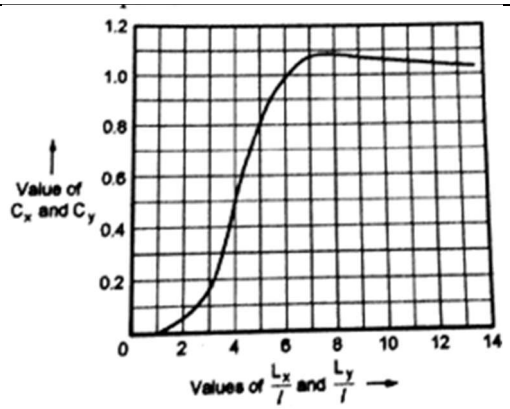
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2021

Programme Name: B. Tech Civil Engineering
Course Name : Transportation Engineering
Course Code : CIVL 3022
Nos. of page(s) : 02
Instructions: Read the question carefully and answer accordingly.

Semester : V
Time : 03 hrs
Max. Marks: 100

SECTION A (5Q x 4M = 20 Marks)			
S. No.		**Marks**	**CO**
Q 1	Explain various provisions to save cost during the planning of highway alignment.	4	CO1
Q 2	Mention the factors controlling highway alignment from geometric design perspective.	4	CO1
Q 3	Compare NHDP and Bharatmala Projects based on their objectives and scale.	4	CO1
Q 4	Briefly explain the defects in flexible pavements and classify them suitably.	4	CO4
Q 5	Mention five ways in which rainwater can damage the road infrastructure.	4	CO4
SECTION B (4Q x 10M = 40 Marks)			
Q 6	Describe the four-stage sequential process of selection of final route alignment for a highway project.	10	CO1
Q 7	The radius of a horizontal circular curve is 105m. The design speed is 55kmph and design coefficient of lateral friction is 0.15. Calculate the following: (i) Required super-elevation, if full lateral friction is developed. (ii) Coefficient of friction, if no superelvation is provided. (iii) Equilibrium superelvation if equal pressure on both inner & outer wheels	10	CO2
Q 8	Calculate the warping stresses at the interior, edge and corner of a concrete pavement of thickness 25cm with transverse joints at 10m spacing and longitudinal joint at 3.7m intervals. For concrete, E= $3x10^5$ kg/cm^2 and μ=0.15, K value for subgrade = 6.5 kg/cm^3. Temperature differential is 0.9 ^oC per cm. Assume Thermal coefficient for concrete as 10 x 10^{-6} per ^0C and radius of loaded area as 15cm. Draw a neat sketch of slab and show the calculated stresses on the same. The graph of warping stress coefficient is given below:	10	CO3

	 **OR** Define ESWL and explain the graphical method for determination of the ESWL.		
Q 9	Explain different types of highway maintenance works and assess its effect on extending the effective pavement's life.	10	CO4
SECTION-C (2Q x 20M = 40 Marks)			
Q 10	Derive a relationship for safe OSD by proper sketching the concerned diagram. **OR** Spot Speeds data collected at a highway stretch is given in the table below: **Speed Range, KMPH** / **No. of vehicles observed** / **Speed Range, KMPH** / **No. of vehicles observed** 0 to 10 / 18 / 50 to 60 / 285 10 to 20 / 30 / 60 to 70 / 215 20 to 30 / 75 / 70 to 80 / 130 30 to 40 / 98 / 80 to 90 / 95 40 to 50 / 245 / 90 to 100 / 25 Determine (i) Modal speed (ii) the upper and lower values of speed limits for regulation of mixed traffic flow and (iii) the design speed for checking the geometric design elements of the highway. Sketch a neat graphical representation for the same.	20	CO2
Q 11	Explain the following in short notes: A. Types of joints in rigid pavement and their field significance B. Flexible pavements components (layers) and their functions	20	CO3