B.E. (Civil Engineering) Fourth Semester (C.B.S.)

Transportation Engineering – I

P. Pages : 3 **NIR/KW/18/3350**

Time : Three Hours Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) What were the recommendations of Mr. Jayakar committee? How those recommendations were fulfilled? **7**

b) Enlist various tests to be performed on bitumen. Explain any two in detail. **7**

OR

2. a) What is meant by phasing of a road project? Explain with an example how the priority is fixed for construction of a specific road. **7**

b) What is abrasion? State why and how the abrasion test is performed. **7**

3. a) For an arterial road in an urban area, the design speed is kept as 100kmph. Design the following road geometric elements : **7**

i) Stopping sight Distance & Night S.D.

ii) Superelevation on horizontal curve.

Take reaction time as 2.5 sec. and radius of curve as 300m. Assume other data suitably.

b) What is camber? Explain different types of camber. Give the values of camber for different types of road surface as per IRC recommendations. **7**

OR

4. a) An ascending gradient of 1 in 50 meets a descending gradient of 1 in 80. Determine the length of summit curve to provide **7**

a) ISD, b) SSD.

Take the design speed as 80kmph and assume all other data suitably.

b) Explain different types of curves to be provided on hill roads. **7**

5. a) Calculate the wheel load stress using Westergaard's stress equation for the following data : **7**

i) Wheel load = 6 kg/cm^2. ii) Thickness of pavement = 150 mm.

iii) $\mu = 0.15$, iv) $k = 0.04\,N/mm^2$

v) $E = 2.5x10^5\,kg/cm^2$

b) Describe the component part of a flexible road pavement with neat sketch. Specify the function of each layer. **6**

OR

6. a) Following observations were made in lab test on a soil specimen for CBR value. Compute the CBR value. **8**

Penetration (mm)	Load (kg)
0.0	0.0
0.5	4.8
1.0	16.0
1.5	28.4
2.0	40.5
2.5	47.9
3.0	56.5
4.0	67.0
5.0	75.5
7.5	88.8
10.0	100.1
12.0	105.7

b) Discuss the group index method of pavement design. **5**

7. a) Enumerate the causes of Accident. What P & how the measures are taken to prevent and minimize the accidents. **6**

b) Draw a representative curve for cumulative speed distribution and mark there on the following : **7**

i) 15^{th} percentile speed.

ii) 85^{th} percentile speed.

iii) 98^{th} percentile speed.

Mention the significance of each speed.

OR

8. a) Discuss now the traffic volume study is undertaken and the data is represented. **7**

b) Discuss the vehicle characteristics in detail. **6**

9. a) What assumptions are made in the analysis of economic span of a bridge? Derive the condition for economic cost of a bridge span and specify to what limitations the derived condition is valid. **7**

b) Initial depth of foundation for a bridge pier is 3.96m. What would be final depth of foundation of a same bridge pier after calculation scouring under the pier for the following condition **6**

i) Discharge – 300 m^3/sec.
ii) Silt factor – 1.1.
iii) Bridge having 3 spans of 30m each.

OR

10. a) What is Afflux? How is it calculated? Comment on the significance of the calculation of afflux value. **6**

b) Calculate the flood discharge from a catchment area of 65km^2. When the rainfall during the storm was 15 cm in 2 hours. The time of concentration is 20 hours & the run-off coefficient is 0.35. Assume other data suitably. **7**

11. a) Describe the methods adopted for sinking of well foundation. How the tilting of well is corrected? **7**

b) Draw the neat sketch of a typical bridge superstructure and enumerate the factors that affects the selection of superstructure. **6**

OR

12. Write detailed note **any four.** **13**

i) Cofferdams.

ii) Rating of bridges.

iii) Culverts.

iv) Inspection of bridges.

v) Launching of bridge girders.

vi) Bridge piers.

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B.E. (Civil Engineering) Fourth Semester (C.B.S.)

