Techno India NJR Institute of Technology

(Approved by AICTE, New Delhi and Affiliated to Rajasthan Technical University Kota (Raj.))

Course File

Subject Title/Subject Code: Transportation Engineering
7CE4-01

Semester: VII Year: IV

Name of the Faculty: Mr Jitendra Choubisa

E-mail id: jitendra.choubisa@technonjr.org

Class Schedule

Total Number of Lectures: 40

i) Course Objective

It aims to provide a comprehensive understanding of transportation engineering, covering highway planning, geometric design, materials, construction, and pavement design. It also introduces the fundamentals of railway, airport, and harbour engineering.

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INDEX - COURSE FILE

Techno India NJR Institute of Technology

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VISSION & MISSION OF INSTITUTE

Vision

Empowering student with recent and emerging technologies to create innovative technical leaders capable of contributing to industrial and societal needs for betterment of mankind across the globe.

Mission

M1: To provide dynamic learning environment to students by providing constant exposure to latest technologies by linking closely with the industries.

M2: To establish effective interface with industry to obtain live problems to enhance critical thinking and problem solving skills among students and consultancy projects for faculty.

M3: To provide avenues and opportunities to faculty for domain specific trainings and qualification upgradation.

M4: To develop ethical leaders with strong communication skills.

VISION & MISSION OF DEPARTMENT

Department Vision

To increase students learning of fundamentals for designing and planning of buildings and latest technologies through industry-aligned project-based learning which will help in transforming students to be good civil engineering professionals leading to innovation and incubation of new ideas.

Department Mission

M1: To create experimental learning through solving problems of Government, Society, Smart Cities, Industry and other entities.

M2: To teach the latest technologies to the students as beyond the syllabus activity so that they are updated and industry ready.

M3: To enable engineering students understand industry-aligned technologies and learn to find solutions from their early engineering days and this is the only way to produce globally relevant engineers solving real-life problems applying current technologies.

M4: To enable students to generate projects through problem faced by and requirement of Smart cities, industry, Government and other entities whereby those outlined problem statements are to be studied deeply by a group of faculty members to convert them into real-time project format.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs 1: To provide an in-depth understanding of the fundamentals of Civil Engineering and create a foundation for lifelong learning to facilitate a progressive career in the construction Industry, as an entrepreneur and in pursuit of higher studies.

PEOs 2: To equip the students with technical and analytical skills to develop innovative solutions to complex real-life problems using existing and novel technologies. To equip the students with good communication and interpersonal skills, inter-disciplinary teamwork and leadership skills to enable them to fulfill professional responsibilities.

PEOs 3: To expose them to various contemporary issues which will enable them to become ethical and responsible towards themselves, co-workers, Society and the Nation.

PEOs 4: To make the student's industry ready by imparting education related to the latest technologies so that they can grab future industry jobs.

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO1: To be aware of and initiate some-work on future technologies and new developments which may impact the future Industry 4.0.

PSO2: Hands on training on upcoming technologies and project-based learning.

PSO3: Get exposure to BIM (Building Information Modeling).

PROGRAMME OUTCOMES (POs)

A student will develop:

PO01. ENGINEERING KNOWLEDGE: An ability to apply knowledge of Mathematics, Science and Engineering Fundamentals in Electronics and Communication Engineering.

PO02. PROBLEM ANALYSIS: Ability to analyze and interpret data by designing and conducting experiments. Develop the knowledge of developing algorithms, designing, implementation and testing applications in electronics and communication related areas.

PO03. DESIGN/ DEVELOPMENT OF SOLUTION: An ability to Design a system Component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

PO04. CONDUCTION OF INVESTIGATION OF COMPLEX PROBLEMS: Ability to Identify, formulate and solve engineering problems.

PO05. MODERN TOOL USAGE: An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

PO06. THE ENGINEERING AND SOCIETY: Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.

PO07. ENVIRONMENT & SUSTAINABILITY: Understand the impact of professional engineering solution in societal and environmental contexts, and demonstrate the knowledge of, and need of sustainable development.

PO08. ETHICS: An ability to understand the professional, social and ethical responsibility.

PO09. INDIVIDUAL AND TEAM WORK: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. COMMUNICATION: An ability to Communicate effectively in order to succeed in their profession such as, being able to write effective reports and design documentation, make effective presentations.

