

01	A	B	C	D	E
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30	A	B	C	D	E
31	A	B	C	D	E
32	A	B	C	D	E
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35	A	B	C	D	E
36	A	B	C	D	E
37	A	B	C	D	E
38	A	B	C	D	E
39	A	B	C	D	E

PRACTICE QUESTIONS

Saudi Council of Engineers

PE003

Practice of Engineering (PE) - Transportation / Highways

EDITION

Demo

QUESTIONS

9

FORMAT

Limited Edition PDF

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9 practice questions for Saudi Council of Engineers **PE003**, each with its answer key and an explanation. Answer a question before you read its key — the explanation is worth more once you have committed.

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Send us three things and we will check it:

- the exam code, **PE003**
- the question number
- the email address on your order

Write to **support@mometrix.net**. We reply within one business day.

QUESTION 1

MULTIPLE CHOICE

A design engineer is checking the stopping sight distance (SSD) on a crest vertical curve on a rural two-lane highway. Which two of the following factors directly enter the AASHTO SSD equation used for crest vertical curve design?

- ☒ **A** Driver perception–reaction time
- ☒ **B** Pavement skid number (SN) or coefficient of friction (f)
- ☐ **C** Maximum superelevation rate used on the approach tangent
- ☒ **D** Design speed of the highway

ANSWER A • B • D

WHY The AASHTO stopping sight distance formula $SSD = 1.47 \cdot V \cdot t + V^2 / (30 \cdot (a/g \pm G))$ (U.S. customary) depends on design speed V , perception–reaction time t , and braking deceleration (typically expressed through friction factor f or a/g). Maximum superelevation on the approach tangent is not a direct input to the SSD used for crest vertical curve design. Therefore, A, B and D are the correct factors.

QUESTION 2

MULTIPLE CHOICE

When using the AASHTO 1993 flexible pavement design equation, which two of the following inputs directly affect the required structural number (SN)?

- ☒ **A** Reliability (R) and overall standard deviation (S_0)
- ☒ **B** Present Serviceability Index at end of design life (P_t)
- ☐ **C** Color of the pavement surface aggregate
- ☒ **D** Estimated future traffic in equivalent single axle loads (ESALs)

ANSWER A • B • D

WHY The AASHTO 1993 flexible pavement design equation solves for the structural number SN as a function of design ESALs (W_{18}), reliability R , overall standard deviation S_0 , design serviceability loss ($\Delta PSI = p_0 - P_t$), and layer coefficients. Aggregate color has no bearing on the structural requirement. Thus A, B and D are correct.

QUESTION 3 SINGLE CHOICE

According to the Highway Capacity Manual (HCM), which performance measure is used to define Level of Service (LOS) for a freeway basic segment?

- ☒ **A** Density (passenger cars per mile per lane, pc/mi/ln)
- ☐ **B** Average travel speed only
- ☐ **C** Volume-to-capacity ratio only
- ☐ **D** Total delay per vehicle (seconds/vehicle)

ANSWER A

WHY For freeway basic segments, the HCM defines LOS based on density in pc/mi/ln. While speed and v/c ratio are reported, LOS thresholds are anchored to density. Total delay per vehicle is the LOS measure for signalized intersections, not freeway basic segments.

QUESTION 4 SINGLE CHOICE

Which AASHTO design parameter represents the lateral friction assumed between the vehicle tires and the pavement surface, used in combination with superelevation to counter centrifugal force on a horizontal curve?

- ☒ **A** Side friction factor (f)
- ☐ **B** Stopping sight distance (SSD)
- ☐ **C** Critical clearing time
- ☐ **D** Coefficient of roughness

ANSWER A

WHY AASHTO horizontal curve design uses the side friction factor f together with superelevation e and the curve radius R to balance the centripetal acceleration: $e + f = V^2/(15R)$ (U.S. customary). SSD is for vertical alignment safety, critical clearing time relates to railroad grade crossings, and coefficient of roughness describes pavement surface texture.

QUESTION 5 SINGLE CHOICE

In highway drainage design, what is the standard design return period (in years) typically used for culverts crossing under Interstate (mainline) highways in the AASHTO and FHWA reference guidance?

- ☐ A 10 years
- ☐ B 25 years
- ☒ C 50 years
- ☐ D 100 years

ANSWER C

WHY FHWA and AASHTO drainage references (e.g., HDS-5) typically recommend a 50-year design storm for mainline Interstate culverts, with a 100-year check for floodplain and overtopping considerations. 10 years is more typical for minor crossroads and 25 years for rural arterials. The standard for the Interstate mainline is 50 years.

QUESTION 6 SINGLE CHOICE

In roadway earthwork computations, what does 'shrinkage factor' account for when converting in-situ (bank) cut volume to compacted fill volume?

- ☒ A Compaction of the fill material to a denser state than its in-situ condition
- ☐ B Expansion of rock due to blasting
- ☐ C Loss of material due to erosion during construction
- ☐ D Subsidence of the underlying subgrade under load

ANSWER A

WHY Shrinkage factor converts bank cubic meters (BCM) of cut into compacted cubic meters (CCM) of fill, accounting for the fact that soil occupies less volume after being excavated, hauled, placed, and compacted. It does not describe blasting swell (which uses a load factor), erosion loss, or subgrade subsidence.

QUESTION 7

SINGLE CHOICE

For an unsignalized intersection with no control on the minor road (i.e., the minor road must yield to the major road), which sight distance triangle must be provided according to AASHTO?

- ☒ **A** Case A – Intersection control with no control (uncontrolled)
- ☐ **B** Case B – Yield control
- ☐ **C** Case C – Stop control on the minor road
- ☐ **D** Case D – Signal control

ANSWER A

WHY AASHTO's Policy on Geometric Design identifies Case A as the intersection sight distance required when there is no control on either roadway (or effectively uncontrolled where minor road traffic must select gaps without benefit of a yield or stop). Yield control is Case B, stop control is Case C, and signalized intersections are Case D.

QUESTION 8

SINGLE CHOICE

In rigid (Portland cement concrete) pavement design, which parameter primarily represents the concrete slab's resistance to bending due to wheel loads?

- ☒ **A** Modulus of rupture (MR) of the concrete
- ☐ **B** California Bearing Ratio (CBR) of the subgrade
- ☐ **C** Asphalt cement viscosity grade
- ☐ **D** Plasticity index (PI) of the subgrade soil

ANSWER A

WHY The modulus of rupture (flexural strength, MR) of the concrete governs the slab's flexural capacity under wheel loads in rigid pavement design (e.g., PCA and AASHTO rigid pavement procedures). CBR, asphalt viscosity grade, and plasticity index relate to subgrade or flexible pavement characterization, not the slab's bending resistance.

QUESTION 9

SINGLE CHOICE

In the classical urban transportation planning four-step model, which step estimates the number of trips originating from and destined for each traffic analysis zone (TAZ)?

- ☒ **A** Trip generation
- ☐ **B** Trip distribution
- ☐ **C** Mode choice
- ☐ **D** Traffic assignment

ANSWER A

WHY Trip generation is the first step and produces trip productions and attractions for each TAZ, typically using regression or cross-classification models. Trip distribution links productions to attractions (e.g., gravity model), mode choice splits trips by mode, and traffic assignment loads trips onto the network. The quantities at each TAZ come from trip generation.