Code No: R2021015 **R20** SET - 1

II B. Tech I Semester Regular/Supplementary Examinations, January - 2023
HIGHWAY ENGINEERING
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions, each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1 a) Explain various factors controlling alignment of road with examples and neat sketch. [7M]

b) Determine the length of different categories of roads in a state in India by the year 2001, using the 3rd road development formula and with the following data : Area of state =90000 km^2; number of towns =75; Road density=70km / 100 km^2. [7M]

OR

2 a) Explain various road patterns with neat sketch. [7M]

b) Write about the factor affecting alignment. [7M]

UNIT-II

3 a) Explain the sight distance, its importance and restrictions to the sight distance. [7M]

b) Explain compensation gradient in horizontal curves. While aligning a hill road with a ruling gradient of 6 percent, a horizontal curve of radius 60m is encountered. Find the grade compensation and compensated gradient at the curve. [7M]

OR

4 a) Explain briefly the highway cross section elements. [7M]

b) A valley curve is formed by a descending gradient of 1 in 25 meetings on 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 height driving assuming suitable details. [7M]

UNIT-III

5 a) What is traffic rotary? What are its advantages and limitations? [7M]

b) Explain the following : [7M]
   i. AADT
   ii. Parking volume
   iii. Time mean speed and space mean speed

OR

6 a) Discuss in detail about the condition diagram and collision diagrams [7M]

b) What is off- tracking? A vehicle has a wheel base of 6m. What is the off tracking while negotiating a curved path with a mean radius of 30m? [7M]
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UNIT-IV

7 a) List the tests on bitumen and explain principle and use of each test. [7M]

b) Explain about California Bearing Ratio. [7M]

OR

8 a) Explain about Group Index. [7M]

b) The load penetration values of CBR tests conducted on two soil specimens of a particular soil are given below .determine the average CBR value of the soil if 10 divisions of load dial represents 20kg load in the calibration chart of proving ring. [7M]

Penetration of plunger , mm		0.0	0.5	1.0	1.5	2.	2.5	3.0	4.0	5.0	7.5	10.0	12.5
Load dial reading ,divisions	**Specimen no1**	0	10	18	26	34	40	50	62	70	87	95	109
	Specimen no 2	0	0.5	3.5	9.0	18	30	40	54	64	80	88	102

UNIT-V

9 a) What are the causes of pavement failure? Draw sketch of failure of wearing course. [7M]

b) Write a short note on: [7M]
(i) equivalent single wheel load (ESWL) (ii) types of joints in rigid pavements

OR

10 a) Enumerate the steps in the construction of CC pavement. [7M]

b) Explain the basic concept in westergaard's analysis of stress in rigid pavements. Compute the radius of relative stiffness of 15 cm thick cement concrete slab having modulus of elasticity of cement concrete is $2.1x10^5 kg/cm^2$, Poisson's ratio 0.15 and modulus of subgrade reaction is 3.0 kg/cm^3. [7M]

Code No: R2021015 **R20** SET - 2

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UNIT-I

1 a) Write major policies and objective of third twenty year road development plans 1981-2001. [7M]

b) What are the significant recommendations of Jayakar committee report? Mention how this helped in road developments in India. [7M]

OR

2 a) Discuss briefly outline the classification of roads as per Nagpur road plan. [7M]

b) Write a short note on road development plan vision 2021 and 2025. [7M]

UNIT-II

3 a) Write a short notes on (i) Kerbs (ii) Roads margins (iii)shoulders (iv)width of formation (v) right of way [7M]

b) Why overtaking zones provided? What is the basis of deciding its length? [7M]

OR

4 a) What are the important pavement surface characteristics with respect to highway geometric design? [7M]

b) Explain camber .what is the objectives of camber. Discuss the effect of shape of the camber. [7M]

UNIT-III

5 a) What are the advantages and disadvantage if traffic signals? [7M]

b) Draw the sketches of parking layout [7M]
(i) Parallel (ii) Angle parking (iii) Kerb parking

OR

6 a) List the various traffic engineering studies. Mention the importance and objectives of each study. [7M]

b) What are the various types of traffic marking commonly used? What are uses of each? [7M]

UNIT-IV

7 a) Write a short note on: [7M]
(i) Flakiness index (ii) Elongation index (iii) Angularity number.
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b) What are the basic materials used for construction of roads, enlist the various tests to be carried out. [7M]

OR

8 a) Explain the desirable properties of good subgrade soil. [7M]

b) Explain the plate bearing load test procedure and how the modulus of subgrade reaction, K is determined. [7M]

UNIT-V

9 a) Discuss in detail the variations in temperature that generally effect the pavement. [7M]

b) Briefly outline IRC recommendations for determining the thickness of CC pavement. [7M]