PO11. PROJECT MANAGEMENT & FINANCE: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in team, to manage projects and in multidisciplinary environment.

PO12. LIFE-LONG LEARNING: Recognize the need and an ability to engage in life-long learning.

COURSE OUTCOMES (COs) OF THE SUBJECT

CO No.	Mapping	Statement
CO35301.1	**Applying**	Students will be able to Apply principles of highway planning, alignment, and design using IRC guidelines.
CO35301.2	**Analyzing**	Students will Analyze and select appropriate construction materials for highways based on their properties and testing standards.
CO35301.3	**Analyzing**	Students will be able to Design both flexible and rigid pavements in accordance with IRC provisions, including IRC 37 and IRC 58.
CO35301.4	**Understanding**	Students will Understand and implement modern highway construction techniques, equipment, and quality control processes.
CO35301.5	**Understanding**	Students will Gain foundational knowledge in railway, airport, and harbour engineering for transportation infrastructure development.

COS MAPPING WITH POs AND PSOs

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	0	0	0	0	1	1	1	0	0	0	2	2	2	2
CO2	2	2	0	0	0	1	1	1	0	0	0	1	1	2	2
CO3	1	2	0	0	0	1	1	1	0	0	0	2	2	2	2
CO4	1	0	0	0	0	1	1	1	0	0	0	1	2	2	1
CO5	1	0	0	0	0	1	1	1	0	0	0	1	2	2	1

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UNIVERSITY ACADEMIC CALENDAR

Academic Calendar for odd Semester for Session

RAJASTHAN TECHNICAL UNIVERSITY KOTA

Course: Bachelor of Technology (B.TECH.) for Odd Semester				
Semester	I	III	V	VII
Induction Program	17.08.2023			
Commencement of Classes	11.09.2023	24.08.2023	04.09.2023	04.09.2023
Commencement of First Mid Term	02.11.2023	03.10.2023	05.10.2023	05.10.2023
Commencement of Second Mid Term	07.12.2023	16.11.2023	20.11.2023	20.11.2023
Last Working Day	23.12.2023	02.12.2023	02.12.2023	30.11.2023
Commencement of Practical Exams	02.01.2024	04.12.2023	23.12.2023	14.12.2023
Commencement of Theory Exams	18.01.2024	14.12.2023	08.12.2023	07.12.2023
Winter Break				

ACADEMIC CALENDAR OF INSTITUTE

Academic Calendar

Academic Calendar for Odd Semester for Session 2023-24 (Odd Semester)

Course: Bachelor of Technology (B.TECH.)				
Semester	**I**	**III**	**V**	**VII**
Induction Program	10-08-2023			
Commencement of Classes	20-08-2023	11-09-2023	30-08-2023	22-08-2023
Commencement of First Mid Term	04-11.2023	02-11.2023	02-11.2023	27-09-2023
Commencement of Second Mid Term	15-01-2024	27-12-2023	27-12-2023	05-12-2023
Last Working Day	20-01-2024	12-01-2024	12-01-2024	20-12-2023
Commencement of Practical Exams	29-01-2024	15-01-2024	15-01-2024	31-12-2023
Commencement of Theory Exams	15-02-2024	30-01-2024	29-01-2024	27-12-2023

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Evaluation Scheme

FACULTY DETAILS:

Name of the Faculty : Mr. Jitendra Choubisa

Designation : Assistant Professor

Department : Civil Engineering

1. TARGET

a) Percentage Pass: 100%
b) Percentage I class: 60 %

2. METHOD OF EVALUATION

- [x] Continuous Assessment Examinations (Mid-Term 1, Mid-Term 2)
- [x] Assignments / Seminars
- [ ] Mini Projects
- [x] Quiz
- [x] Semester Examination

Others_____

3. List out any new topic(s) or any innovation you would like to introduce in teaching the subject in this Semester.
4. Take the help of creative tools to stimulate creativity. Include slide presentations, demonstration or forms of visual exercises that will excite the young minds and capture their interest.

