KUMARAGURU
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B.E. DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Fourth Semester

CIVIL ENGINEERING

U18CEI4202: Highway and Traffic Engineering

(Indian Road Congress (IRC) Codes - 37 and 58 are Permitted)

COURSE OUTCOMES

CO1: Acquire knowledge about the surveys involved in planning and highway alignment
CO2: Design the geometric elements of highways and expressways.
CO3: Apply the knowledge of the traffic studies and implement traffic regulation and control measures and intersection design
CO4: Characterize pavement materials and design flexible and rigid pavements as per IRC
CO5: Understand the concepts of pavement distress and methods to evaluate and maintain the pavement

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions: -
PART A (10 x 2 = 20 Marks)
(Answer not more than 40 words)

1.	Differentiate positive and negative obligatory points with an example	CO1	[K3]
2.	What are the contributions made by the Jayakar committee for road development in India?	CO1	[K2]
3.	Name the geometric elements of the highway and mention their need	CO2	[K2]
4.	Enlist the factors affecting the alignment of hill roads	CO2	[K2]
5.	State the use of Enoscope in traffic studies	CO3	[K3]
6.	Write any four-road furniture and its importance in traffic engineering	CO3	[K2]
7.	Name the grades of cutback bitumen and give the main advantage of cutback bitumen.	CO4	[K3]
8.	Differentiate Flexible and Rigid Pavement on technical grounds (any four points)	CO4	[K3]
9.	Define the term overlay and list its types	CO5	[K2]
10.	Name the common distress of Flexible and Rigid Pavement	CO5	[K2]

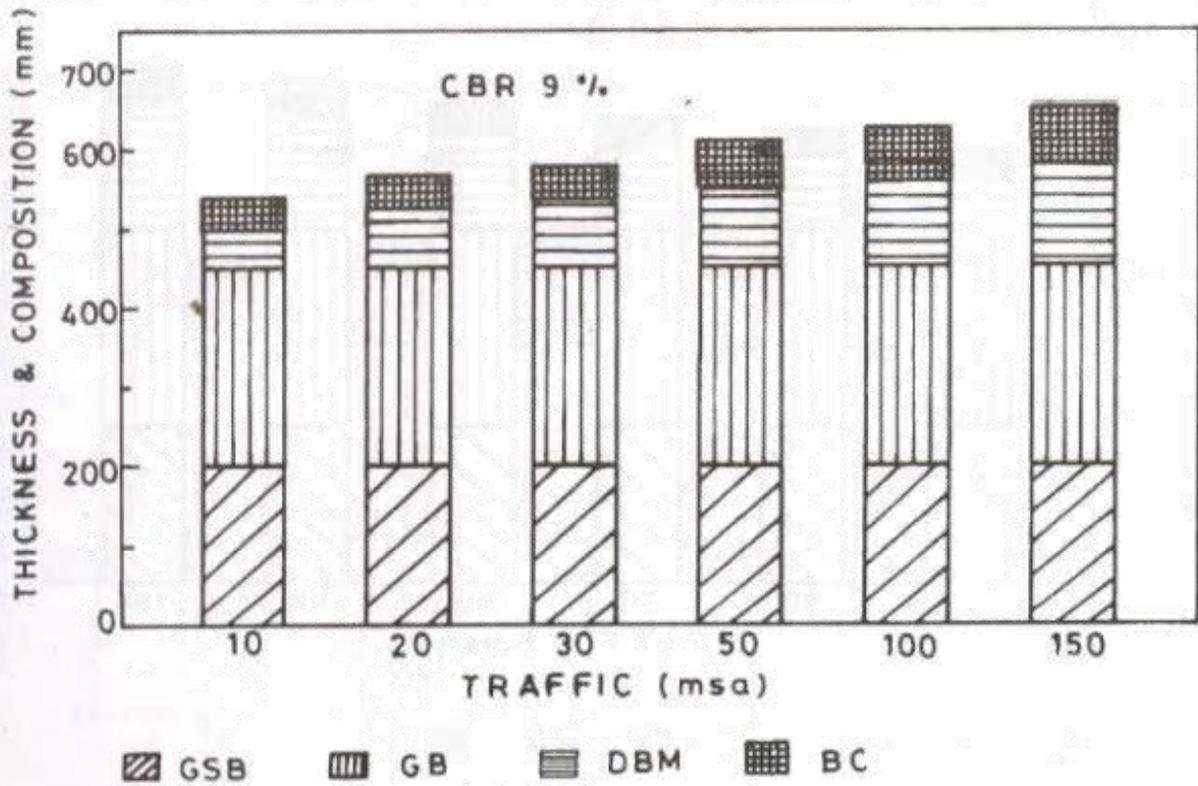**Answer any FIVE Questions: -**
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11.	a)	Explain the various surveys to be conducted for a highway alignment	8	CO1	[K2]
	b)	Compare Conventional methods with modern methods in Highways.	8	CO1	[K2]

