



NARASIMHA REDDY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad

Accredited by NAAC with A Grade, Accredited by NBA

CIVIL ENGINEERING QUESTION BANK

Course Title : Transportation engineering

Course Code : CE3103PC

Regulation : NR20

Course Objectives: This course aims at providing a comprehensive insight of various elements of highway transportation engineering. Topics related to the highway development, characterization of different materials needed for highway construction, structural and geometric design of highway pavements along with the challenges and possible solutions to the traffic related issues will be covered as a part of this course.

Course Outcomes(CO's):

| | |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1 | An ability to apply the knowledge of mathematics, science and engineering in the areas of traffic engineering, highway development and maintenance |
| CO2 | Assess the issues related to the road traffic and engineering solutions |
| CO3 | To evaluate the structural and functional conditions and maintaining measures |
| CO4 | An ability to design, conduct experiments to assess the suitability of the highway materials like soil, bitumen, aggregates. Also, the students will develop the ability to interpret the results |
| CO5 | Design of the flexible and rigid pavements for varying traffic according to the environmental condition |

UNIT-1

UNIT NAME: HIGHWAY DEVELOPMENT AND PLANNING

| S.No | Questions | BT | CO | PO | |
|------------------------------------------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|---|
| Part – A (Short Answer Questions) | | | | | |
| 1 | Enlist the requirements of a highway alignment. | L1 | CO1 | 1 | |
| 2 | Explain briefly main features of Indian Road Congress | L2 | CO1 | 1 | |
| 3 | What are engineering surveys for highway alignment. | L2 | CO1 | 1 | |
| 4 | What is meant by Reconnaissance? | L2 | CO1 | 1 | |
| 5 | Explain briefly the recommendations of Jayakar Committee. | L2 | CO1 | 1 | |
| 6 | Explain about central road fund | L2 | CO1 | 1 | |
| 7 | What are the objectives of road development vision 2021? | L2 | CO1 | 1 | |
| 8 | What are the factors affecting alignment? | L2 | CO1 | 1 | |
| 9 | What are the main features of Bombay plan? | L2 | CO1 | 1 | |
| 10 | List the classification of roads. | L1 | CO1 | 1 | |
| Part – B (Long Answer Questions) | | | | | |
| 11 | a) | Explain about the four most important recommendations made by the Jayakar committee. | L2 | CO1 | 1 |
| | b) | Explain about the five main objectives of highway planning | L2 | CO1 | 1 |
| 12 | a) | Write the salient features of Nagpur Road Plan | L1 | CO1 | 1 |
| | b) | What are the factors effecting highway alignment? Discuss in detail. | L2 | CO1 | 1 |
| 13 | a) | What is the need for highway planning? Discuss the benefits of well-planned highway system in the social and economic development of a country | L2 | CO1 | 1 |
| | b) | List the classification of roads. | L1 | CO1 | 1 |
| 14 | a) | What are the various engineering drawings and reports recommended for highway planning? | L2 | CO1 | |
| | b) | What are engineering surveys for highway alignment. | L2 | CO1 | 1 |
| 15 | a) | Discuss the second twenty year road plan and its salient feature | L2 | CO1 | 1 |
| | b) | What are the uses of map study in engineering surveys for highway location? | L2 | CO1 | 1 |
| 16 | a) | What are the policies and goals of the third road development plan 1981-2001? | L2 | CO1 | 1 |
| | b) | Explain how the final location and detailed survey of a highway are carried out? | L2 | CO1 | 1 |

