UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Programme Name: B. Tech. (Civil +ID)   Semester   : V
Course Name: Transportation Engineering   Time   : 03 hrs
Course Code: CIVL 3006   Max. Marks : 100
Nos. of page(s)   : 02
Instructions: Be brief and relevant. Use flow-charts, diagrams and tables, wherever necessary.

SECTION A

S. No.		Marks	CO
Q 1	Briefly outline the major features and advantages of various road patterns in use.	**05**	**CO1**
Q 2	Define Camber and discuss its advantages. In a rural area, where rainfall is heavy, a WBM road, 3.5m wide is to be constructed. Select the appropriate camber recommended by IRC for each and calculate the height of the crown with respect to its edges using parabolic equation.	**05**	**CO2**
Q 3	Define Equivalent Single Wheel Load (ESWL)? Briefly explain the graphical method determination of the ESWL?	**05**	**CO3**
Q 4	List and define various types of stresses developed in a cement concrete pavement.	**05**	**CO4**

SECTION B

Q 5	Briefly outline the major features and advantages of various road patterns in use.	**10**	**CO1**
Q 6	Which type of engineering surveys are essential to make a DPR of highway projects? Explain how the route alignment of a highway is finalized by minimizing the cost.	**10**	**CO1**
Q 7	Explain the advantages and disadvantages of rigid pavements along with the working sketch of each of them. Which type of pavement shall be favourable in a high rainfall area and why?	**10**	**CO4**
Q 8	What do you understand by pavement distress? Explain the major parameters responsible for it and how to avoid distress in highway pavements. **OR** Draw a detailed section of a flexible pavement with proper nomenclature. Compare between WBM and WMM layer on at least five parameters.	**10**	**CO4**

SECTION-C

Q 9	Determine the safe stopping distance to avoid a head-on collision of two cars approaching at the speeds of 70km/h and 55km/h respectively. Assume a reaction time 2.0 seconds, coefficient of friction as 0.35 and a brake efficiency of 80% for both the cars. **OR** The speeds of overtaking and overtaken vehicles are 80 and 50kmph respectively on a two way road. The average acceleration during overtaking may be assumed as 0.98m/sec^2. Calculate safe overtaking sight distance and minimum length of overtaking zone.	**20**	**CO2**
Q 10	Calculate the warping stresses at the interior, edge and corner of a concrete pavement of thickness 20cm with transverse joints at 4.5m spacing. The width of the slab is 3.5m. For concrete, E= 3×10^5kg/cm^2 and μ=0.15, K value for subgrade = 5kg/cm^3. Temperature differential is 0.9 °C per cm. Assume Thermal coefficient for concrete as 10×10^{-6} per ^{0}C. Draw a neat sketch and show the calculated stresses on the same.	**20**	**CO3**