

GUJARAT TECHNOLOGICAL UNIVERSITY

5th Semester Civil Engineering – PDDC

Subject Code & Name: X50601 - Highway Engineering

Sr. No.	Course content
1.	Highway Planning and Development : Highway planning in India, development, rural and urban roads, road departments in India, road classification, road authorities i.e. IRC, CRRI, CRF, HRB, NHAI, NHDP, PMGSY etc.
2.	Field Surveys: Reconnaissance, aerial surveys, location surveys, location of bridges, problems in rural and urban areas.
3.	Highway Geometric Design: Topography and physical features, cross section elements like pavement widths, carriageway width, formation width, land width, right of way, road boundaries, etc., friction, light reflecting characteristics, roughness, camber, sight distances, horizontal alignment, design speed, minimum and ruling radius, super-elevation, transition curve, gradients, design of summit and valley curves.
4.	Road Sub-Grade: Soil and its classification, soil investigation, CBR, important characteristics, tests.
5.	Road Material: Aggregates and their types, physical and engineering properties, tests, fillers, bitumen, characteristics, emulsions and cutbacks, tests.
6.	Pavements: Design of flexible (G.I. method and CBR method) and rigid pavements (Westergaard Method), maintenance of pavements.
7.	Drainage: Surface and sub-surface drainage arrangements and sketches.
8.	Mountain Roads: Elementary principles of alignment in hilly areas and drainage.
9.	Roadside Amenities: Arboriculture, street lighting, road safety.
10.	Traffic Engineering: Road user characteristics, vehicular characteristics, traffic flow characteristics, speed, traffic volume studies, parking studies - definition, purpose, types, survey methods. Accident studies - purpose, types, causes, collision diagram, condition diagram, preventive measures. Traffic control devices like pavement marking, signs, signals etc. traffic management, various types of intersection and their design criteria.
Term Work: Term work shall be based on the above mentioned course content.	
References Books: <ol style="list-style-type: none">1. Highway Engineering by Khanna & Justo2. Traffic Planning and Design by Subhash Saxena3. Traffic Engineering by L.R. Kadiyali4. Principles of Transportation Engineering by Animesh Das & Partha Chakroborty	

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC SEMESTER– V • EXAMINATION – SUMMER 2015

