



Answer sheet

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- |                    |                    |                    |
|--------------------|--------------------|--------------------|
| 1 (T) (F)          | 21 (A) (B) (C) (D) | 41 (A) (B) (C) (D) |
| 2 (T) (F)          | 22 (A) (B) (C) (D) | 42 (A) (B) (C) (D) |
| 3 (T) (F)          | 23 (A) (B) (C) (D) | 43 (A) (B) (C) (D) |
| 4 (T) (F)          | 24 (A) (B) (C) (D) | 44 (A) (B) (C) (D) |
| 5 (T) (F)          | 25 (A) (B) (C) (D) | 45 (A) (B) (C) (D) |
| 6 (T) (F)          | 26 (A) (B) (C) (D) | 46 (A) (B) (C) (D) |
| 7 (T) (F)          | 27 (A) (B) (C) (D) | 47 (A) (B) (C) (D) |
| 8 (T) (F)          | 28 (A) (B) (C) (D) | 48 (A) (B) (C) (D) |
| 9 (T) (F)          | 29 (T) (F)         | 49 (A) (B) (C) (D) |
| 10 (T) (F)         | 30 (T) (F)         | 50 (A) (B) (C) (D) |
| 11 (A) (B) (C) (D) | 31 (T) (F)         | 51 (A) (B) (C) (D) |
| 12 (A) (B) (C) (D) | 32 (T) (F)         | 52 (A) (B) (C) (D) |
| 13 (A) (B) (C) (D) | 33 (T) (F)         | 53 (A) (B) (C) (D) |
| 14 (A) (B) (C) (D) | 34 (T) (F)         | 54 (A) (B) (C) (D) |
| 15 (A) (B) (C) (D) | 35 (T) (F)         | 55 (A) (B) (C) (D) |
| 16 (A) (B) (C) (D) | 36 (T) (F)         | 56 (A) (B) (C) (D) |
| 17 (A) (B) (C) (D) | 37 (T) (F)         | 57 (A) (B) (C) (D) |
| 18 (A) (B) (C) (D) | 38 (T) (F)         | 58 (A) (B) (C) (D) |
| 19 (A) (B) (C) (D) | 39 (A) (B) (C) (D) | 59 (A) (B) (C) (D) |
| 20 (A) (B) (C) (D) | 40 (A) (B) (C) (D) | 60 (A) (B) (C) (D) |

Key  
 (A) (B) (C) (D)

امتحان طرق 2018



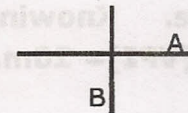
**Answer the following questions, and assume any missing data.**

ظلل إجابتك الصحيحة في ورقة التقييم المرفقة بأخر ورقة الأسئلة

Put  $\checkmark$  or  $\times$

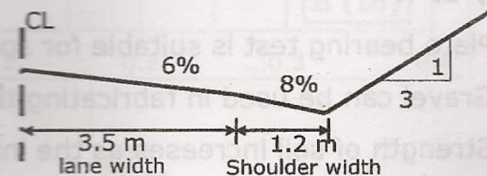
- 1 Difference in grade is always negative on sag curves.
- 2 SD and superelevation are the only two problems on horizontal curves.
- 3 Storage length is added to the acceleration lane to solve L.T. problems.
- 4 Minimum grade is 1% for a purpose of rain drainage.
- 5 Using spirals curves allows the centrifugal force to develop gradually.
- 6 Design of sag curves depends on head light sight distance requirement.
- 7 Rotation the pavement about I.E. is more suitable in case of drainage problems.
- 8 Climbing lane Climbing lanes are always added to the vertical grades.
- 9 Flared intersection can solve problems of left turn.
- 10 Tangent runout is the length between normal crown and crown removal sections.