Signature of Faculty: **Signature of HOD**

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UNIVERSITY SYLLABUS

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 compactionofdifferentlayersofbituminousroads, modernpavers 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

PRESCRIBED BOOKS

- Highway Engineering by Khanna SK & CG Justo, Nem Chand & Brothers, Roorkee.
- Highway Engg. By LR Kadyali, Khanna Tech Publications, Delhi.
- Specifications for Roads & Bridges by Ministry of Road Transport & Highways and Indian Road Congress.
- Railway Engineering by Satish Chandra and MM Agarwal, Oxford University Press, Delhi.
- Railway Engineering by Saxena SC and Arora SP, Dhanpat Rai Publishers, Delhi.
- S C Rangwala, airport engineering, Charotar publication house.
- Gautam H. Oza, Dock &Harbour Engineering, Charotar publication House.

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WEEKLY TIME TABLE OF THE TEACHER

Time Table: with effect from (Date): 16-08-2023

Day	1	2	3	4	5	6	7
Monday							
Tuesday	TE						
Wednesday							
Thursday							
Friday		TE					
Saturday	TE	TE					

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COURSE-PLAN

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,
		Runway Length etc.
39	8	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.

Signature of Faculty: **Signature of HOD**

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Assignment – 1

1. Discuss the historical development of road construction in India and its impact on modern highway infrastructure. Include the role of key agencies such as IRC and NRRDA.

2. Explain the process of highway alignment selection and the engineering surveys involved. Why is alignment crucial in highway planning?

3. Describe the types of sight distances used in highway design and their importance in ensuring road safety. Support your answer with IRC recommendations.

4. Compare and contrast flexible and rigid pavements, including their construction techniques, materials used, and maintenance requirements.

5. Explain the role of camber, super elevation, and transition curves in highway geometric design. How do they affect vehicle movement on roads?

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Assignment – 2

1. Discuss the testing procedures and desirable properties of highway construction materials such as soil, stone aggregates, and bitumen. How do they contribute to the durability of roads?

2. Evaluate the advantages and challenges of bituminous road construction compared to concrete roads. Include a discussion on modern equipment and quality control measures.

3. Outline the key considerations in the design of rural roads under the PMGSY project, and explain how they differ from urban road designs.

4. Describe the different types of railway gauges and the factors influencing gauge selection. How do these affect the stability and efficiency of rail transport?

5. Explain the major components of an airport and harbour, discussing their roles in the planning and operation of these transportation hubs. How do site selection and classification influence their design?

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SAMPLE QUIZ QUESTIONS

1) Which agency is responsible for setting the standards and guidelines for road construction in India?

a) Indian Roads Congress (IRC)
b) National Highways Authority of India (NHAI)
c) Ministry of Transport
d) National Rural Roads Development Agency (NRRDA)

Answer: (a) Indian Roads Congress (IRC)

2) What is the primary purpose of camber in road design?

a) To increase road width
b) To facilitate drainage
c) To improve vehicle speed
d) To enhance road aesthetics

Answer: (b) To facilitate drainage

3) What is the most commonly used binder in bituminous road construction?

a) Cement
b) Lime
c) Tar
d) Bitumen

Answer: (d) Bitumen

4) Which of the following types of sight distance is crucial for overtaking safely on highways?

a) Stopping sight distance
b) Intermediate sight distance
c) Overtaking sight distance
d) Passing sight distance

Answer: (c) Overtaking sight distance

5) Which type of pavement is typically more flexible and suitable for heavy traffic loads?

a) Concrete Pavememt
b) Rigid Pavememt
c) Flexible Pavememt
d) Stabilized Pavememt

Answer: (c) Flexible Pavememt

6) Which of the following is a key consideration in the design of transition curves in highways?

a) Increasing road width
b) Reducing road friction
c) Providing smooth entry and exit from curves
d) Reducing sight distance

Answer: (c) Providing smooth entry and exit from curves

7) What is the main component of a hot mix plant used in bituminous road construction?

a) Aggregate feeder
b) Asphalt mixer
c) Control panel
d) All of the above

Answer: (d) All of the above

8) Which IRC code is primarily used for the design of flexible pavements?

a) IRC 37
b) IRC 58
c) IRC 81
d) IRC 22

Answer: (a) IRC 37

9) What is the most suitable airport classification factor for determining runway length?

a) Passenger capacity
b) Geographic location
c) Type of aircraft
d) Climate conditions

Answer: (c) Type of aircraft

10) What is the purpose of using a ballast in railway track construction?

a) To secure the rails in position
b) To distribute the load from the rails
c) To aid in drainage
d) All of the above

Answer: (d) All of the above

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Mid Term Paper-I

TECHNO INDIA NJR INSTITURE OF TECHNOLOGY, UDAIPUR

DEPARTMENT OF CIVIL ENGINEERING

VII SEM MID TERM EXAM 2023

SUBJECT: Transportation Engineering [7CE4-01]

TIME: 2 HRS MM: 30

Attempt Any 3 Questions.