Subject Code: X50601

Date: 07/05/2015

Subject Name: Highway Engineering

Time: 02:30 pm - 05:00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define highway alignment. What are the requirements of ideal alignment of road? **07**
- (b) Explain the classification of roads based on location and function as suggested in the Nagpur Road Plan. **07**
- Q.2** (a) Write a short notes on : **07**
(1) Width of Carriageway
(2) Shoulders
- (b) Explain the PIEV theory and derive the expression for SSD at gradient $n\%$. **07**
- OR**
- (b) Calculate the superelevation required on a road curve of 240 m radius with mixed traffic conditions. The design speed is 80 km/hr. The coefficient of friction is 0.15. The road is passing through rolling terrain. **07**
- Q.3** (a) Give classification of soil according to Highway Research Board. **07**
- (b) The speed of overtaking and overtaken vehicles are 80 kmph and 60 kmph respectively. The acceleration of the overtaking vehicle is 2.5 kmph/sec^2 . Calculate safe overtaking sight distance for (i) One way traffic (ii) Two way traffic. **07**
- OR**
- Q.3** (a) Write a short note on CBR test. **07**
- (b) Write a short note on Ductility test on bitumen. **07**
- Q.4** (a) State the difference between road safety reviews and road safety audit. **07**
- (b) Write a short note on design of flexible pavement by California Bearing Ratio Method. **07**
- OR**
- Q.4** (a) Write a short note on causes of land slide. **07**
- (b) What are the importances of drainage? Explain any one method of subsurface drainage. **07**
- Q.5** (a) Describe Preventive measures of road accidents. **07**
- (b) Describe Arboriculture. **07**
- OR**
- Q.5** (a) Explain PPP mode in context to road administration. **07**
- (b) Explain road user characteristics. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI • EXAMINATION – WINTER • 2014****Subject Code: X50601****Date: 29-11-2014****Subject Name: Highway Engineering****Time: 10:30 am - 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain (1) Indian Road Congress (2) Indian Motor Vehicle act. **07**
 (b) What are the factors affecting alignments of road? Explain in detail. **07**
- Q.2** (a) What is the necessity of cross slope? Draw the sketch of shapes of cross slopes. **07**
 (b) Explain ruling, maximum and exceptional gradient. **07**
- OR**
- (b) A national highway passing through plain and rolling areas. Design super elevation for the given conditions: **07**
 (1) For plain terrain: Ruling design speed=80kmph and horizontal curve radius=215m.
 (2) For rolling terrain: Ruling design speed=80kmph and horizontal curve radius=300m.
- Q.3** (a) Draw the fully dimensioned sketch of national highway in embankment. **07**
 (b) Give the index properties of soil. **07**
- OR**
- Q.3** (a) Write a short note on “Los Angeles Abrasion test” **07**
 (b) Explain the methodology of constructing cement concrete roads. **07**
- Q.4** (a) What are the applications of origin and destination studies? **07**
 (b) Explain the significance of PPP models. **07**
- OR**
- Q.4** (a) What is the necessity of parking space in urban area? Draw the sketch of angular parking. **07**
 (b) What are the desirable characteristics of road side tree plantations? **07**
- Q.5** (a) Explain various types of intersection at grade with sketch. **07**
 (b) Define traffic volume count. Describe procedure of traffic volume count. **07**
- OR**
- Q.5** (a) Draw the sketch of : **07**
 (1) Regulatory sign board (2) Warning sing board with dimensions.
 (b) State the advantages and dis-advantages of traffic signal. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-V • EXAMINATION – SUMMER • 2014

Subject Code: X50601**Date: 27-05-2014****Subject Name: Highway Engineering****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q-1** (a) Explain the classification of roads as per 1st Twenty Year Road Plan. **07**
(b) Explain (i) Central Road Fund (ii) Indian Road Congress (iii) Indian Motor Vehicle act. **07**
- Q-2** (a) Explain camber. What are the objects of camber? Discuss the factors on which the amount of camber depends. **07**
(b) Explain the factors which control the highway alignments. **07**
- OR**
- (b) State the objects of widening of pavement on horizontal curves. What are the factors on which the design of widening depends? Explain. **07**
- Q-3** (a) Explain the maintenance of bituminous road. **07**
(b) Write a short note on “Penetration Test”. **07**
- OR**
- Q-3** (a) Give the index properties of soil. **07**
(b) Describe the test procedure of “Aggregate impact test”. **07**
- Q-4** (a) Explain various types of intersection at grade with sketch. **07**
(b) What is the necessity of parking space in urban area? Draw the sketch of angular parking **07**
- OR**
- Q-4** (a) What are the advantages and limitations of traffic rotary? **07**
(b) What are the applications of origin and destination studies? **07**
- Q-5** (a) What are the desirable characteristics of road side tree plantations? **07**
(b) Explain surface drainage and sub-surface drainage. **07**
- OR**
- Q-5** (a) Explain the significance of PPP models. **07**
(b) What are the road pavements? Draw the sketch of rigid and flexible pavements. **07**

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GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-V • EXAMINATION – WINTER 2013