UNIT-II
UNIT NAME: HIGHWAY

| S.No | Questions | BT | CO | PO | |
|------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|---|
| Part – A (Short Answer Questions) | | | | | |
| 1 | Define sight distance? | L1 | CO2 | 1 | |
| 2 | What are the classifications of sight distance? | L2 | CO2 | 1 | |
| 3 | Define reaction time | L1 | CO2 | 1 | |
| 4 | Define super elevation? | L1 | CO2 | 1 | |
| 5 | What are the two effects of centrifugal force? | L2 | CO2 | 1 | |
| 6 | What is the relationship between super elevation, friction and centrifugal force | L2 | CO2 | 1 | |
| 7 | Define gradient | L1 | CO2 | 1 | |
| 8 | What are the different types of gradients | L2 | CO2 | 1 | |
| 9 | What is extra widening of pavement | L2 | CO2 | 1 | |
| 10 | Define camber or cross slope | L1 | CO2 | 1 | |
| Part – B (Long Answer Questions) | | | | | |
| 11 | a) | Calculate the minimum sight distance required to avoid head on collision of two cars approaching from the opposite direction at 90 and 60 km/hr. assume a reaction time of 2.5 sec and brake efficiency of 70% for both the cars. | L5 | CO2 | 3 |
| | b) | Define sight distance | L1 | CO2 | 1 |
| 12 | a) | A motorist travelling at 100km/hr on a highway needs to take the next exist, which has a speed limit of 50km/hr. The section of the roadway before the ramp entry has a down grade of 3% and coefficient of friction is 0.35. In order to enter the ramp at the maximum allowable speed limit. The braking distance in M. from the exit ramp is. | | CO2 | 3 |
| | b) | What are the different types of sight distance? | L5 | CO2 | 1 |
| 13 | a) | Define stopping sight distance and factors with necessary formulae. | L1 | CO2 | 1 |
| | b) | The perception time for a vehicle travelling at 90km/hr given the coefficient of longitudinal friction 0.35 and SSD 170 m | L5 | CO2 | 3 |
| 14 | a) | The design speed for a road is 65kmph, longitudinal coefficient of friction 0.36 and reaction time of driver is 2.5sec.calculate. i). head light sight distance and ii) intermediate sight distance. | L5 | CO2 | 3 |
| | b) | Define over taking sight distance with necessary formulae. | L1 | CO2 | 1 |
| 15 | a) | With the help of neat sketch, explain the attainment of super elevation | L5 | CO2 | 2 |
| | b) | Calculate the stopping sight distance on a highway at a descending gradient of 2% for a design speed of 80kmph. Assume other data as per IRC recommendations. | L5 | CO2 | 3 |
| 16 | a) | The speed of overtaking and overtaken vehicles are 70 and 40 kmph respectively on a two way traffic road. If the acceleration of overtaking vehicle is 0.99m/sec i). Calculate safe overtaking sight distance ii). mention minimum length of overtaking zone. | L5 | CO2 | 3 |
| | b) | Explain PIEV theory and total reaction time of the driver | L2 | CO2 | 1 |

UNIT-III

UNIT NAME: TRAFFIC ENGINEERING

| S.No | Questions | BT | CO | PO |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|----|
| Part – A (Short Answer Questions) | | | | |
| 1 | Define highway capacity | L1 | CO3 | 1 |
| 2 | What are different types of highway capacity | L2 | CO3 | 1 |
| 3 | What is spot speed and Time headway? | L2 | CO3 | 1 |
| 4 | Define possible capacity | L1 | CO3 | 1 |
| 5 | What is level of service | L2 | CO3 | 1 |
| 6 | What are the different causes of traffic accidents? | L2 | CO3 | 1 |
| 7 | Define practical capacity | L1 | CO3 | 1 |
| 8 | Define volume capacity | L1 | CO3 | 1 |
| 9 | Relate the terms the between flow, speed and concentration | L4 | CO3 | 1 |
| 10 | Define lost time and headway. | L1 | CO3 | 1 |
| Part – B (Long Answer Questions) | | | | |
| 11 | a) Write a short note on various road user characteristics affecting the traffic. | L1 | CO3 | 1 |
| | b) What will be the theoretical capacity for a single lane of a highway. If the speed of traffic stream is 40kmph? | L2 | CO3 | 1 |
| 12 | a) Define the terms cycle length, change interval, phase, lost time, headway, saturation flow. | L1 | CO3 | 1 |
| | b) Define webster method with necessary formula. | L1 | CO3 | 1 |
| 13 | a) Explain the level of service and its representation and explain the relationship between level of service and volume capacity ratio. | L2 | CO3 | 2 |
| | b) Define critical flow ratio and green time by webster method | L1 | CO3 | 1 |
| 14 | a) The average normal flow of traffic on cross roads A and B during period are 400 and 250pcu/hr. The saturations flow values are 1250 and 1000pcu/hr. respectively. The all-red time required for pedestrian crossing is 12 secs. Design two phase traffic signal by websters method. | L5 | CO3 | 3 |
| | b) What are different types of highway capacity | L2 | CO3 | 1 |
| 15 | a) If the length available for parking is 50m and space taken by one vehicle is 3.6mts parked at 45 ⁰ .find the number of vehicles that can be parked. | L5 | CO3 | 3 |
| | b) Find the width of the parking, if the vehicles are parked at 90 ⁰ parking. | L5 | CO3 | 3 |
| 16 | a) The average normal flow of traffic on cross roads A and B during period are 1200 and 1250pcu/hr. The saturations flow values are 1160 and 1090pcu/hr respectively. The all-red time required for pedestrian crossing is 12 secs. Design two phase traffic signal by websters method and effective green time. | L5 | CO3 | 3 |
| | b) Define possible capacity and practical capacity. | L1 | CO3 | 1 |

