

Techno India NJR Institute of Technology



Course file

Transportation Engineering (7CE4-01)

Session 2022-23

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Department of CE



RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

IV Year- VII & VIII Semester: B. Tech. (Civil Engineering)

7CE4-01: Transportation Engineering

Credit 3

Max. Marks: 150(IA:30, ETE:120)

3L+0T+0P

End Term Exam: 3Hours

SN	Contents	Hours
1	Introduction: Objective, scope and outcome of the course	1
2	Highway planning and alignment: Different modes of transportation – historical Development of road construction- Highway Development in India –Classification of roads- Road pattern – Highway planning in India- Highway alignment - Engineering Surveys for alignment – Highway Project- Important Transport/Highway related agencies in India. PMGSY project. Introduction about IRC, NRRDA	5
3	Geometric Design of highways: The highway crosses sectional elements- Camber-Sight Distance - Types of sight distances -Design of horizontal alignments - Super elevation, Widening of Pavements on horizontal curves- transition Curves- Design of Vertical alignments – Gradients- summit and Valley Curves- Recommendations of IRC Codes of Practice.	7
4	Highway Materials: Desirable Properties, Testing Procedures, Standards and standard values relating to Soil, Stone Aggregates, Bitumen and Tar, fly- ash/pond-ash. Role of filler in Bituminous mix, materials of filler. Specifications of DLC and PQC for rigid pavement	6
5	Highway Construction and Equipments: Methods of constructing different types of roads viz. Earth roads, Stabilized roads, WBM, WMM roads, earthen embankments, DLC and embankments with fly ash. Bituminous roads and Concrete roads. Berms and Shoulders, Features of rural roads including those in PMGSY. Hot mix plant for Bituminous roads-components, layout, control panel, quality assurance. Highway construction of rigid and flexible pavements including types of road rollers, specifications of compaction of different layers of bituminous roads, modern pavers for CC roads. Roller compacted concrete road construction	8
6	Design of flexible and rigid pavements as per IRC: IRC provisions including those of IRC 37, IRC 58	5
7	Introduction of Railway Engineering: Types and Selection of Gauges, Selection of Alignment, Ideal Permanent Ways and Cross-sections in different conditions, Drainage, Salient Features and types of Components viz. Rails, Sleepers, Ballast, Rail Fastenings.	3
8	Introduction of Airports and Harbours: Airport Engineering: - Introduction: Requirements to Airport Planning, Airport Classifications, Factors in Airport Site Selection, Airport Size. Planning of Airport: Requirements of Airport- Terminal Area, Runway Length etc. Harbours: history of water transportation, modern trends in water transportation, components of harbour, classification of harbours. Ports and docks.	5
Total		40

Course Overview:

This course is designed for engineering students who would like to understand the role of railway engineering in transportation system. The course is suitable for civil, engineering students. The information provided in this course falls into three categories:

- 1) Railway engineering and its comparison with Highways,
- 2) Introduction to Bridge Engineering, and
- 3) Introduction to airport engineering

Course Outcomes:

CO. NO.	Cognitive Level	Course Outcome
1	Analysis	To understand the principles of Highway geometrics design as per IRC standards. Perform geometric design for the Highway & Basic concept of Pavement design.
2	Application	To understand Types of pavements & Materials required for highway construction. Construction procedures for different types of pavements. Maintenance procedures for different types of pavements.
3	Design	To understand the Traffic engineering & different types of traffic control device.
4	Design	Analysing the strength required for pavement and designing flexible and rigid pavement by different methods.
5	Synthesis	Describe and understand the various components of railway track.

Prerequisites:

1. Basic knowledge of Indian Road Codes
2. Basic knowledge of planning
3. Knowledge of Surveying subject.
4. Knowledge of Horizontal and vertical curves.

