

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V EXAMINATION – WINTER 2025****Subject Code:3150613****Date:25-11-2025****Subject Name:Pavement Design and Highway construction****Time:10:30 AM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Draw the cross section of flexible pavement showing all components of it.	03
	(b) Compare Tar and Bitumen.	04
	(c) Enlist the tests on aggregates and explain impact test in detail.	07
Q.2	(a) Define: (i) Vehicle Damage Factor (ii) ESWL (iii) Modulus of Resilient	03
	(b) What are the factors considered for rigid pavement design?	04
	(c) Explain the Boussinesq's theory of stress analysis.	07
	OR	
	(c) Explain the Burmister's two-layer and three-layer theory.	07
Q.3	(a) Describe various factors affecting selection of type of pavement.	03
	(b) Evaluate the radius of relative stiffness and equivalent of resisting section for the following data. Thickness of pavement=18 cm. Poisson's ratio=0.15 Radius of contact area=15 cm. Modulus of elasticity of cement concrete= 3×10^5 kg/cm ² Modulus of subgrade reaction= 6 kg/cm ³	04
	(c) Write a short note on Westergaard's stress analysis.	07
	OR	
Q.3	(a) Differentiate between flexible and rigid pavement.	03
	(b) Compute the design traffic (in msa) for bituminous pavement by considering the following data. • Two lane single carriageway • Initial traffic in the year of completion of construction = 400 cvpd • Traffic growth rate per annum = 7.5 % • Design life period = 15 years • Vehicle damage factor = 2.5	04
	(c) Write the steps to be followed for analyzing flexible pavements using IITPAVE.	07
Q.4	(a) Draw neat, titled sketches of joints in rigid pavement.	03
	(b) Briefly explain the need of soil stabilization.	04
	(c) Explain the construction process of Subgrade.	07
	OR	
Q.4	(a) List the properties required for joint filler and joint sealer material.	03
	(b) Describe cement stabilization.	04
	(c) Explain the construction process of WBM and WMM.	07
Q.5	(a) Define the terms: (i) PQC and (ii) DLC	03

- (b) Briefly explain the methodology adopted for rigid pavement maintenance. **04**
- (c) Explain the importance of ultra-thin white topping over the conventional white topping. **07**

OR

- Q.5**
- (a) Give the function of Prime coat and Seal coat. **03**
 - (b) Briefly explain the types of defects in flexible pavements. **04**
 - (c) Explain the terms: (a) Cold in place (b) Hot in place (c) Micro surfacing **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V (NEW) EXAMINATION – WINTER 2024****Subject Code:3150613****Date:05-12-2024****Subject Name: Pavement Design and Highway construction****Time:10:30 AM TO 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.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) What are the desirable properties of a bituminous mix? **03**
 (b) Define the terms: resilient modulus, elastic modulus, stiffness modulus, dynamic modulus **04**
 (c) Enlist various tests on aggregates and explain any two in detail. **07**
- Q.2** (a) Identify the difference between standard axle load and legal axle load. **03**
 (b) Explain the difference in analysis approach between the concrete and bituminous pavements. **04**
 (c) Explain various types of joints used in concrete Pavements. Point out the differences in their functions. **07**
- OR**
- (c) Explain the subgrade rutting criteria and fatigue cracking criteria for bituminous layer. **07**
- Q.3** (a) Draw the cross section of a typical bituminous pavement showing all its components. **03**
 (b) Briefly discuss the criteria for pavement design of low volume road as per IRC SP-62. **04**
 (c) Explain the boundary conditions and circular loading concept for Boussinesq's problem. **07**
- OR**
- Q.3** (a) Mention the advantages and disadvantages of full depth bituminous pavement. **03**
 (b) Explain the differences in design principles for design of dowel bar and tie bar systems. **04**
 (c) Explain the use of dry lean concrete in rigid pavement construction as per IRC-49. **07**
- Q.4** (a) How is the quantity of lime decided in soil-lime stabilization? **03**
 (b) Explain the concept and procedure of recycling of bituminous pavement. **04**
 (c) Describe the strength requirements as per guidelines of IRC SP 63. **07**
- OR**
- Q.4** (a) Distinguish between tack coat, seal coat and prime coat. **03**
 (b) Write a note on Interlocking Concrete Block Pavement (ICBP). **04**
 (c) Describe the symptoms, location and causes of raveling in bituminous layer. **07**
- Q.5** (a) Write the causes of pavement bleeding. **03**
 (b) Explain the moisture susceptibility in warm mix asphalt as per IRC SP 101. **04**
 (c) Explain the criteria for selection of preventive maintenance treatment of pavements. **07**
- OR**
- Q.5** (a) Discuss the benefits of white topping on existing bituminous pavements. **03**
 (b) Write a note on micro surfacing in pavements. **04**
 (c) Write a note on (i) Cold in place (CIP), (ii) Hot in place (HIP) **07**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2023

Subject Code:3150613

Date:13-12-2023

Subject Name:Pavement Design and Highway construction

Time:10:30 AM TO 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.**
- 4. Simple and non-programmable scientific calculators are allowed.**