**Compute the number of conflict points for the + intersection (all movements are allowed except L.T. from A to B).**



- 11 NO. of crossing point =.....  
 A: 7                      B: 8                      C: 9                      D: 10
- 12 NO. of merging point =.....  
 A: 6                      B: 7                      C: 8                      D: 9
- 13 NO. of diverging point =.....  
 A: 5                      B: 6                      C: 7                      D: 8
- 14 The difference between urban and rural roads is existing of.....  
 A: curb                      B: median                      C: Shoulder                      D: base course
- 15 Example of grade separation intersection is.....  
 A: trumpet                      B: rotary                      C: 3-leg                      D: full cloverleaf

**The shown section of a horizontal curve of a highway was constructed in a cut area. Determine the maximum operating speed on that section. If  $R= 305m$ , specify the following:**

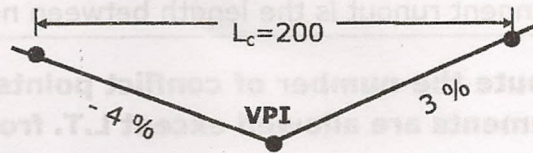


- 16 Lateral clearance for sight distance  $M = \dots\dots\dots m$   
 A: 5.25                      B: 5.35                      C: 5.45                      D: 5.55



- 17 Assuming that  $S < L$ , then  $S = \dots\dots\dots$ m  
 A: 114                      B: 116                      C: 118                      D: 120
- 18  $V_1$ (from sight distance) =  $\dots\dots\dots$ kph  
 A: 60                      B: 70                      C: 85                      D: 90
- 19  $V_2$ (from balance) =  $\dots\dots\dots$ kph  
 A: 85                      B: 90                      C: 70                      D: 60
- 20 Maximum operating speed =  $\dots\dots\dots$ kph  
 A: 60                      B: 70                      C: 85                      D: 90
- 21 Rotating the pavement about I.E is more convenient for  $\dots\dots\dots$  section  
 A: cut                      B: Embankment                      C: fill                      D: flat
- 22 In highway projects, one station normally =  $\dots\dots\dots$ m  
 A: 10                      B: 25                      C: 50                      D: 100

The opposite figure represents a sag curve. Knowing  $st(VPI) = 11+00$  and  $Elev(VPI) = 20m$ . Specify the following:



- 23 Difference between grades A =  $\dots\dots\dots$   
 A: - 1 %                      B: - 7 %                      C: 7 %                      D: 1 %
- 24  $St(VPC) = \dots\dots\dots$   
 A: 10+00                      B: 12+00                      C: 13+00                      D: 9+00
- 25  $Elev(VPC) = \dots\dots\dots$   
 A: 16                      B: 24                      C: 17                      D: 23
- 26 Distance to critical point =  $\dots\dots\dots$   
 A: 114.3                      B: 115                      C: 114.8                      D: 113.8
- 27 Station of suitable location for drainage pipe  $\approx \dots\dots\dots$   
 A: 11+12                      B: 11+13                      C: 11+15                      D: 11+16
- 28 Elevation of critical point =  $\dots\dots\dots$   
 A: 22.3                      B: 20.8                      C: 21.3                      D: 21.8

**Put  $\checkmark$  or  $\times$**

- 29 Plate bearing test is suitable for specifying the cohesion of soil
- 30 Gravel can be used in fabricating the hot-asphalt-mix
- 31 Strength of soil increases as the internal friction increase
- 32 The tire pressure equals to inflation pressure in calculating the stresses
- 33 Tar is known as green asphalt
- 34 AC 80/100 is more suitable for hot climate

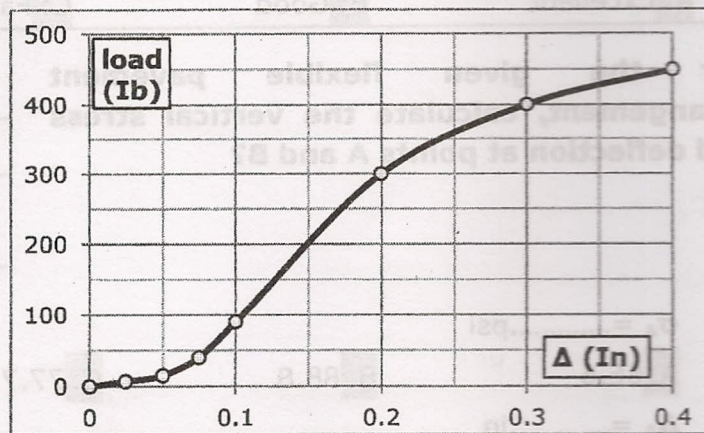

- 35 Tack coat layer is sprayed by a rate of (1:2) kg/m<sup>2</sup>
- 36 Reinforcement Stabilization can be done by geotextile
- 37 Maximum size of aggregate size used in surface layer is 2 cm
- 38 Thickness of binder coarse is often 4 cm