Subject Code: X50601

Date: 04-12-2013

Subject Name: Highway Engineering

Time: 10.30 am - 01.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q-1 (a) What are the objectives of highway planning? Give classification of highways according to Nagpur road plan. 07
- (b) Explain (i) Central Road Fund (ii) Indian Road Congress 07
- Q-2 (a) State the objects of widening of pavement on horizontal curves. What are the factors on which the design of widening depends? Explain. 07
- (b) Draw the neat sketch of cross section of National highway in embankment mention dimensions also. 07
- OR**
- (b) Calculate the length of stopping sight distance for two way traffic in a single lane road the design speed is 75kmph, reaction time of driver is 2 sec. coefficient of friction is 0.5 alignment is in ascending 1.5% and also descending 2.5% 07
- Q-3 (a) Write a short note on “Los Angeles Abrasion test” 07
- (b) Give the index properties of soil. 07
- OR**
- Q-3 (a) Explain the maintenance of bituminous road. 07
- (b) Explain by drawing sketch rigid and flexible pavements. 07
- Q-4 (a) What is the necessity of highway drainage system? Draw the sketch of surface drainage system of urban roads. 07
- (b) Draw the sketch of hill road components. 07
- OR**
- Q-4 (a) State the advantages of street lighting. 07
- (b) What are the desirable characteristics of road side tree plantations 07
- Q-5 (a) What is the necessity of parking space in urban area? Draw the sketch of angular parking 07
- (b) Define traffic volume count. Describe procedure of traffic volume count. 07
- OR**
- Q-5 (a) What are the causes of road accidents? Explain. 07
- (b) Describe in detail road user characteristics 07

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC - SEMESTER-V • EXAMINATION – SUMMER 2013****Subject Code: X50601****Date: 10-05-2013****Subject Name: Highway Engineering****Time: 02.30 pm - 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) What are the objectives of highway planning? Give classification of highways according to Nagpur road plan. **07**
(b) Explain (i) Central Road Fund (ii) Indian Road Congress (iii) Indian Motor vehicle act. **07**
- Q.2** (a) Explain the factors which control the highway alignments. **07**
(b) What is the necessity of cross slope? Draw the sketch of shapes of cross slopes. **07**
- OR**
- (b) Explain by drawing sketch single lane and two lane pavements. **07**
- Q.3** (a) Draw the fully dimensioned sketch of national highway in embankment. **07**
(b) Calculate safe stopping sight distance for design speed of 5 **07**
- OR**
- Q.3** (a) Describe the test procedure of “Aggregate impact test”. **05**
(b) Calculate the minimum sight distance required to avoid head on collision of two cars approaching from opposite direction at 90.0 and 60.0kmph. assume Reaction time 2.5seconds. coefficient of friction 0.7 brake efficiency = 50% **09**
- Q.4** (a) What are the road pavements? Draw the sketch of rigid and flexible pavements. **07**
(b) Describe the steps of construction procedure of W.B.M. roads. **07**
- OR**
- Q.4** (a) Describe the test procedure of softening point test for bituminous material. **07**
(b) What is the necessity of highway drainage system? Draw the sketch of surface drainage system of urban roads. **07**
- Q.5** (a) What is the human reaction time? Describe vehicular dimensions with sketch. **07**
(b) Define traffic volume count. Describe procedure of traffic volume count. **07**
- OR**
- Q.5** (a) What are the applications of origin and destination studies? **07**
(b) What are the purposes of road side plantations? Draw the sketch of trees and Shrubs on urban roads **07**

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER – V • EXAMINATION – WINTER 2012

Subject code: X 50601**Date: 11/01/2013****Subject Name: Highway Engineering****Time: 02.30 pm - 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a) Give classification of roads according 07
➤ to Nagpur road plan and
➤ third road plan
(b) Define the alignment of roads. What are the requirements of ideal alignments? 07

- Q.2 (a) (i) Give classification of urban roads 07
(ii) What are the functions of IRC?
(b) Draw the neat sketch of cross section of National highway in embankment 07
mention dimensions also.