OR

10 a) Explain in detail of flexible pavement design methods. [7M]

b) Calculate the stresses at interior, edge and corner regions of CC pavement using Westergaard's stress equation. Use the following data: Wheel load= 5100 kg, modulus of elasticity is $3x10^5$ kg/cm^2, pavement thickness =18cm, Poisson's ratio of concrete = 0.15, modulus of subgrade reaction 6 kg/cm^3 and radius of contact area is 15cm. [7M]

Code No: R2021015 **R20** SET - 3

II B. Tech I Semester Regular/Supplementary Examinations, January - 2023
HIGHWAY ENGINEERING
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions, each Question from each unit
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UNIT-I

1 a) Explain about obligatory points with sketches and discuss how these control the alignment of road. [7M]
b) State and explain the economic factors influencing highway alignments. [7M]

OR

2 a) Write stages in engineering surveys before alignment. [7M]
b) Explain the role of transportation in rural development. [7M]

UNIT-II

3 a) Explain the stopping distance, overtaking and intermediate sight distances. [7M]
b) Explain with neat sketch the methods of eliminating camber and introduction to super elevation. [7M]

OR

4 a) What is off tracking, explain with sketches? Determine the off tracking of a vehicle with wheel base 7m while negotiating horizontal curve radius of 100m? [7M]
b) Explain the importance of Geomatric design. [7M]

UNIT-III

5 a) Explain the terms basic capacity. Estimate the basic capacity of a traffic lane at a speed of 60kmph. Assume that all the vehicles are of average length of 6m. [7M]
b) With neat sketch explain different types of traffic signs. [7M]

OR

6 a) Write short note on: [7M]
(i) thirteenth highest hourly traffic volume
(ii) 85^{th} percentile speed iii) PCU values
b) Explain the grade separated intersections with its advantages and disadvantages. [7M]
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UNIT-IV

7 a) List the different tests on road aggregates and explain in detail the procedure for testing aggregate crushing strength. [7M]

b) What are the desirable properties of subgrade soil? Enumerate the identification and classification tests of soils. [7M]

OR

8 a) Explain briefly the Marshall method of bituminous mix design. [7M]

b) Explain briefly two different tests carried out to determine the abrasion of aggregates. [7M]

UNIT-V

9 a) Briefly explain the advantage and limitations of rigid and flexible pavements. [7M]

b) Discuss the types of joints in CC pavements and their functions. [7M]

OR

10 a) Explain the components in typical flexible pavement structure from the bottom to top. [7M]

b) Explain in detail types of stresses are developed in rigid pavements. [7M]

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Answer any **FIVE** Questions, each Question from each unit
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UNIT-I

1	a)	Discuss the role of transportation in national development.	[7M]
	b)	What are the various basic requirements for ideal highway alignment? Explain briefly.	[7M]

OR

2	a)	Compare the advantages and disadvantages road transportation with other mode of transportation.	[7M]
	b)	Write a short note on (i) Obligatory points (ii) Geometric design in view of controlling alignment.	[7M]

UNIT-II

3	a)	Which factors effecting stopping sight distance? Calculate the stopping sight distance for a design speed of 90 kmph. Take the total reaction time 2.5 seconds and the coefficients of friction as 0.35.	[7M]
	b)	State the factors that govern the length of summit curve &valley curves. How it's decided.	[7M]

OR

4	a)	Explain the super elevation? A radius of 250 m has to be provided at a locality due to site restrictions in national highway in plain terrain. Design the super elevation. Should there be restriction in speed.	[7M]
	b)	The speed of overtaking and overtaken vehicle is 75 and 55 kmph respectively. If the acceleration of the overtaking vehicle is 2.5 kmph per second, calculate the safe passing sight distance for (i) one way traffic (ii) two way traffic .	[7M]

UNIT-III

5	a)	What are the various methods of carrying out speed and delay study? Explain floating car method in detail.	[7M]
	b)	Compare the following (i) angle parking with parallel parking (ii) parking lots and garages.	[7M]

OR

6	a)	Enumerate the different methods of conducting traffic volume studies. Indicate the principle of each.	[7M]
	b)	Explain about Webster method.	[7M]
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Code No: R2021015 **R20** SET - 4

UNIT-IV

7 a) Distinguish between bitumen and tar with its properties. [7M]

b) A plate load test was conducted on a soaked subgrade during monsoon season using a plate diameter of 30cm. the load values corresponding to the mean settlement dial readings are given below. Determine the modulus of subgrade reaction for the standard plate. [7M]

Mean settlement values ,mm	0.0	0.24	0.52	0.76	1.02	1.23	1.53	1.76
Load values ,kg	0.0	460	900	1180	1360	1480	1590	1640

OR

8 a) Briefly explain characteristics and tests of bitumen emulsion. [7M]

b) Explain the steps for design of a bituminous mix. [7M]

UNIT-V

9 a) What are the factors considered in the design of flexible pavements? [7M]

b) Explain the components in rigid pavements and their functions. [7M]

OR

10 a) Explain briefly the concept of equivalent single wheel load (ESWL) [7M]

b) What are the factors causing warping stresses in rigid pavements? Explain briefly. [7M]