Course Outcome Mapping with Program Outcome:

Transportation Engineering															
Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO471.1	3	2	2	2	2	1	1	1	2	1	1	2	2	2	2
CO471.2	2	2	1	1	1	2	1	1	2	2	2	1	1	2	2
CO471.3	3	2	2	2	2	1	1	1	2	1	1	2	2	2	2
CO471.4	3	3	3	2	2	1	2	1	2	1	1	1	2	2	1
CO471.5	3	3	3	2	2	1	2	1	2	1	1	1	2	2	1
CO471 (AVG)	2.8	2.4	2.2	1.8	1.8	1.2	1.4	1	2	1.2	1.2	1.4	1.8	2	1.6

Course Coverage Module Wise:

Lecture No.	Unit	Topic
1	1	Introduction: Objective, scope and outcome of the course.
2	2	Different modes of transportation, historical Development of road construction.
3	2	Highway Development in India –Classification of roads- Road pattern.
4	2	Highway planning in India- Highway alignment - Engineering Surveys for alignment – Highway Project- Important
5	2	Highway planning in India- Highway alignment - Engineering Surveys for alignment – Highway Project- Important
6	2	Transport/Highway related agencies in India. PMGSY project. Introduction about IRC, NRRDA
7	3	The highway crosses sectional elements- Camber-Sight Distance.
8	3	Types of sight distances- Discuss and Derivation on Stopping Sight Distance.
9	3	Discuss and Derivation on Overtaking Sight Distance.
10	3	Design of horizontal alignments - Super elevation.
11	3	Widening of Pavements on horizontal curves.
12	3	Transition Curves- Design of Vertical alignments – Gradients.
13	3	Summit and Valley Curves- Recommendations of IRC Codes of

		Practice.
14	4	Highway Materials: Desirable Properties.
15	4	Highway Materials: Testing Procedures.
16	4	Standards and standard values relating to Soil.
17	4	Discuss Properties on Stone Aggregates, Bitumen and Tar, fly-ash/pond-ash.
18	4	Role of filler in Bituminous mix, materials of filler.
19	4	Specifications of DLC and PQC for rigid pavement.
20	5	Methods of constructing different types of roads viz. Earth roads.
21	5	Methods of constructing different types of roads viz Stabilized roads, WBM.
22	5	Methods of constructing different types of roads viz WMM roads, earthen embankments.
23	5	DLC and embankments with fly ash. Bituminous roads and Concrete roads. Berms and Shoulders.
24	5	Features of rural roads including those in PMGSY. Hot mix plant for Bituminous roads-components, layout, control panel, quality assurance.
25	5	Highway construction of rigid and flexible pavements including types of road rollers.
26	5	Specifications of compaction of different layers of bituminous roads.
27	5	Modern pavers for CC roads. Roller compacted concrete road construction.
28	6	Design of Flexible Pavement.
29	6	Design of Flexible Pavement.
30	6	Design of Rigid Pavement.
31	6	Design of Rigid Pavement.
32	6	Numerical based on Rigid and Flexible Pavements.
33	7	Railway Engineering: Types and Selection of Gauges, Selection of Alignment, Ideal Permanent Ways.
34	7	Cross- sections in different conditions, Drainage, Salient Features and types of Components viz. Rails.
35	7	Discuss to Sleepers, Ballast, and Rail Fastenings.
36	8	Airport Engineering: - Introduction: Requirements to Airport Planning
37	8	Airport Classifications, Factors in Airport Site Selection, Airport Size
38	8	Planning of Airport: Requirements of Airport- Terminal Area,

39	8	Runway Length etc. Harbours: history of water transportation, modern trends in water transportation
40	8	Components of harbour, classification of harbours. Ports and docks.

TEXT/REFERENCE BOOKS

1. Railway Engineering by Sexena S.C. and Arora S.P, Dahnpat Rai Publishers, Delhi.
2. Airport Engineering by Rangwala, Charotar Publishing House.
3. Transportation Engineering by A.K. Upadhyay, S.K. Kataria and Sons.
4. Railway Engineering by Satish Chandra and M.M Agarwal, Oxford University Press, Delhi.

Assessment Methodology:

1. Practical exam in lab where they have to write Tests Related to the Quality of road material and construction. (Once in a week)
2. Assignments one from each unit.
3. Midterm subjective paper where they have to write about concepts related to road materials.
4. Final paper at the end of the semester subjective.

Teaching and Learning resources unit-wise:

Theory concepts

1. <https://nptel.ac.in/courses/105101087>
2. https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_TEI_Lecture_Notes.pdf
3. https://vssut.ac.in/doc/Transportation-1_Lecture-Note.pdf

TECHNO INDIA INSTITUTE OF TECHNOLOGY

I MID TERM ONLINE EXAMINATION (VII Semester)

SUB. Transportation Engineering

Time: 2 Hours

Max Marks: 82

PART -A

(Answer Should be given up to 25 words only) [5X2=10]

(All questions are compulsory)

1. What are the significant recommendation of Jaykar committee report?
2. Highway Related Agencies in India. (Only Name)
3. Compare mode of transportation (ONLY FLOW CHART)
4. What do you know about Highway Alignment?
5. Discuss about Minimum Travel Pattern.