UNIT-IV

UNIT NAME: HIGHWAY MATERIALS AND CONSTRUCTION PRACTICES

| S.No | Questions | BT | CO | PO | |
|------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----|-----|---|
| Part – A (Short Answer Questions) | | | | | |
| 1 | Define flakiness index | L1 | CO4 | 1 | |
| 2 | Define Elongation index. | L1 | CO4 | 1 | |
| 3 | What is the purpose of conducting abrasion test? | L2 | CO4 | 1 | |
| 4 | Define Softening point | L1 | CO4 | 1 | |
| 5 | What are tests conducted for coarse aggregates? | L2 | CO4 | 1 | |
| 6 | What are tests conducted for bitumen? | L2 | CO4 | 1 | |
| 7 | What is mean by penetration test? | L2 | CO4 | 1 | |
| 8 | What are the basic materials used for construction of roads, enlist the various | L2 | CO4 | 1 | |
| 9 | What is the purpose of conducting crushing value test? | L2 | CO4 | 1 | |
| 10 | What is the purpose of conducting impact test? | L2 | CO4 | 1 | |
| Part – B (Long Answer Questions) | | | | | |
| 11 | a) | Present the experiment procedure of the crushing value test for coarse aggregate. | L4 | CO4 | 5 |
| | b) | Present the experiment procedure of the impact value test for coarse aggregate. | L4 | CO4 | 5 |
| 12 | a) | Present the experiment procedure of the impact value test for coarse aggregate. | L4 | CO4 | 5 |
| | b) | Present the experiment procedure of water absorption test and specific gravity for coarse aggregate | L4 | CO4 | 5 |
| 13 | | Discuss the following any three test procedures for testing procedures for the testing the quality of aggregate | L4 | CO4 | 5 |
| 14 | | Discuss the following any three test procedures for the testing the quality of Bitumen | L4 | CO4 | 5 |
| 15 | | Explain the procedure for the construction of water bound macadam roads | L4 | CO4 | 5 |
| 16 | | Present the experiment procedure of abrasion test for coarse aggregate. | L4 | CO4 | 5 |

UNIT-V
UNIT NAME: PAVEMENT DESIGN

| S.No | Questions | BT | CO | PO |
|------------------------------------------|----------------------------------------------------------------------------------|----|-----|----|
| Part – A (Short Answer Questions) | | | | |
| 1 | Explain rigid pavement | L1 | CO5 | 1 |
| 2 | Define Pavement? | L1 | CO5 | 1 |
| 3 | List the application of rigid pavement | L1 | CO5 | 1 |
| 4 | What are the types of Pavement Structure? | L2 | CO5 | 1 |
| 5 | What are the factors considered in design of pavements? | L2 | CO5 | 1 |
| 6 | What are the design methods available in flexible pavement? | L2 | CO5 | 1 |
| 7 | Describe the factors influencing the design of flexible pavements | L2 | CO5 | 1 |
| 8 | What are the types of Rigid Pavements? | L2 | CO5 | 1 |
| 9 | What are the effects of Temperature on Rigid Pavements? | L2 | CO5 | 1 |
| 10 | Define seal coat and tack coat | L2 | CO5 | 1 |
| Part – B (Long Answer Questions) | | | | |
| 11 | a) Define the term overlays and explain different types of overlays. | L1 | CO5 | 1 |
| | | | | |
| | a) Explain the design procedure for method of rigid pavement as per IRC 58-2015. | L4 | CO5 | 4 |
| | | | | |
| 13 | a) Explain the design procedure of flexible pavement as per IRC:37-2012 | L4 | CO5 | 4 |
| | b) Explain the stresses in rigid pavement. | L1 | CO5 | 1 |
| 14 | a) Difference between rigid and flexible pavement in pavement design | L4 | CO5 | 2 |
| | | | | |
| 15 | a) Explain the Design of Joints in detail. | L6 | CO5 | 1 |
| | | | | |
| 16 | a) Explain the functions of the components of flexible pavements | L1 | CO5 | 1 |

***Blooms Taxonomy Level (BT):** (L1–Remembering; L2–Understanding; L3–Applying; L4–Analyzing;L5–Evaluating;L6–Creating)

Course Outcomes (Cos)

Program Outcomes (Pos)

Prepared By: M. RAGHU VARDHAN
Assistant Professor CE

HOD, CE

NARSIMHA REDDY ENGINEERING**MODEL QUESTION PAPER****COLLEGE (UGC AUTONOMOUS)****III B. Tech I Semester (NR20) Regular Examination, January 2023****TRANSPORTATION ENGINEERING****(CIVIL ENGINEERING)****Time :3 hours****Maximum marks: 75**