MARKS

Q.1 (a) Explain modulus of resilient of subgrade. **03**
 (b) Discuss advantages of modified bitumen in brief. **04**
 (c) Explain various pavement layers with neat sketch. **07**

Q.2 (a) Write a short note on penetration macadam. **03**
 (b) Compare alternate bay and continuous bay methods of construction of cement concrete road. **04**
 (c) Write the construction procedure for WBM **07**

OR

(c) Explain Dry lean concrete. Write the advantages of dry lean concrete **07**

Q.3 (a) The standard single axle load is 8.2 Tonnes. The axle load spectrum from a survey data is presented in the following table. Find the value of VDF using fourth power damage law. **03**

Axle Load range (tonne)	17-15	15-13	13-11	11-09	09-07	07-05
Percentage frequency	5	20	25	37	10	3

(b) State the procedure of Marshall stability test. **04**
 (c) Explain Burmister three layers theory with neat sketch. **07**

OR

Q.3 (a) Write a short note on ESWL . **03**
 (b) Compute the design traffic (in msa) for bituminous pavement by considering the following data **04**

- Four lane divided carriageway
- Initial directional traffic in the year of completion of construction = 2500 cvpd
- Traffic growth rate per annum = 6.0 per cent
- Design life period = 20 years
- Vehicle damage factor = 5.2

(c) Write the steps to be followed for analysing flexible pavements using IITPAVE. **07**

Q.4 (a) Discuss the importance of drainage in pavement design. **03**
 (b) Explain factors affecting pavement design. **04**
 (c) Calculate the stresses at interior, edge and corner region of cement concrete pavement using Westergaard's stress equations. Take wheel load = 5000 kg, **07**

$E_c = 3.1 \times 10^5 \text{ kg/cm}^2$, Pavement thickness = 20 cm, $\mu = 0.15$, Modulus of subgrade reaction $K = 7 \text{ kg/cm}^3$, Radius of contact area = 15cm

OR

- Q.4** (a) Define: (1) Modulus of subgrade reaction (2) Poisson's ratio (3) warping stress **03**
(b) Differentiate between dowel bar and tie bar. **04**
(c) Discuss the critical combination of stresses due to wheel load and temperature effects in rigid pavement. **07**

- Q.5** (a) Enlist and explain type of pavement maintenance. **03**
(b) Explain the advantages of concrete block pavement. Enlist various types of concrete blocks. **04**
(c) Classify pavement distress in flexible pavement and mention the causes and preventive measures of any three type of distress as per IRC 82:2015 **07**

OR

- Q.5** (a) Enlist functions of Pavement Maintenance Management System. **03**
(b) What are the benefits of white topping as per IRC SP:076-2015 **04**
(c) Enlist various aspects of recycling and explain hot in place recycling in detail. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2022****Subject Code:3150613****Date:13-01-2023****Subject Name:Pavement Design and Highway construction****Time:10:30 AM TO 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.
4. Simple and non-programmable scientific calculators are allowed.
5. Any codes/guidelines are not allowed.

		MARKS
Q.1	(a) Define: Bitumen, Emulsion, Tar.	03
	(b) Explain the terms: ESWL, EWLF, VDF, modulus of resilient.	04
	(c) Discuss the physical properties requirements for rural road and high-volume road.	07
Q.2	(a) Write a note on: drainage consideration in pavement design.	03
	(b) Write a note on: modified bitumen.	04
	(c) Explain the Boussinesq's theory of stress analysis.	07
	OR	
	(c) Explain the Burmister's two-layer and three-layer theory.	07
Q.3	(a) Give the requirements of transverse joints and longitudinal joints in rigid pavements.	03
	(b) Explain the fatigue concept used in IIT RIGID as per IRC-58.	04
	(c) Explain the Friberg's analysis of dowel bar design.	07
	OR	
Q.3	(a) Discuss the importance of lime stabilized subgrade.	03
	(b) Discuss the criteria of pavement design for low volume road as per IRC SP-62.	04
	(c) Discuss the subgrade rutting criteria and fatigue cracking criteria for bituminous layer.	07
Q.4	(a) Explain the symptoms and causes of edge-breaking in pavements.	03
	(b) Explain the use of dry lean concrete as subbase for rigid pavement.	04
	(c) Explain with a neat sketch, the transition slab between rigid and flexible pavement.	07
	OR	
Q.4	(a) Explain the symptoms and causes of shallow depressions in pavements.	03
	(b) Write a note on: Interlocking Concrete Block Pavement (ICBP).	04
	(c) Explain the method of construction of block pavement as per IRC SP 63.	07
Q.5	(a) Explain different types of slurry sealing.	03
	(b) Explain the types of defects in bituminous surfacing.	04
	(c) Discuss the attributes and warrants for suitable preventive maintenance treatments as per IRC-82.	07
	OR	
Q.5	(a) Write a note on: Hot in-plant recycling (HIP).	03
	(b) Explain the important properties of bitumen emulsion.	04
	(c) Explain the milling process of reclamation in pavement.	07