PART-B

(Attempt any FOUR questions) [4x10=40]

1. Discuss about Transportation Engineering and its Importance
2. Derive Expression about Overtaking Sight Distance (OSD) .
3. Calculate the length of Transition Curve and the shift using following data:
Design speed 70kmph, radius of circular curve 200m, allowable rate of change acceleration 0.5 to 0.8 m/s² , allowable rate of introduction of super elevation is 1In120, pavement Width =7.5m.
4. The speed of overtaking and overtaken vehicles are 70 &40 kmph respectively on a two way traffic on road. If the acceleration of overtaking vehicle is 0.99 m/s² .
 - I. Calculate safe overtaking sight distance
 - II. find minimum length of overtaking Zone.
 - III. Draw a neat sketch of overtaking zone and show the position of Sign posts
5. The radius of the horizontal curve is 100m . the design speed is 50Kmph and the design Coefficient is 0.15, then
 - I. Calculate the Super elevation req. if full Lateral friction is assumed to develop.
 - II. Calculate the Coefficient of friction needed if no Superelevation is provided
 - III. Calculate the req. Superelevation if the pressure on inner wheel and outer wheel should be equal.

Techno India NJR Institute of Technology

Civil Engineering Department

Tutorial-I/VII Sem.(IV Year)

(Subject Code: 3CE3-04): Transportation Engineering

Tutorial-1

- 1) Explain the various road patterns along with their advantages and disadvantages.
- 2) Calculate O.S.D. for a design speed of 76 kmph. Assume all other data as per IRC.

OR

A two lane road with a design speed of 80 kmph has radius of a horizontal curve is 480m. Design the rate of superelevation for mixed traffic. By how much should be the outer edge of pavement raised w.r.t. the inner edge if the pavement is 7.5m wide at the horizontal curve?

- 3) A Vertical summit curve is to be designed when two grades 1 in 50 (ascending) and 1 in 80 (descending) meets on a highway. Calculate the length of summit curve to have an overtaking sight distance at a design speed of 96 kmph.
- 4) Write a short note on- (any 4)
 - a. Horizontal curve
 - b. Kerb
 - c. Road margins
 - d. Camber
 - e. Jaykaar committee
- 5) Explain Nagpur Road Plan in brief.

Techno India NJR Institute of Technology

Civil Engineering Department

Tutorial-II/VII Sem.(IV Year)

(Subject Code: 3CE3-04): Transportation Engineering

Transportation-II

- 1) A two lane road with a design speed of 80 kmph has radius of a horizontal curve is 480m. Design the rate of superelvation for mixed traffic. By how much should be the outer edge of pavement raised w.r.t. the inner edge if the pavement is 7.5m wide at the horizontal curve?
- 2) Calculate O.S.D. for a design speed of 86 kmph. Assume all other data as per IRC.
- 3) A Vertical summit curve is to be designed when two grades 1 in 60 (ascending) and 1 in 90 (descending) meets on a highway. Calculate the length of summit curve to have an overtaking sight distance at a design speed of 86 kmph.
- 4) Write a short note on- **(any 4)**
 - f. Horizontal curve
 - g. Kerb
 - h. Road margins
 - i. Camber
 - j. Jaykaar committee
- 5) Explain Bombay Road Plan in brief.

Techno India NJR Institute of Technology

Civil Engineering Department

Tutorial-III/VII Sem.(IV Year)

(Subject Code: 3CE3-04): Transportation Engineering

- 1) Explain Lucknow Road Plan in brief.
- 2) Calculate O.S.D. for a design speed of 50 kmph. Assume all other data as per IRC.

OR

A two lane road with a design speed of 70 kmph has radius of a horizontal curve is 680m. Design the rate of superelvation for mixed traffic. By how much should be the outer edge of pavement raised w.r.t. the inner edge if the pavement is 5.5m wide at the horizontal curve?

- 3) A Vertical summit curve is to be designed when two grades 1 in 50 (ascending) and 1 in 80 (descending) meets on a highway. Calculate the length of summit curve to have an overtaking sight distance at a design speed of 76 kmph.
- 4) Write a short note on- (any 4)
 - a. Horizontal curve
 - b. Carriage way
 - c. Road margins
 - d. Camber
 - e. Jaykaar committee.