Transportation Engineering - I

P. Pages : 2 **NJR/KS/18/4405**

Time : Three Hours Max. Marks : 80

Notes :
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7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain the necessity and objectives of highway planning. **6**

b) Enumerate the surveys to be carried to finalize an alignment. **7**

OR

2. a) Write note on : **6**

i) Penetration test on Bitumen.

ii) Los Angeles abrasion test on aggregate.

b) Discuss the salient features of 2^{nd} road development plan. **7**

3. a) A highway is to be provided a superelevation with ruling minimum radius. Design the superelevation for the speed of 90 kmph. **7**

b) Design the length of summit curve for stopping sight distance for the following data. **6**

i) Gradients are $+3.0\% \& -5.0\%$

ii) Design speed = 80 kmph.

OR

4. a) Calculate extra widening required for a national highway having carriageway width 10.5m. The other data is given below : **6**

i) Radius of curve = 280 m

ii) Length of wheel base = 6.1 m

iii) Speed of vehicle = 100 kmph.

b) Discuss the analysis of overtaking sight distance. Comment on overtaking zones. **7**

5. a) Explain the Group Index method of pavement design. **7**

b) What is ESWL. Explain in brief. **7**

OR

6. a) Discuss the characteristics of rigid pavement. **6**

b) Design a flexible pavement for the following data : **8**

i) Area of plunger = $19.6\,m^2$

ii) Sub base CBR = 22%

iii) Volume of Traffic = 1200 CVD

iv) Load at 2.5 mm penetration = $2.75\,kg/cm^2$

v) Load at 5.0 mm penetration = $3.80\,kg/cm^2$

vi) WBM base course CBR = 80%

Ref. design chart.

7. a) Write note on : **6**

i) 3 E's of Traffic Engineering.

ii) PIEV Theory.

b) Describe spot speed study in detail. How the data is presented? Explain. **7**

OR

8. a) Enumerate the causes of accident. Explain how to minimise the accidents? **6**

b) Describe how to undertake Traffic Volume. How the data is presented. **7**

9. a) Write note on : **7**

i) Live Loads on Bridge.

ii) Afflux.

b) Calculate the scour depth for the following data. **7**

i) 3 span of 35 m

ii) 2 span of 52 m

Given that average discharge is $425\,m^3/sec$ and silt factor = 1.1.

OR

10. a) What is Economic Span? Derive a formula to determine the Economic span for Bridge. **7**

b) Write short notes on : **7**

i) Afflux

ii) Classification & Numbering of bridges.

11. a) Describe the construction of well foundation. Comment on correction in tilting of well. **6**

b) Write notes on : **7**

i) Pneumatic Caisson.

ii) Rating & Launching of Bridges.

OR

12. Write notes on : **13**

i) Cofferdams

ii) Wing Walls

iii) Bridge Aesthetics

iv) Bridge Inspection

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B.E. (Civil Engineering) Fourth Semester (C.B.S.)

Transportation Engineering - I

P. Pages : 2 | **NRJ/KW/17/4405**

Time : Three Hours | Max. Marks : 80

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Notes :
1. All questions carry marks as indicated.
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8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Explain in details First 20 years Road developed plan & its salient features. **6**

b) Explain the planning survey to be carried out to finalized the Road alignment. **7**

OR

2. a) Write a short notes on Geosynthetics. **6**

b) Explain the softening point test on bitumen with labelled diagram. **7**

3. a) Design the super elevation & extra widening required for a highway in built up area with the following data : **8**

a) Radius of curve = 300 m
b) Speed of vehicle = 80 kmph
c) Length of wheel base = 6.1 m
d) Width of carriage way = 7.0 m

b) The speed of overtaking & over taken vehicles are 70 & 40 kmph with the acceleration of over taking vehicle as $0.99\,\text{m}/\text{sec}^2$ calculate OSD. **6**