- Note:**
- This question paper contains two parts A and B
 - Part A is compulsory which carries 25 marks (1st 5 sub questions are one from each unit carry 2 Marks each & Next 5 sub questions are one from each unit carry 3 Marks). Answer all questions in Part A
 - Part B Consists of 5 Units. Answer any one full question from each unit. Each question carries 10 Marks and may have a, b sub questions

Part-A**(25 Marks)**

Answer all questions

| Q.No | Question | M | CO | BL | PO |
|------|------------------------------------------------------------------------------------|---|----|----|----|
| 1) | a. What are engineering surveys for highway alignment | 2 | 1 | 1 | 1 |
| | b. What is extra widening of pavement? | 2 | 2 | 1 | 1 |
| | c. Relate the terms the between flow, speed and concentration | 2 | 3 | 1 | 1 |
| | d. What is mean by penetration test? | 2 | 4 | 1 | 1 |
| | e. What are the factors considered in design of pavements? | 2 | 5 | 1 | 1 |
| | f. Explain briefly main features of Indian Road Congress | 3 | 1 | 1 | 1 |
| | g. Define super elevation with necessary formulae | 3 | 2 | 1 | 1 |
| | h. Define lost time and headway. | 3 | 3 | 1 | 1 |
| | i. What are the basic materials used for construction of roads, enlist the various | 3 | 4 | 1 | 1 |
| | j. Define seal coat and tack coat | 3 | 5 | 1 | 1 |

Part-B**(50 Marks)**

Answer any five questions

| Q.No | Question | M | CO | BL | PO |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|----|----|
| UNIT-I | | | | | |
| 2) | a. What are the various engineering drawings and reports recommended for highway planning? | 8 | 1 | 2 | 1 |
| | b. What is meant by Reconnaissance? | 2 | 1 | 2 | 1 |
| OR | | | | | |
| 3) | a. What is the need for highway planning? Explain the different road plans in India | 10 | 1 | 2 | 1 |
| | | | | | |
| UNIT-II | | | | | |
| 4) | a. A motorist travelling at 100km/hr on a highway needs to take the next exist, which has a speed limit of 50km/hr. The section of the roadway before the ramp entry has a down grade of3% and coefficient of friction is 0.35. In order to enter the ramp at the maximum allowable speed limit. The braking distance in M. | 7 | 2 | 5 | 1 |

| | | | | | | |
|-----------------|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|---|---|
| | | from the exit ramp is. | | | | |
| | b. | Define stopping sight distance and factors with necessary formulae. | 3 | 2 | 2 | 1 |
| OR | | | | | | |
| 5) | a. | The speed of overtaking and overtaken vehicles are 70 and 40 kmph respectively on a two way traffic road. If the acceleration of overtaking vehicle is 0.99m/sec i). Calculate safe overtaking sight distance ii). mention minimum length of overtaking zone. | 6 | 2 | 5 | 3 |
| | b. | Explain PIEV theory and total reaction time of the driver. | 4 | 2 | 2 | 1 |
| UNIT-III | | | | | | |
| 6) | a. | The average normal flow of traffic on cross roads A and B during period are 1200 and 1250pcu/hr. The saturations flow values are 1160 and 1090pcu/hr respectively. The all-red time required for pedestrian crossing is 12 secs. Design two phase traffic signal by websters method and effective green time. | 8 | 3 | 5 | 3 |
| | b. | What are different types of highway capacity | 2 | 3 | 1 | 1 |
| OR | | | | | | |
| 7) | a. | Explain the level of service and its representation and explain the relationship between level of service and volume capacity ratio. | 7 | 3 | 1 | 1 |
| | b. | Find the width of the parking, if the vehicles are parked at 90° parking. | 3 | 3 | 4 | 3 |
| UNIT-IV | | | | | | |
| 8) | a. | Discuss the following any three test procedures in detailed for testing procedures for the testing the quality of aggregate | 10 | 4 | 2 | 1 |
| OR | | | | | | |
| 9) | a. | Discuss the following any three test procedures in detailed for the testing the quality of Bitumen. | 10 | 4 | 2 | 1 |
| UNIT-V | | | | | | |
| 10) | a. | Explain the design procedure of flexible pavement as per IRC:37-2012 | 6 | 5 | 3 | 3 |
| | b. | Define the term overlays and explain different types of overlays | 5 | 5 | 4 | 1 |
| OR | | | | | | |
| 11) | a. | Explain the design procedure for method of rigid pavement as per IRC 58-2015. | 6 | 5 | 2 | 3 |
| | b. | Explain the stresses in rigid pavement. | 4 | 5 | 2 | 1 |

M – Marks **CO** – Course Outcomes **PO** – Program Outcomes

BL – Bloom's Taxonomy Levels (**L1**–Remembering, **L2**–Understanding, **L3**–Applying, **L4**–Analyzing, **L5**–Evaluating, **L6**–Creating)