Techno India NJR Institute of Technology

Civil Engineering Department

VII Sem.(IV Year)

(Subject Code: 3CE3-04): Transportation Engineering

Important Question Bank

- 1) Explain Lucknow Road Plan in brief.
- 2) A Vertical summit curve is to be designed when two grades 1 in 50 (ascending) and 1 in 80 (descending) meets on a highway. Calculate the length of summit curve to have an overtaking sight distance at a design speed of 76 kmph.
- 3) Calculate O.S.D. for a design speed of 46 kmph. Assume all other data as per IRC.
- 4) Explain Bombay Road Plan in brief.
- 5) Explain the various road patterns along with their advantages and disadvantages.
- 6) Explain Nagpur Road Plan in brief. Write a short note on- (any 4)
 - f. Horizontal curve
 - g. Kerb
 - h. Road margins
 - i. Camber
 - j. Jaykaar committee
- 7) A two lane road with a design speed of 80 kmph has radius of a horizontal curve is 480m. Design the rate of superelvation for mixed traffic. By how much should be the outer edge of pavement raised w.r.t. the inner edge if the pavement is 7.5m wide at the horizontal curve?

Techno India NJR Institute of Technology

Civil Engineering Department

VII Sem.(IV Year)

(Subject Code: 3CE3-04): Transportation Engineering

Open Book Test

- 1) Explain Nagpur Road Plan in brief. Write a short note on- **(any 4)**
 - k. Horizontal curve
 - l. Kerb
 - m. Road margins
 - n. Camber
 - o. Jaykaar committee
- 2) A two lane road with a design speed of 80 kmph has radius of a horizontal curve is 480m. Design the rate of superelvation for mixed traffic. By how much should be the outer edge of pavement raised w.r.t. the inner edge if the pavement is 7.5m wide at the horizontal curve?
- 3) Calculate O.S.D. for a design speed of 86 kmph. Assume all other data as per IRC.

Transportation MCQ

1. What is Highway Engineering?
 - a) Highway Engineering is a specialized field of Civil Engineering
 - b) Highway Engineering is a specialized field of Concrete Technology
 - c) Highway Engineering is a specialized field of Transportation Engineering
 - d) None of the mentioned

2. What is the use of highways?
 - a) Highways were created to connect cities and villages
 - b) Highways is the quickest option
 - c) Highways reduce travel time by half
 - d) All of the mentioned

3. The road foundation for modern highways construction, was developed by which of the following scientists?
 - a) Telford
 - b) Macadam
 - c) Tresguet
 - d) Both Telford and Macadam

4. The New highway project is divided into how many stages?
 - a) Four
 - b) Three
 - c) Two
 - d) One

5. Which of the following does not include in the phases of highway planning?
 - a) Financing
 - b) Showing the phasing of a plan in the five-year plan
 - c) Assessment of road length requirement
 - d) Preparation of master plan

6. Which of the following is a commercial element in highway construction?
 - a) Material
 - b) Environmental aspects
 - c) Installation technique
 - d) Traffic

7. The maximum number of cities and towns are connected by which type of highway?
 - a) State highway
 - b) Village road
 - c) National highway
 - d) Major district road

8. Which of the following is the longest international highway?
 - a) Karakoram highway
 - b) Australia highway 1

- c) Pan-American highway
- d) Trans-Canada highway

9. As per the Nagpur plan, the un-surfaced roads were meant for _____

- a) Other district road and village road
- b) Major district road
- c) State highway
- d) National highway

10. Which of the following is not considered when designing highways?

- a) Settlement
- b) Cross section
- c) Level of service
- d) Sight distance

11. Airports can be classified on how many basis?

- a) 5
- b) 4
- c) 3
- d) 2

12. Which of the below does not affect the site-selection of an airport site?

- a) Adequate access
- b) Air traffic potential
- c) Sufficient airspace
- d) Number of ground staff

13. Which of the following is not a characteristic of centralized system of the terminal Area?

- a) Passengers, cargo routed centrally
- b) Passenger facilities in small units
- c) Walking distance to aircraft < 200m
- d) Common facilities for different gate positions

14. 6. Runways are oriented in a direction against the prevailing wind.