OR

- (b) Calculate the length of stopping sight distance for two way traffic in a single 07
lane road the design speed is 65kmph, reaction time of driver is 2.2 sec.
coefficient of friction is 0.56 alignment is in ascending 1.8% and also
descending 2.1%
Q.3 (a) Give the index properties of soil. 07
(b) Describe test procedure of aggregate impact test draw sketch of apparatus also 07

OR

- Q.3 (a) Describe construction procedure of WBM roads. 07
(b) Explain by drawing sketch rigid and flexible pavements. 07

- Q.4 (a) Draw the sketch of hill road components. 07
(b) What are the desirable characteristics of road side tree plantations 07

OR

- Q.4 (a) Explain the road safety audits for which aspect the road safety audit is 07
conducted?
Q.4 (b) Explain surface drainage and sub surface drainage 07

- Q.5 (a) Describe in detail road user characteristics 07
(b) Define the terms :- (i) traffic volume (ii) running speed 07
(iii) spot speed (iv) axle spacing (v) journey speed (vi) brake efficiency (vii)
sight distance

OR

- Q.5 (a) What is the necessity of parking space in urban area? Draw the sketch of 07
angular parking
(b) (i) draw the sketch of regulatory sign board 07
(ii) warning sign board with dimensions

GUJARAT TECHNOLOGICAL UNIVERSITY**PDDC-Semester –V (May-2012) Examination****Subject code: X 50601****Subject Name: Highway Engineering****Date: 14/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the objectives of Indian Road Congress. **07**
(b) What are the factors affecting alignments of road? Explain in detail. **07**

- Q.2** (a) Explain ruling, maximum and exceptional gradient. **07**
(b) State the objects of widening of pavement on horizontal curves. What are the factors on which the design of widening depends? Explain. **07**

OR

- (b) Calculate the length of stopping distance for two way traffic in a single lane road. The design speed is 80 kmph. Assume reaction time of driver is 3 sec and coefficient of friction is 0.5 for sloping road with **07**
(i) Ascending slope of 2%
(ii) Descending slope of 3%

- Q.3** (a) What are the various tests carried out on bitumen? Briefly mention the purpose of each test. **07**
(b) Write a short note on “Los Angeles Abrasion test” **07**

OR

- Q.3** (a) Explain the methodology of constructing cement concrete roads. **07**
(b) Explain the maintenance of bituminous road. **07**

- Q.4** (a) Differentiate between surface and sub surface drainage. **07**
(b) Enlist the parts and functions of hill road components with neat sketch. **07**

OR

- Q.4** (a) State the advantages of street lighting. **07**
(b) Explain the significance of PPP models. **07**

- Q.5** (a) Explain road user characteristics. **07**
(b) What are the causes of road accidents? Explain. **07**

OR

- Q.5** (a) State the advantages and dis-advantages of traffic signal. **07**
(b) Explain various types of intersection at grade with sketch. **07**

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GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC SEM-V Examination-Nov-2011

Subject code: X50601

Date: 19/11/2011

Subject Name: Highway Engineering

Time: 2.30 pm -5.00 pm

Total marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the classification of roads as per 1st Twenty Year Road Plan. **07**
(b) Explain the various requirements of an ideal highway alignment in detail. **07**

- Q.2** (a) Explain camber. What are the objects of camber? Discuss the factors on which the amount of camber depends. **07**
(b) Calculate the stopping sight distance for a design speed of 90 kmph for (a) two way traffic on a two lane road (b) two way traffic on a single lane road. Take the total reaction time 2.5 second and the coefficient of friction=0.30. **07**

OR

- (b) List the various types of transition curve used in highways. What is an ideal transition curve? Explain. **07**

- Q.3** (a) Explain HRB Soil classification systems. **07**
(b) Write a short note on "Penetration Test". **07**

OR

- Q.3** (a) Explain the CBR method of pavement design. **07**
(b) Write a short note on "Impact Value". **07**

- Q.4** (a) What are the requirements of a good highway drainage system? **07**
(b) What are the special points to be considered in the alignment of hill road? Discuss. **07**

OR

- Q.4** (a) Write a short note on "Street Lighting". **07**
(b) Explain PPP model of Road Administration. **07**

- Q.5** (a) Explain Road user characteristics. **07**
(b) Explain the term traffic volume. What are the objects of carrying out traffic volume studies? **07**

OR

- Q.5** (a) With neat sketches show various types of traffic signs. Classifying them in proper groups. **07**
(b) What are the advantages and limitations of traffic rotary? **07**