1. What are the requirements of ideal highway alignment. Also explain factors controlling the alignment?
2. Explain difference between Rigid and flexible pavement in tabular form. Draw neat diagram also. Define Permanent Way with neat sketch. Describe requirements of an ideal permanent way.
3. What are the factors to be considered while selection of site for airport?
4. Explain steps involve in highway construction. What are the Equipments used in compaction of different layers of pavements? Explain in detail.
5. Define Harbour. Explain requirements of good harbour. Describe classification of harbours
6. Write short Notes on
    a. Runway
    b. Terminal Building
    c. Apron
    d. Taxiway Hanger

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Marks and Gap Analysis of Mid-Term I

S.No.	University Roll No.	Name of Student	Mid-Term 1 MM-70	Remark (Remedial Class need or not – Y/N)
1.	20ETCCE001	Avinash Ahari	65	N
2.	20ETCCE002	Ayushi Choubisa	54	N
3.	20ETCCE004	Kamal Singh Rao	54	N
4.	20ETCCE005	Kritika Dodia	52	N
5.	20ETCCE006	Pradeep Sharma	54	N
6.	20ETCCE009	Rudraksh Pacholi	52	N
7.	20ETCCE010	Shailesh Meghwal	50	N
8.	20ETCCE011	Suryabhan Singh Sarangdevot	63	N
9.	20ETCCE012	Vinit Mali	50	N
10.	20ETCCE300	Shailesh Mali	52	N

*(Y, if obtained marks are <50%)

Signature of Faculty: **Signature of HOD**

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Remedial Action Taken to Remove the Gaps (After Mid- Term 1)

S.no.	University Roll no.	Name of Student	Topics to be discussed in Remedial Class	Schedule Date of Remedial Class	Outcome Achieved
1.	NIL				
2.					

Signature of Faculty: **Signature of HOD**

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Mid Term Paper-II

TECHNO INDIA NJR INSTITURE OF TECHNOLOGY, UDAIPUR

DEPARTMENT OF CIVIL ENGINEERING

VII SEM MID TERM EXAM 2023

SUBJECT: Transportation Engineering [7CE4-01]

TIME: 2 HRS MM: 30

Attempt Any 3 Questions.

1. What are the requirements of ideal highway alignment. Also explain factors controlling the alignment?
2. Explain difference between Rigid and flexible pavement in tabular form. Draw neat diagram also. Define Permanent Way with neat sketch. Describe requirements of an ideal permanent way.
3. What are the factors to be considered while selection of site for airport?
4. Explain steps involve in highway construction. What are the Equipments used in compaction of different layers of pavements? Explain in detail.
5. Define Harbour. Explain requirements of good harbour. Describe classification of harbours
6. Write short Notes on
    a. Runway
    b. Terminal Building
    c. Apron
    d. Taxiway Hanger

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Marks and Gap Analysis of Mid-Term II

S.No.	University Roll No.	Name of Student	Mid-Term 2 MM-70	Remark (Remedial Class need or not – Y/N)
1.	20ETCCE001	Avinash Ahari	64	N
2.	20ETCCE002	Ayushi Choubisa	53	N
3.	20ETCCE004	Kamal Singh Rao	53	N
4.	20ETCCE005	Kritika Dodia	51	N
5.	20ETCCE006	Pradeep Sharma	53	N
6.	20ETCCE009	Rudraksh Pacholi	51	N
7.	20ETCCE010	Shailesh Meghwal	49	N
8.	20ETCCE011	Suryabhan Singh Sarangdevot	62	N
9.	20ETCCE012	Vinit Mali	49	N
10.	20ETCCE300	Shailesh Mali	51	N

*(Y, if obtained marks are <50%)

Signature of Faculty: **Signature of HOD**

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Remedial Action Taken to Remove the Gaps (After Mid- Term 1I)

S.no.	University Roll no.	Name of Student	Topics to be discussed in Remedial Class	Schedule Date of Remedial Class	Outcome Achieved
1.	NIL				
2.					

