = 312$

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

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

$= 334+68$

Station of EVC = (334+68) + (21+84)

= 356+52

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

= 217.24 ft

Station	Distance from BVC	Tangent Elevation	Offset $\left[y = \frac{Ax^2}{200L}\right]$	Curve Elevation (Tangent − Offset) ft
BVC 334+68	0	217.24	0.01	217.24
	32	$217.24 + \frac{32}{100} \times 3 = 218.2$	0.02	218.18
BVC 335 +00		221.20	0.28	220.92
BVC 336+00	132	224.20	0.86	223.34
BVC 337+00	232	227.20	1.77	225.43
BVC 338+00	332	230.20	2.99	227.21
BVC 339 +00	432	233.20	4.54	228.66
BVC 340+00	532	236.20	6.40	229.80
BVC 341+00	632	239.20	8.59	230.61
BVC 342+00	732	242.20	11.09	231.11
BVC 343 +00	832	245.20	13.92	231.28
BVC 344 +00	982	248.20	17.07	231.13
BVC 346 +00	1032	251.20	20.54	230.66
BVC 347 +00	1132	254.20	24.32	229.88
BVC 348 +00	1232	257.20	28.43	228.77
BVC 349 +00	1332	260.20	32.86	227.34
BVC 350 +00	1432	263.20	37.61	225.59
BVC 351 +00	1532	266.20	42.68	223.52
BVC 352 +00	1632	269.20	48.07	221.13
BVC 353 +00	1732	272.20	53.79	218.41
BVC 354 +00	1832	275.20	59.82	215.38
BVC 355 +00	1932	278.20	66.17	212.03
BVC 356 +52	2032	281.20	72.84	208.36
	2132	284.20	76.44	207.76
	2184			

QNO3
Sol

Solution

Reliability level (R) = 99%

Standard deviation (So) = 0.49

Initial serviceability index P_i = 4.5

Terminal serviceability index P_t = 2.5

$\Delta PSI = 4.5 - 2.5 = 2.0$

Finding SN_1 an D_1 (surface course)

Step 1:- Draw the line joining the reliability level of 99% and the over all standard deviation So of 0.49

Step 2:- Draw a line joing point A to the ESAL of 2×10^6

Step 3:- Draw a line joing point B and resilind modulus (Mr) of Base coarse and extent this line

Step 4 → Draw a horizental line from the point c to intersect the design serviceability

→ Loss (PSI) curve at point D

$\Delta PSI = 4.5 - 2.5 = 2$

→ D_1 of surface coarse is 2.6

Step 6 Resilind value of Asphalt

$= 450,000 \text{ lb/in}^2$

Therfore a_1 0.44

Thickness of surface course D_1

$$D_1 = SN_1/a_1$$
$$2.6/0.44$$
$$= 5.9"$$

Thickness should be taken to the nearest 0.5"

So Thickness of surface coarse is 6"

$$SN_1^* = D_1" \times a_1$$
$$SN_1^* = 6 \times 0.44 = 2.64$$

Finding SN_2 and D_2 (Base Course)

$$D_2 = (SN_2 - SN_1^*) / a_2 m_2$$

$$= (3.8 - 2.64) / 0.14 \times 0.80$$

$$D_2 = 10.36''$$

Use $12''$

So Thickness of base coarse is $12''$

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

$$SN_2^* = 1.34 + 2.64$$

$$SN_2^* = 3.98$$

Finding SN_3 and D_3 (subbase course)

$$D_3 = (SN_3 - SN_2^*) / a_3 m_3$$

$$D_3 = (4.4 - 3.98) / 0.10^* 0.80$$

$$D_3 = 5.25''$$

We will use 6" as a sub base

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

$SN_3 = 4.467 \approx 4.4$ okey

Final Design:

Surface Course = 6"

Base Course = 18"

Subbase = 6"

Total Pavement Thickness = 24"

QNo 4 What are the different pavement distresses? Explain in detail?

Pavement Distress:-

⇒ Distress is a condition of pavement structure that reduce ~~stuv~~ serviceability of leads to reduction in service life

⇒ Distress could occure in pavement due to

* ~~Ust~~ Unstable mixes
* Higher wheel loads than those considered in design.

Alligator cracking:-

⇒ possibe causes

* over loading
* Inadequate structural design
* poor construction

Repair:-

→ Crack sealing is in effective
→ Dig out and replace area of poor subgrade

Block cracking:-

Possible causes:-

* HMA shrinkage
* Asphalt binder aging
* poor choice of asphalt binder in the mix design

Repair

* Low serverity cracks
* High serverity cracks

Potholes:-

Small bowl shape depression in the pavement surface that penetrate all the way through the HMA layer down to the base coarse

Possible Cause:

Generally potholes are the end result of fatigue cracking. A fatigue cracking become ~~set~~ severe, the interconnected cracks create small chunks of pavement ~~which~~ which can be dislodged as vehicles drive over them

Repair:-

patching techniques

Rutting:-

Surface depression in the wheel path are particularly evident after a rain when they are filled with water

Possibe Cause:-

* Insufficent compaction of HMA layer during construction
* Subgrade rutting
* Improper mix design.

Repair :-

* Slight ruts

Bleeding :-

Possibe Cause :-

* Excessive asphalt binder in the HMA
* Excessive application of asphalt binder during BST application
* Low HMA air void content

Polished Aggregate :-

Possibe causes :-

Repeated trafic application this can occure quicker if the aggregate is Susceptible to abrasion

Repair :-

Apply a skid-resistance slurry seal BST or non structure overlay.