

**PDFZilla – Unregistered**

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Total No. of printed pages = 6

**CE 131504**

Roll No. of candidate

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**2017**

**B.Tech. 5th Semester End-Term Examination**

**Civil**

**TRANSPORTATION ENGINEERING — I**

Full Marks – 100

Time – Three hours

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The figures in the margin indicate full marks  
for the questions.

Answer Question No. 1 and any *six* from the rest.

1. Answer the following questions : (10 × 1 = 10)
  - (a) The super elevation on roads in snow bound areas, should not generally exceed
    - (i) 15%
    - (ii) 12%
    - (iii) 6%
    - (iv) 7%
  - (b) The number of vehicles moving in a specified direction on a roadway, that pass a specific given point during specific unit of time is called
    - (i) Traffic volume
    - (ii) Traffic density
    - (iii) Basic capacity
    - (iv) Traffic capacity

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- (c) Bottom most component of flexible pavement is
- (i) Subgrade
  - (ii) Subbase
  - (iii) Base
  - (iv) Base course
- (d) The minimum shoulder width recommended by IRC is
- (i) 2.5 m
  - (ii) 4.0 m
  - (iii) 0.5 m
  - (iv) 3.5 m
- (e) The width of carriageway as per IRC specifications for multi-lane pavement is
- (i) 4.0 m per lane
  - (ii) 3.5 m per lane
  - (iii) 3.2 m per lane
  - (iv) 3.0 m per lane
- (f) The road surface is provided with camber so that
- (i) Centrifugal force is counter balanced
  - (ii) Rain water drains out
  - (iii) Frictional resistance lowers down
  - (iv) None of the above

- (g) The shape of vertical curve is
- (i) Spiral
  - (ii) Elliptical
  - (iii) Cycloidal
  - (iv) Parabolic
- (h) An example of rigid pavement is
- (i) Earthen road
  - (ii) Bitumen road
  - (iii) Water bound macadam road
  - (iv) Concrete road
- (i) Length of a vehicle affects the design of
- (i) Vertical profile of the road
  - (ii) Overtaking distance
  - (iii) Geometric and cross sectional characteristics
  - (iv) Axle and wheel load
- (j) An instrument used to study spot speeds in traffic engineering is
- (i) Speedometer
  - (ii) Speed recorder
  - (iii) Enoscope
  - (iv) Enometer

2. Differentiate between rigid and flexible pavements. Explain with diagrams the failures of flexible and rigid pavements. (5 + 10 = 15)

3. Explain the design steps of super elevation. A national highway passing through rolling terrain in heavy rainfall area has a horizontal curve of radius 500 m. Design the length of transition curve assuming suitable data. (5 + 10 = 15)

4. What do you understand by the term saturation system? What are the factors affecting it? Following four alternate road plan development proposals with particulars as mentioned below are available: (2 + 4 + 9 = 15)

Proposal	Road length in km	Number of towns and villages				Total products in thousand tones
		1001-2000	2001-5000	5001-10000	>10000	
P	300	160	80	30	6	200
Q	400	200	90	60	8	270
R	500	240	110	70	10	315
S	550	248	112	73	12	335

Assume the utility unit as given below :

Population	Unit
1001-2000	0.25
2001-5000	0.50
5001-10000	1.00
>10000	2.50

Production	Unit
1000 tones	1

5. Write the tests carried out for road aggregates? Explain any one of them. Calculate the stresses at interior, edge and corner regions of a cement concrete pavement using Westergaard's stress equations. Use the following data :

Wheel load,  $P = 5100$  kg

Modulus of elasticity of cement concrete,  $E = 3 \times 10^5$  kg/cm<sup>2</sup>

Pavement thickness,  $h = 18$  cm

Poisson's ratio of concrete,  $\mu = 0.15$

Modulus of subgrade reaction,  $K = 6$  kg/cm<sup>2</sup>

Radius of contact area,  $a = 15$  cm. (2 + 4 + 9 = 15)

6. Briefly explain with diagram the different types of road patterns. The CBR value of subgrade soil is 4%. The traffic survey revealed the present ADT of commercial vehicle as 1200. The annual rate of growth traffic is found to be 8 percent. The pavement construction is to be completed in three years after last traffic count. Assume wheel load as 4100 kg and tire pressure 6 kg/cm<sup>2</sup>. Calculate the total thickness of a pavement using

(a) Design chart recommended by IRC

(b) Design formula developed by the US Corps of Engineers. (5 + 10 = 15)

7. Write the requirements for ideal alignment? What are the objectives of highway alignment? What is PIEV theory? (4 + 8 + 3 = 15)

8. Write a short note on the objectives and functions of Jayakar Committee. What do you mean by capacity, ideal capacity and level of service (LOS) of highways? Calculate the capacity of a traffic lane with one-way traffic flow at a stream speed of 60 kmph. (7 + 3 + 5 = 15)
9. What are the essential requirements of highway drainage? Calculate the safe stopping sight distance for design speed of 60 kmph for
- (a) Two-way traffic on a two lane road.
  - (b) Two-way traffic on a single plane road.

Assume coefficient of friction as 0.37 and reaction time of driver as 2.5 seconds.  
(7 + 8 = 15)

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