- a) True
- b) False

15. The application of _____ diagram is used to find the orientation of the runway to get the desired wind coverage.

- a) Wind Butterfly
- b) Wind Cycle
- c) Wind Star
- d) Wind Rose

16. Which of the following are types of gauges present in Indian railways?

- a) Broad gauge, standard gauge and metre gauge
- b) Standard gauge, metre gauge and narrow gauge
- c) Metre gauge, narrow gauge and 2 broad gauges

d) Broad gauge, metre gauge and 2 narrow gauges

17. Which of the following is not a component of the rail?

- a) Ballast
- b) Foot
- c) Web
- d) Head

18. India's first passenger train from BoriBunder (Mumbai) to Thane was run on which of the following gauge?

- a) Metre gauge
- b) Standard gauge
- c) Broad gauge
- d) Narrow gauge

19. Which of the following is the most used ballast on Indian railways?

- a) Coal ash ballast
- b) Brickbat ballast
- c) Broken stone ballast
- d) Sand ballast

20. Why the railway track is made resilient and elastic?

- a) Easy fixing
- b) It can be adjusted easily
- c) So that it absorbs shocks
- d) To make it economic

1.c, 2.d, 3.d, 4.b, 5.a, 6.b, 7.c, 8.c, 9.d, 10.a, 11.b, 12.d, 13.b, 14.b, 15.d, 16.d, 17.a, 18.c, 19.c, 20.c

TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR

Department Of Civil Engineering

VII SEM Mid Term Examination

Max. Time: 3 Hrs.

Transportation Engineering-II

Max. Marks: 80

Instruction for candidates:

Attempt any 8 Questions, Each question carries equal marks.

- Q.1:** Write what are the types of gauges and Write the factors considered in selection of a specific gauges. (10 Marks)
- Q.2:** What do you understand by Ideal Permanent ways? Write factors involved in selection of an alignment. (10 Marks)
- Q.3:** Draw the cross section of a B.G track in embankment (on straight track).
Explain what is Coning of wheel? (10 Marks)
- Q.4:** Write down the rail failures with diagrams.
Explain wear of rails and describe its types. (10 Marks)
- Q.5:** Explain Requirements of a railway joint.
Write down the types of rail joint and explain them. (10 Marks)
- Q.6:** Write down the functions of sleepers.
Write down the classifications of sleepers and explain them. (10 Marks)
- Q.7:** Explain:
(a) Fish plates (b) Types of spikes (c) Types of chairs (10 Marks)
- Q.8:** Explain the functions of Ballast.
Write the types of Ballast & explain them. (10 Marks)
- Q.9:** Write the basic requirements that a railway station must have to provide.
Write down the types of Railway station with sketches. (10 Marks)
- Q.10:** Write down the types of signals. (10 Marks)

TECHNO INDIA NJR INSTITUTE OF TECHNOLOGY, UDAIPUR

Department Of Civil Engineering

VII SEM II-Mid Term Examination

Max. Time: 3 Hrs.

Transportation Engineering-II

Max. Marks: 80

Instruction for candidates:

Attempt any 8 Questions, Each question carries equal marks.

- Q.1:** What do you understand by crossing? Explain different types of crossing.
- Q.2:** Explain the term super elevation? What are the objectives of providing the super elevation on curves of a railway track?
- Q.3:** Calculate the maximum permissible speed on a curve of high speed B.G Track having following parameters:
- (i) Degree of curve = 1°
 - (ii) Amount of super elevation = 12 cm
 - (iii) Length of transition curve = 10 m
 - (iv) Maximum Speed of the section likely to be sanctioned = 175 kmph
- Q.4:** Write short notes on:
- (a) Equilibrium Cant
 - (b) Cant Deficiency
- Q.5:** What do you understand by zoning and also explain its types and factors considered while formulating zoning laws?
- Q.6:** Describe various types of runway patterns with the help of neat sketches.
- Q.7:** Explain Grade compensation and its necessity at curves. What should be the compensated gradient provided if the ruling gradient as 1 in 250 has been fixed on a B.G section and a horizontal curve of 3° is also introduced over it.
- Q.8:** Enlist the various factors considered for the airport site selection.
- Q.9:** If an 8° curve of a track diverges from a main curve of 5° in an opposite direction in the layout of B.G. yard, calculate the super elevation and the speed on the branch line, if the maximum speed permitted on the main line is 45 kmph.
- Q.10:** What is WIND ROSE Diagram? Explain briefly with a neat sketch any one method of orientation of runway.