Signature of Faculty: **Signature of HOD**

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Model Question Paper

7E1712

Roll No. _____ [Total No. of Pages]

7E1712

B.Tech. VII - Sem. (Main/Back) Examination, January - 2023

Civil Engg.

7CE4-01 : Transportation Engineering

Time : 3 Hours **Maximum Marks : 120**

Min. Passing Marks : 42

Instructions to Candidates:

Attempt all Ten questions From Part A, Five Questions out of seven from Part B and four questions out of five from Part C .

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)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. How economic activity and transportation are related to each - other ? discuss. **(2)**
2. Write about scope of transportation Engineering. **(2)**
3. What is the difference between National Highways and State Highways? **(2)**
4. What are the basic requirements of an ideal alignment between two terminal stations? **(2)**
5. What are the objects of Highway geometric design? **(2)**
6. What is the use of fly-ash/pond-ash as highway materials? **(2)**
7. Give definition of flexible and rigid pavements as per IRC. **(2)**
8. What do you understand by Berms and Shoulders? **(2)**
9. What do you understand by Rail Fastenings? **(2)**
10. Define terminal area in construction of Airport. **(2)**

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions. **(5×8=40)**

1. Give difference between Macadam method and Telford method, also draw typical cross-section for Macadam and Telford's construction. **(8)**

2. Write short notes on following: **(8)**
   a) Nagpur Road plan
   b) Star and Grid pattern
   c) Indian Road Congress
   d) PMGSY project.

3. a) Give difference between stopping sight distance and overtaking sight distance. **(4)**
   b) Calculate the value of :
      i) Head light sight distance.
      ii) Intermediate sight distance for a highway with a design speed of 65 km ph. Assume suitably all the data required. **(4)**

4. Give the name of various test carried out on Bitumen. Explain ductility test on Bitumen with the help of neat diagram. **(8)**

5. a) Write advantages and disadvantages of Bituminous Roads and Concrete Roads. **(4)**
   b) What are the specifications of compaction of different layers of bituminous roads? **(4)**

6. a) Define the rails. Explain types of Rails with the help of diagram. **(4)**
   b) Write about types and selection of Gauges in Railway construction with specifications. **(4)**

7. a) Write about factors affecting selection of site for Airport. **(4)**
   b) Define harbour. Explain component of harbours with the help of neat diagram. **(4)**

PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any Four questions. **(4×15=60)**

1. a) Define super elevation and what are the objectives of super elevation. Discuss the factors on which the amount of super elevation to be provided depends. **(7)**
   b) Calculate the length of transition curve and the shift using following data:
      i) Design speed = 80 km ph and radius of circular curve is 300 metre. Allowable rate of introduction of super - elevation is 1 in 150.
      ii) Pavement width including extra widening = 7.5 metre. **(8)**

2. a) What do you understand by quality assurance in Highway Construction? Explain. **(5)**

   b) What are the various methods of flexible pavement design? Explain group index of pavement design. What are the limitation of this method? **(10)**

3. a) Expain the desirable properties of aggregate. **(5)**

   b) Explain the test principle and procedure of CBR Test. Draw sketches showing standard details of CBR penetration test. **(10)**

4. a) 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 km ph. Assume wheel base = 6 meter. **(8)**

   b) Expain briefly the construction of earth roads, discuss the advantages and limitations of earth roads. **(7)**

5. Write short notes on followings:-

   i) Permanent ways in Railway.

   ii) Function of Sleepers.

   iii) Airport Size.

   iv) Runway Length

   v) Ports and Docks. **(15)**

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STUDENT PERFORMANCE REPORT

Roll No.	Name of Student	I Mid-Term	II Mid-Term	Average
20ETCCE001	Avinash Ahari	65	64	64.5
20ETCCE002	Ayushi Choubisa	54	53	53.5
20ETCCE004	Kamal Singh Rao	54	53	53.5
20ETCCE005	Kritika Dodia	52	51	51.5
20ETCCE006	Pradeep Sharma	54	53	53.5
20ETCCE009	Rudraksh Pacholi	52	51	51.5
20ETCCE010	Shailesh Meghwal	50	49	49.5
20ETCCE011	Suryabhan Singh Sarangdevot	63	62	62.5
20ETCCE012	Vinit Mali	50	49	49.5
20ETCCE300	Shailesh Mali	52	51	51.5

