



Question 1 (25 marks)

1. Discuss in details the construction stages of highways?
2. Explain in detail the methods used to make check on the soil compaction in the site?
3. Explain in detail the implementation of the base layer in flexible pavement?
4. Discuss the benefits of tack coat and prime coat in asphaltic layer?
5. Explain the types of base course stabilization?

Question 2 (25 marks)

1. Talk about the different stresses causes in rigid pavement?
2. Calculate the ESWL using equal stress according to the following data :
 - Single axle with dual tandem of total axle load = 120000 Ibs
 - Tire pressure = 90 Psi
 - Tandem spacing 40*60 inches
 - Flexible pavement thickness = 22 inch
3. A plate loading test using a 30 inch diameter plate , was made on a subgrade soil and a 7 inch gravel base course , the settlement of two tests was 0.15 inch where the unit loads required for each were 15 and 25 psi respectively . Determine the required thickness for pavement to sustain a single load of 62000 Ib and $P_t = 120$ psi and 0.25 inch deflection.

Question 3 (25 marks)

A highway consists of 6 lanes, the pavement layers as shown:

A.C. thickness = 3.5 in	$M_r = 450000$ psi
base thickness = 7 in	$M_r = 32000$ psi
subbase. thickness = 10 in	$M_r = 17000$ psi
subgrade	

Find the maximum number of ESAL for the total highway for the initial year.

Knowing that: ($R = 90\%$, $S_o = 0.5$, $p_i = 4.5$, $p_t = 2$, direction factor $F_d = 0.4$, growth factor $G_{it} = 41.6$, drainage factors = 1).

The CBR values for the subgrade in each season are as shown.

Season	Winter	Spring	Summer	Autumn
CBR (%)	9.99	7.56	8.13	9.22

Question 4 (25 marks)

1. The following data taken during a CBR test for base soil ,

Pen . (in)	0.025	0.05	0.075	0.1	0.15	0.20	0.30	0.40	0.50
Load (ib)	36	51	90	240	600	900	1250	1350	1400

- a) Determine CBR value for this soil.
 - b) Determine the thickness of various layers for a flex. pavement under the calculated ESWL, (using CBR method) if :
CBR subbase =9 %, CBR subgrade = 4.0 %, CBR base as calculated above.
2. A test hole (5.0 inch diameter and 6.5 inch depth) was made in compacted subgrade soil of 2.3 gm/cm³ wet density and 6.44% moisture content and 2.63 specific gravity.
It is required to determine:
- a) The dry density and saturated density for the pavement section.
 - b) The zero air voids density the pavement section.
 - c) Void ratio and porosity for this soil.



With my best wishes
Dr. Ahmed Abu El-Maaty

Intended Learning Outcomes (ILOs)

Question No.	ILOs
1	A-5-1, A-5-2, B-16-3, C-14-2
2	A-15-1, B-14-2, C-17-1, C-18-4
3	B-15-1, C-13-3, D-4-3, A-13-2,
4	A-13-2, C-15-3, B-13-4, D-9-1, D-5-2