6E6035	Roll No. _____	Total No of Pages: 4
	6E6035 B. Tech. VI-Sem. (Main/Back) Exam., April/May-2016 Civil Engineering 6CE5A Transportation Engineering-I	

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks (Main & Back): 26

Instructions to Candidates:-

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

UNIT-I

Q.1 (a) Discuss the role of transportation in national development. [6]

(b) What are the significant recommendations of Jayakar Committee Report? How this helped in road development in India. [10]

OR

Q.1 (a) Compare road transportation with other modes of transportation. [6]

- (b) Determine the lengths of different categories of roads in a state in India by the year 2018 using the 3rd road development formula and with the following data. [10]

Area of state: 18000 sq.km.

Number of towns: 25

Road Density: 83 km/ 100 km².

UNIT-II

- Q.2 (a) List and explain the properties and requirements of road aggregates. Also mention the various tests conducted for judging the suitability of road aggregates. [8]
- (b) Explain briefly the construction of earth roads. Discuss the advantages and limitations of earth roads. [8]

OR

- Q.2 (a) List different types of cutbacks. When are these used? Discuss in brief the tests carried out on cutback bitumen? [10]
- (b) Briefly list the methods of construction of gravel roads. [6]

UNIT-III

- Q.3 (a) What is Super elevation? Explain the steps for practical design of super elevation. [8]
- (b) Calculate the length of transition curve for a plain and rolling terrain for the following data: Design speed = 80 kmph., Radius of curve = 250 m, Road width = 70 m, Maximum allowable rate of super elevation 1 in 150, Super elevation maximum restricted to 0.07. Assume pavement is rotated with respect to centerline. [8]

OR

- Q.3 (a) Define SSD. Explain any one factor that restricts the SSD. [6]
- (b) A valley curve is formed by a descending gradient of 1 in 25 meeting an ascending gradient of 1 in 30. Design the total length of valley curve, if the design speed is 100 kmph so as to fulfill comfort conditions and head light sight distance for night driving assuming suitable details. [10]

UNIT-IV

- Q.4 (a) Indicate how the traffic volume data are presented and the results used in traffic engineering. [8]
- (b) What are the various objects and applications of spot – speed studies? [8]

OR

- Q.4 (a) Write short note on :- [4×2=8]
- (i) Thirteenth highest hourly traffic volume.
 - (ii) PCU
 - (iii) Road Markings.
 - (iv) Traffic Signal System
- (b) Explain origin and destination study. What are the various uses of O & D studies. [8]

UNIT-V

- Q.5 (a) Explain “Flexible and Rigid” pavements and write the points of difference. [8]
- (b) What are the special points to be considered in the alignment of hill road? Discuss. [8]

7E7064	Roll No. _____	Total No of Pages: 3
	7E7064 B. Tech. VII Sem. (Main/Back) Exam., Nov.-Dec.-2016 Civil Engineering 7CE4A Transportation Engineering - II	

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)*

1. NIL

2. NIL

UNIT - I

- Q.1 (a) Explain different types of rail failures with the help of neat diagrams. [8]
(b) Compare different material sleepers in tabular form. [8]

OR

- Q.1 (a) Explain the various factors considered in selection of alignment. [10]
(b) Enlist the various factors considered in gauge selection. [6]

UNIT - II

- Q.2 (a) Design a turnout with 1 in 16 crossing from the following data: [8]
- (i) Gauge = 1.676m
 - (ii) Heel divergence = 13.3cm
 - (iii) Straight arm between T.N.C. and tangent point of crossing curve = 0.85m
 - (iv) Angle of crossing = $3^{\circ}34'35''$
 - (v) Angle of switch = $1^{\circ}34'27''$
- (b) What do you understand by crossing. Explain different types of crossing with the help of neat sketches. [2+6=8]

OR

- Q.2 (a) Enlist merits and demerits of various railway systems in urban areas. [8]
- (b) Draw a neat sketch of a point and also explain it's various components. [3+5=8]

UNIT - III

- Q.3 (a) What do you understand by widening of gauge at curve? If the wheel base of a vehicle moving on a B.G. track is 5.2m, the diameter of wheel is 1.5m and the depth of flanges below the top of rail is 3.5cm. Determine the extra width required to be provided on gauge, if the radius of curve is 160m. [3+5=8]
- (b) Explain the term superelevation. What are the objectives of providing superelevation on curves of a railway track? [4+4=8]