OR

4. a) An ascending gradient of 1 in 40 meets descending gradient of 1 in 50. A summit curve is to be designed, so as to have a passing distance of 500 m. Design speed of highway is 75 kmph. Calculate the length of summit curve required for following condition. **8**

i) $L > OSD$ ii) $L < OSD$

b) Define Camber. What are it's types? Describe. **6**

5. a) Discuss the comparison between Flexible & Rigid Pavement. **6**

b) What do you understand by ESWL. Explain in details. **7**

OR

6. a) Briefly explain the construction of WBM road. **6**

b) A sub grade soil has the following characteristics. Estimate GI of soil from following Data & comment on the grade of soil. **7**
1) Soil portion passing 0.074 mm sieve = 50%
2) Liquid limit = 40%
3) Plasticity Index = 20%

7. a) Briefly explain the Accident study. **6**

b) Briefly explain the Parking study. **7**

OR

8. a) Discuss the road user characteristics. **6**

b) Explain the procedure carried out for spot speed study & speed and delay study. **7**

9. a) What is Economic span? Derive a formula to determine the economic span for Bridge. **7**

b) A bridge is proposed to be constructed across an alluvial stream carrying a discharge of $300\,m^3/sec$. Assuming the value of silt factor = 1.1 determine the maximum scour depth when the bridge consist 2 span of 35 m each. **7**

OR

10. a) Explain IRC loading for class AA. **7**

b) The catchment area of a stream is of sandy soil with thick vegetation cover and the area of catchment is 8000 hectares. The length of the catchment area is 20 km and the H = 160 m from the critical point to the bridge. **7**
Calculate the peak runoff for designing the bridge if the storm is 16 cm of rain in 4 hrs.

11. a) Describe with neat sketches the various types of wing walls. **6**

b) Explain the construction of well foundation with neat sketch. **7**

OR

12. Explain the following terms in details **any three.** **13**

a) Coffer dam

b) Repair & Maintenance of bridge

c) Rating of Bridge

d) Caissons

e) Afflux.

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B.E. Fourth Semester (Civil Engineering) (C.B.S.)

Transportation Engineering - I

P. Pages : 3 **NKT/KS/17/7265**

Time : Three Hours Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
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6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) State the ideal requirement of highway alignment. Explain how the obligatory points influences the alignment of a new road. **7**

b) Describe the following test on highway materials : **6**
i) Penetration test on bitumen.
ii) Impact test on aggregate

OR

2. a) Discuss the Engineering surveys to be undertaken during the planning of a new road. **7**

b) Discuss how to judge the suitability of sub-grade soil with the help of Group index method. **6**

3. a) Design a super elevation for the design speed of 100 k.m.p.h and ruling minimum radius. **7**

b) State the primary & secondary objectives of providing transition curve. **6**

OR

4. a) In a vertical alignment of two gradients, a vertical summit curve is formed at their intersection. The gradients are of +4.0% & -6.0%. The design speed on the same section of road is fixed as 100 kmph. Design the length of summit curve to provide stopping sight distance. **7**

b) Discuss the purpose & types of Camber provided on road. **6**

5. a) Enumerate the factors affecting the design of a pavement. **6**

b) Suggest a suitable crust composition of flexible pavement from the given data **8**

i) Area of plunger = 19.6 cm^2
ii) Load at 5 mm penetration = 3.98 kg/cm^2
iii) Load at 2.5 mm penetration = 2.81 kg/cm^2
iv) Sub-base CBR = 20%
v) WBM base course CBR = 90%
vi) Expected final traffic volume = 600 CVD.

Ref design chart.

OR

6. a) Discuss the failure of pavement in detail. **6**

b) Calculate the wheel load stresses at corner edges & interior region from the given details. **8**

i) Design wheel load = 4500 kg
ii) Tyre pressure = 6 kg/cm^2
iii) Modulus of subgrade reaction = 4 $kg/cm^2/cm$
iv) $E = 2.5 \times 10^5 \ kg/cm^2$, $\mu = 0.15$
v) Slab thickness = 15 cm.