12.	a)	On a two-way traffic road, the speed of overtaking and overtaken vehicles is 70 and 40 kmph. If the acceleration of overtaking vehicle is 0.99m/sec^2. Calculate Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), and Intermediate Sight Distance (ISD) and comment on your result.	8	CO2	[K3]
	b)	A National Highway passing through the rolling terrain of heavy rainfall area, R=500m. Design speed-80 kmph, Pavement width-7m, Allowable rate of Superelevation 1in 150, Pavement to be rotated about the inner edge, two-lane road, and standard wheelbase 6 m. Design the Length and Shift of the Transition Curve.	8	CO2	[K3]

13.	a)	List and explain the various methods of carrying out speed and delay study	8	CO3	[K2]
	b)	Discuss the various methods of recording accidents. How to prevent accidents by taking different measures in highway design	8	CO3	[K2]

14.	a)	It is proposed to widen an existing two-lane road into a four-lane road. Find the thickness of the pavement for the construction of a new two-lane carriageway for a design life of 10 years using the IRC method. The initial traffic in the year of completion in each direction is 5600 CPVD and the traffic growth rate is 8% per annum, VDF based on axle load survey= 4.5 standard axle per commercial vehicle. Design CBR of subgrade soil = 9 %. **(Use the attached Figure No - 1)**	8	CO4	[K3]
	b)	Write in detail about the various joints in the rigid pavement with neat sketches	8	CO4	[K3]

15.	a)	Examine any three non-destructive testing methods of pavement deflection	8	CO5	[K3]
	b)	Explain how the Benkelman Beam Deflection Test (BBDT) is used to design the thickness of the overlay design.	8	CO5	[K3]

16.	a)	The radius of the horizontal circular curve is 100m. The design speed is 50 kmph and the design coefficient of later friction is 0.15. Calculate the superelevation required if full lateral friction is developed Calculate the coefficient of lateral friction if no superelevation is provided. Calculate the Equilibrium super elevation when pressure on inner and outer wheels are equal (i.e. Coefficient of lateral friction(f) is Zero) Comment on your result.	8	CO2	[K3]
	b)	Prove that stress at the edge will be greater when compared to the interior, and corner region of cement concrete while designing the pavement using Westergaard's equation. Use the following data. Wheel load =5100kg, Pavement thickness=18cm, The radius of contact area=15cm, Poisson's's ratio of concrete=0.15, Subgrade Modulus=6 kg/cm^3, Elastic modulus of cement concrete E=3x10^5 kg/cm^2	8	CO4	[K3]

RECOMMENDED DESIGNS FOR TRAFFIC RANGE 10-150 msa

CBR 9%				
Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION		
		Bituminous Surfac'ng		Granular Base & Sub-base (mm)
		BC (mm)	DBM (mm)	
10	540	40	50	
20	570	40	80	
30	585	40	95	Base = 250
50	605	40	115	
100	635	50	135	Sub-base = 200
150	655	50	155	

(Figure No - 1)