OR

- Q.3 (a) Calculate the maximum permissible speed on a curve of high speed B.G. track having following particulars:
- (i) Degree of curve = 1°
 - (ii) Amount of Superelevation curve = 12cm
 - (iii) Length of transition curve = 150m
 - (iv) Maximum speed of the section likely to be sanctioned = 175 kmph. [10]

- (b) Write short notes on: [2×3=6]
- (i) Equilibrium cant.
 - (ii) Cant deficiency

UNIT – IV

- Q.4 (a) An airport is proposed at an elevation of 600m above mean sea level where the mean of maximum and mean of average daily temperature of the hottest month are 43.2°C and 26.4°C respectively. The maximum elevation difference along the proposed profile of runway is 5.8m. If the basic runway length is 1380m, determine the actual length of runway to be provided. [10]
- (b) What do you understand by zoning and also explain it's types and factors considered while framing zoning laws. [2+2+2=6]

OR

- Q.4 (a) Describe various types of runway patterns with the help of neat sketches. [8]
- (b) Write short notes on: [2×4=8]
- (i) Hanger
 - (ii) Apron

UNIT – V

- Q.5 (a) Describe Load classification number (LCN) method of rigid and flexible pavement design for runway. [12]
- (b) Enlist causes of failure in rigid pavement. [4]
- OR**
- Q.5 (a) Describe the Westergaard's method for design of rigid pavement for runway. [8]
- (b) Enlist various types of flexible pavement failures. [8]

6E6035

Roll No. : 18 ECTCE024

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Total Printed Pages : 4

B. Tech. (Sem. VI) (Main / Back) Examination, April-May 2018
Civil Engg.
6CE5A Transportation Engineering - I

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 26

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL 2. NIL

UNIT - I

- 1 (a) Enumerate different agencies related to highways in India. Also explain the objectives and activities of different agencies in India. 10
- (b) What are the different modes of transportation ? Explain the specific functions of each of them. 6

OR

- 1 (a) The following datas were collected for planning the road development programme of a backward district
- Total area = 9600 km²
- Agricultural and developed area = 3200 km²
- Existing railway track = 115 km
- Existing length of metalled road = 312 km
- Existing length of un-metalled road = 450 km

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1

[P.T.O.

Number of towns/villages in different population ranges are as below.

Population	>5000	2001-5000	1001-2000	501-1000	<500
Number of villages and towns	8	40	130	280	590

Calculate the additional length of metalled and unmetalled roads for the road system based on Nagpur road plan formulae for this district.

- (b) Explain in detail the main features of various road patterns commonly used with neat sketches.

8

8

UNIT - II

- 2 (a) State the test principle and procedure of CBR test. Draw sketches showing standard details of CBR penetration test and expansion test.

10

- (b) Explain the desirable properties of Bitumen.

6

OR

- 2 (a) What are the advantages and drawbacks of cement concrete roads ? Explain cement grouted and rolled concrete layers and their uses.

10

- (b) What are the different types of joints which are used in construction of cement concrete pavement ?

6

UNIT - III

- 3 (a) Define superelevation. Derive an expression for finding the superelevation required if the design coefficient of lateral friction is 'f'.

6

- (b) Calculate the length of transition curve and salient elements of combined curve consisting of a circular curve joined with a transition curve to its either end.

The required curve design inputs are as follows :

Road class = National Highways

Design speed = 50 kmph

Terrain and climate = Snow bound mountainous terrain

Road type = undivided two lanes 7.0 m wide

Radius of horizontal curve = 160.0 m

Angle of deflection between two tangents of the proposed combined curve = 64°

Chainage at the point of intersection = 500 m

Permissible rate of change of superelevation = 1 in 60.

The superelevation is attained by the rotation of pavement surface about its centre line. Take the maximum permissible superelevation as 7.0 per cent.

10

OR

- 3 (a) Distinguish between Intermediate sight distance and intersection sight distance using diagrams.

8

- (b) Calculate the extra width of pavement required on a horizontal curve of radius 700 meter on a two lane highways, the design speed being 80 kmph. Assume wheel base = 6 meter.