7. a) Describe in detail traffic volume study. State the significance of 30^{th} highest hourly volume of traffic. **7**

b) Explain how the static & dynamic characteristics of vehicle affects the safe driving. **6**

OR

8. a) What are the objectives of carrying out speed study. State the significance of the following terms related with speed study : **8**

i) 98^{th} percentile of speed
ii) 85^{th} percentile of speed
iii) 15^{th} percentile of speed

b) Discuss the use of Intelligent transportation system with Indian perspective. **5**

9. a) Derive the condition for economic span of a bridge. State its limitations. **7**

b) What is Scour depth ? Calculate the scour depth for the following conditions **7**

i) 3 span of 22.5 m
ii) 2 span of 47.5 m

Hydrological data given are as below :

i) Average discharge = 325m^3/sec
ii) Self factor = 1.1.

OR

10. a) Enlist various loads acting on a bridge. Describe all types of live load. **7**

b) Discuss how to compute of load discharge using Rationale method. **7**

11. a) Describe the construction of well foundation for a bridge. Also comment on tilting of well. **7**

b) Discuss the Inspection and Repairs of Bridges. **6**

OR

12. Write short note on **any four.** **13**

i) Afflux

ii) Cofferdams.

iii) Wing walls

iv) Rating of Bridges

v) Clearance & free board.

vi) Bridge Aesthetics.

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B.E. Fourth Semester (Civil Engineering) (C.B.S.)

Transportation Engineering - I Paper – III

P. Pages : 2 **KNT/KW/16/7265**

Time : Three Hours Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Explain the necessity and objectives of Highway planning. **6**

b) What are the various tests for judging the suitability of aggregates? Discuss any two tests in detail. **7**

OR

2. a) Briefly explain the engineering surveys needed for locating a new highway. **6**

b) A subgrade soil has the following characteristics **7**

i) Passing 425 micron = 50%

ii) Passing 75 micron = 62%

iii) Liquid limit = 49%

iv) Plastic limit = 21%

Find the group index of soil and its rating as a subgrade.

3. a) Explain camber? What are the objectives of camber? Discuss the factors on which the amount of camber to be provided. **7**

b) Calculate the extra widening required for a pavement of within 7 m on a horizontal curve of radius 240 m. If the longest wheel base of vehicle expected on the road is 7 m. Design speed is 65 kmph. **7**

OR

4. a) While aligning a highway in a built up area it was necessary to provide a horizontal circular curve of radius 325m. Design the following geometric features. **9**

i) Super elevation ii) Extra widening of pavement

iii) Length of transition curve, Data available are, Design speed = 65 kmph. Length of wheel base of largest truck = 6 m pavement width = 10.5 m.

b) Explain "PIEV" theory **5**

5. a) Explain 'Flexible and Rigid' Pavements and bring out the points of difference. **6**

b) Explain the factors affecting design of pavements. **7**

OR

6. a) Calculate the stresses at interior, edge and corner regions of a cement concrete pavements using Westergaard's stress equations. Use the following data. **8**
Wheel load = 5000 kg
modulus of elasticity of cement concrete, E = 3 x 10^5 kg/cm^2
Pavement thickness, h = 18 cm
Poisson's ratio of concrete μ = 0.15 modulus of subgrade reaction. k = 6.0 kg/cm^3
Radius of contact area, a = 15 cm.

b) Write short notes on Joints in cement concrete pavement. **5**

7. a) Explain the traffic-volume study in detail. **7**

b) Discuss the spot-speed study in detail. **6**

OR

8. Write short note on **any three.** **13**
i) Penetration test on bitumen
ii) Gradients.
iii) PCU
iv) 3 E's of traffic Engg.
v) ESWL

9. a) Explain classification & numbering of bridges. **6**

b) The catchment area of a stream is of sandy soil with light vegetation cover and the area of the catchment is 12000 hectare. The length of the catchment is 25 km, and the fall in level from the critical point to the bridge site is 180 m. Calculate the peak runoff for designing the bridge. The rainfall in 4 hours is recorded 18 cm. Area factor = 0.70 and coefficient to account for losses due to absorption = 0.20. **8**

OR

10. a) The approximate costs of one pier and one superstructure span for a multiple span bridge for various lengths of span are tabulated as follows. **7**

Span in (m)	Cost of one pier (Rs)	Cost of one superstructure (Rs)
10	25000	7000
15	28000	13815
20	32500	31000
25	33700	36000
30	34800	41400

Determine economic span.

b) Enumerate the various forces. Loads and stresses which are to be considered in the design of a bridge. **7**

11. a) What are the substructures of a bridge? Mention the functions of each of them. **7**

b) Define the following **6**
Abutment, pier, Wing wall, cut water, Ease water, cofferdams.