Signature of Faculty: **Signature of HOD**

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RESULT ANALYSIS

S.NO.	RTU ROLL NUMBER	NAME OF STUDENT	END TERM MARKS	SESSIONAL MARKS	TOTAL
		MAX MARKS	**70**	**30**	**100**
1.	20ETCCE001	Avinash Ahari	45	29	74
2.	20ETCCE002	Ayushi Choubisa	42	24	66
3.	20ETCCE004	Kamal Singh Rao	37	24	61
4.	20ETCCE005	Kritika Dodia	45	23	68
5.	20ETCCE006	Pradeep Sharma	31	24	55
6.	20ETCCE009	Rudraksh Pacholi	22	23	45
7.	20ETCCE010	Shailesh Meghwal	40	22	62
8.	20ETCCE011	Suryabhan Singh Sarangdevot	43	28	71
9.	20ETCCE012	Vinit Mali	39	22	61
10.	20ETCCE300	Shailesh Mali	20	23	43

TOTAL	PASS	FAIL	ABSENT	PASS %
10	10	0	0	100%

Indirect Assessment:

Overall Teacher Self-Assessment (at the completion of course) in terms of course objective and outcomes

Course Objectives:

It aims to deepen students' understanding of advanced structural analysis techniques essential for civil engineering. It covers the unit load method for deflection analysis, energy methods for evaluating strain energy under various loading conditions, and the application of Castigliano's theorems to both determinate and indeterminate structures. Students will learn to construct and interpret influence line diagrams, analyze the effects of rolling loads, and study the behavior of arches under different support conditions. Additionally, the course introduces unsymmetrical bending, focusing on the computation of stresses and the location of the shear center. Approximate methods for analyzing multistory frames subjected to lateral loads, as well as the tension coefficient method for space trusses, are also explored. Through this course, students will develop the analytical skills necessary to solve complex structural problems, preparing them for professional practice in civil engineering.

Course Outcomes:

At the end of this course students will be able to:

CO1: Students will be able to apply principles of highway planning, alignment, and design using IRC guidelines.

CO2: Students will analyze and select appropriate construction materials for highways based on their properties and testing standards.

CO3: Students will be able to design both flexible and rigid pavements in accordance with IRC provisions, including IRC 37 and IRC 58.

CO4: Students will understand and implement modern highway construction techniques, equipment, and quality control processes.

CO5: Students will gain foundational knowledge in railway, airport, and harbour engineering for transportation infrastructure development.

Methodology to identify bright student

It is done by considering a range of criteria, including academic performance, creativity, critical thinking, problem-solving skills, and enthusiasm for learning. Bright students often excel in multiple areas. Observed how students perform in the classroom. In terms of active participation, engagement in discussions, leadership, and the ability to grasp complex concepts.

Efforts to keep students engaged

1. Active Learning:

- Incorporate active learning strategies, such as group discussions, problem-solving activities, and hands-on projects. Active participation keeps students engaged and encourages critical thinking.

2. Varied Teaching Methods:

- Use a variety of teaching methods, including lectures, group work, multimedia presentations, and interactive activities to cater to different learning preferences.

3. Technology Integration:

- Leverage technology, such as online platforms, educational apps, and interactive software, to make lessons more engaging and interactive.

Methodology to identify weak student

It is done by considering a range of criteria, including classroom observation, formative assessment, summative assessment, assignment review etc. Weak students are struggling students with sensitivity and a desire to support their learning. Some measures, such as additional tutoring, personalized assignments, or alternative assessment methods, to help students succeed.

Targeted inventions for weak student

1. Additional Resources
Offer supplementary learning materials, such as textbooks, online resources, or multimedia content, to provide alternative explanations and reinforce key concepts.

2. Remedial classes
Establish a tutoring program where students can receive extra help from teachers.

3. Flipped classroom
Students are assigned pre-class learning materials, often in the form of videos, readings, or online modules, to cover the foundational concepts before coming to class.