8

UNIT - IV

- 4 (a) At a right angled intersection of two roads, Road 1 has four lanes with a total width of 12.0 meter and Road 2 has two lanes with a total width of 6.6 meter. The volume of traffic approaching the intersection during design hour are 900 and 743 PCU/hour on two approaches of Road 1 and 278 and 180 PCU/hour on two approaches of Road 2. Design the signal timings as per IRC guidelines.

10

- (b) What are the applications of location file, spot, maps, collision diagram and condition diagram.

6

OR

3

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[P.T.O.

- 4 (a) With neat sketches, show various types of traffic signs, classifying them in proper group. 8
- (b) Write short notes on the following : 8
- (i) Spot speed study
 - (ii) On-street parking
 - (iii) Trip generation
 - (iv) Origin and destination studies

UNIT - V

- 5 (a) Discuss the effects of repeated applications of loads on pavements. Explain equivalent wheel load factors for load repetitions. 8
- (b) What is the importance of hill road drainage ? With the aid of neat sketches show the surface drainage system for effective drainage and disposal of water. 8

OR

- 5 (a) What are the various methods of rigid pavement design ? Explain Westergard method of pavement design. What are the limitations of this method ? 8
- (b) Soil subgrade sample collected from the site was analyzed and the results obtained are as given below :
- Soil portion passing 0.074 mm sieve, percent = 50
 - Liquid limit, percent = 40
 - Plastic limit percent = 20
- Design the pavement section by group index method for anticipated traffic volume of over 300 commercial vehicles per day. 8

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Roll No. 15EECTCE024Total No of Pages: 4

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B. Tech. VII Sem. (Main / Back) Exam., Nov. - Dec. - 2018

Civil Engineering

7CE4A Transportation Engineering - II

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 26

Instructions to Candidates:

Attempt any **five** questions, selecting **one** question from each unit. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. NIL2. NIL**UNIT - I**

Q.1 (a) Describe the requirements for an ideal permanent way. Also sketch the neat diagram of Permanent way. [8]

(b) State the classification of gradients and explain each in detail. [8]

OR

Q.1 (a) Write the design parameter of marshalling yard. Define the different types of marshalling yards. Give a sketch of a marshalling yard. [8]

(b) Discuss different types of rail section used on B. G. and M. G. in India. Mention the relative merits and demerits of any two of them. [8]

UNIT- II

Q.2 Explain in brief –

[8×2=16]

- (a) Symmetrical Split
- (b) Diamond Crossing
- (c) Scissors Crossover
- (d) Single Slip and Double Slip
- (e) Gauntlet Track & Fixed Point System
- (f) Gathering Lines
- (g) Triangle
- (h) Double Junction

OR

- Q.2 (a) What are the different types of stress induced in railway track? [8]
- (b) Discuss the objectives of Urban Transport. Explain the major issues relating to the development of the Metropolitan transport system. [8]

UNIT- III

- Q.3 (a) What are the objects of providing transition curves? Explain briefly the essential requirements of an ideal transition curve. [8]
- (b) Explain Grade compensation and its necessity at curves. What should be the allowable ruling gradient, if the ruling gradient is 1 in 150 on a particular section of B. G. and at the same time a curve of 4 degree is situated on this ruling gradient. [8]

OR

- Q.3 (a) Explain the terms 'Super elevation' and 'Cant deficiency' in brief. Also write the limits of Super elevation and Cant deficiency for Indian Railway. [8]
- (b) If a 8 degree curve of track diverges from a main curve of 5 degree in an opposite direction in the layout of B. G. yard, calculate the super elevation and the speed on the branch line, if the maximum speed permitted on the main line is 45 kmph. [8]

UNIT- IV ✓

- Q.4 (a) Write a brief note on "Airport Classifications". [8]
- (b) What is Wind Rose diagram? Explain briefly with a neat sketch any one method of orientation of runway. [8]

OR

- Q.4 (a) Enlist the various factors considered for the airport site selection. Explain any five important factors in brief out of the various factors listed. [8]
- (b) Explain the factors controlling taxiway layout and turn around taxiway. [8]

UNIT- V ✓

- Q.5 (a) Write detail note on the various methods for designing flexible airport pavements. [8]
- (b) What are the various factors to be considered in airport pavement design? Discuss the significance of each. [8]

OR

- Q.5 (a) What are imaginary surface? Explain in detail. [8]
- (b) Explain ESWL method of designing of rigid pavement. [8]