OR

12. a) The normal velocity of flow in a river is 1.50 m/s. The normal waterway under the bridge, artificial waterway under the bridge and enlarged area upstream of the bridge are respectively. 8000 m^2, 7000 m^2, 10,000 m^2. Assume g = 9.81 m/s^2 calculate the height of afflux and increase in velocity due to afflux. **7**

b) What is the necessity of maintenance of bridges? Explain. **6**

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B.E. (Civil Engineering) Fourth Semester (C.B.S.)

Transportation Engineering – I Paper - III

P. Pages : 2 **TKN/KS/16/7353**

Time : Three Hours *0766* Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
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6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) What for Jayakar committee was set-up? What were the recommandations of the committee? **7**

b) Describe the abrasion test on aggregate with IRC recommended values. **6**

OR

2. a) Enlist various test on bitumen? Explain any two with neat sketch. **7**

b) Discuss the engineering survey to be undertaken for the new road proposal. **6**

3. On a state highway, horizontal curve is provided with ruling minimum radius. Design the following geometric features: **14**

i) Superelevation.

ii) Extra widening.

iii) Length of Transition curve.

iv) SSD & ISD.

Given that design speed is 80 kmph. Assume all other suitable data.

OR

4. a) In a vertical alignment of two gradients of + 3.0% & -5.0%, design the length of summit curve for the Design speed of 90 kmph to provide SSD. **7**

b) Discuss the types & purpose of providing curb with neat sketches. **7**

5. a) A flexible pavement is to be designed with the following data. **8**

i) Area of plunger = 19.6m^2.

ii) Expected final traffic volume = 500 CND.

iii) Load at 2.5 mm penetration = 2.80 kg / cm^2.

iv) Load at 5.0 mm penetrations = 3.95 kg/cm^2.

v) Sub-base CBR = 22%.

vi) WBM base course CBR = 85%.

Suggest a suitable crust composition.

b) Differentiate between flexible & Rigid pavement. **6**

OR

6. a) Calculate the wheel load stresses at corner, edges & Interior region from the given details. **8**

i) Design wheel load = 4000 kg.

ii) Tyre pressure = $6.1\ kg/cm^2$.

iii) Modulus of subgrade reaction = $4\ kg/cm^2/cm$.

iv) $E = 2 \cdot 5 \times 10^5\ kg/cm^2$, $\mu = 0.15$.

v) Thickness of slab = 13 cm.

b) Describe the group Index method of flexible pavement design. **6**

7. a) Discuss Road user characteristic in detail. **6**

b) Discuss 'Spot speed studies' in detail. Explain how the data is represented. **7**

OR

8. a) Discuss the traffic volume study in detail. Comment on "30^{th} highest hourly volume of traffic. **7**

b) Discuss the parking study in detail. **6**

9. a) What are the points to be considered while selecting site for a new bridge. **7**

b) Calculate the total depth for the following condition. **6**

i) 3 Spans of 2.5 m.

ii) 2 Span of 4.5 m.
Given that average discharge = $325\ m^3/sec.$ & silt factor = 1.1.

OR

10. a) Explain the computation of flood discharge by rational approach. **6**

b) Explain the following terms: **7**

i) Afflux ii) Clearance

11. a) Describe various types of cofferdams. **7**

b) Describe various types of wing walls. **6**

OR

12. Write short note on **any three.** **13**

i) Economic span.

ii) Classification & Numbering of bridges.

iii) Maintenance & Inspection of bridge.

iv) Bridge aesthetic.

v) Culverts.

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