**The opposite pavement section is proposed for a highway. Knowing that R= 90%, S<sub>0</sub>= 0.35, Pt= 2.2, m<sub>1</sub>=m<sub>2</sub>=m<sub>3</sub>=0 specify the following:**

4"	E <sub>1</sub> = 200 000	<b>WS</b>
7"	E <sub>2</sub> = 21 000	<b>B</b>
6"	E <sub>3</sub> = 13 500	<b>SB</b>
	E <sub>SG</sub> = 10 000	<b>SG</b>

- 39 **a<sub>1</sub>** =.....  
 A: 0.2                      B: 0.3                      C: 0.35                      D: 0.4
- 40 **a<sub>2</sub>** =.....  
 A: 0.10                      B: 0.14                      C: 0.12                      D: 0.08
- 41 **a<sub>3</sub>** =.....  
 A: 0.08                      B: 0.10                      C: 0.12                      D: 0.14
- 42 **ΔPSI** =.....  
 A: 2                              B: 2.5                              C: 3                              D: 3.5
- 43 **SN** =.....  
 A: 1.8                              B: 2                              C: 2.5                              D: 3
- 44 **ESAL** =.....  
 A: 0.2×10<sup>6</sup>                      B: 1×10<sup>6</sup>                      C: 0.5×10<sup>6</sup>                      D: 1.1×10<sup>6</sup>

**The figure represents a result for the CBR test, determine the following:**



- 45 Is the curve needs correction?  
 A: No                              B: Yes                              C: --                              D: --
- 46 CBR<sub>0.1</sub> =  
 A: 6.6 %                              B: 6 %                              C: 5 %                              D: 3.3 %

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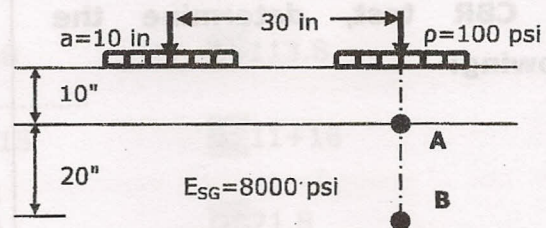
33

34



- 47  $CBR_{0.2} =$   
 A: 5 %      B: 8 %      C: 6 %      D: 6.6 %
- 48 Is the test needs to be repeated?  
 A: Yes      B: No      C: May be      D: --
- 49 The CBR value of the soil is  
 A: 6.6 %      B: 6 %      C: 8 %      D: 3.3 %
- 50 Soil A of  $P_{40} = 55 \%$ ,  $LL = PL = 0$  is classified as  
 A: A-6      B: A-1-b      C: A-4      D: A-3
- 51 Volume change characteristics of soil A is  
 A: Slight      B: None      C: High      D: Medium
- 52 Rating of soil A as subgrade is  
 A: Excellent      B: Good      C: Fair      D: Poor
- 53 The suitable roller for soil A is  
 A: Vibrators      B: Smooth Wheel      C: Sheep foot      D: Pneumatic wheel
- 54 Soil B of  $P_{200} = 55 \%$ ,  $LL = 40$ ,  $PL = 20$  is classified as  
 A: A-6      B: A-1-b      C: A-4      D: A-3
- 55 Rating of soil B as subgrade is  
 A: 6      B: 7      C: 6.5      D: 8
- 56 GI of soil B =  
 A: Excellent      B: Good      C: Fair      D: Poor

**For the given flexible pavement arrangement, calculate the vertical stress and deflection at points A and B?**



- 57  $\sigma_A = \dots \text{psi}$   
 A: 66.6      B: 88.8      C: 77.7      D: 55.5
- 58  $\Delta_A = \dots \text{in}$   
 A: 0.15      B: 0.18      C: 0.21      D: 0.24
- 59  $\sigma_B = \dots \text{psi}$   
 A: 12      B: 15      C: 18      D: 21
- 60  $\Delta_B = \dots \text{in}$   
 A: 0.12      B: 0.11      C: 0.10      D: 0.09