Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, May 2024

Course: Automotive Subsystem Design **Semester : VI**

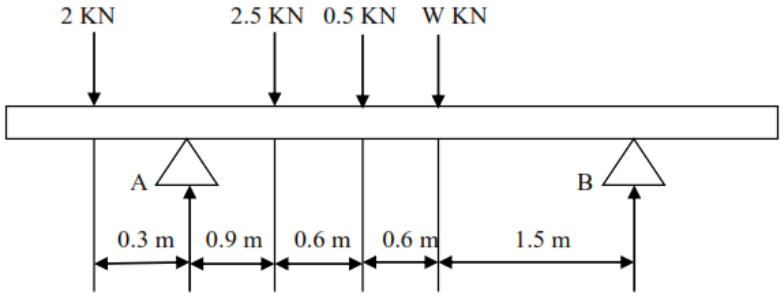
Program: B.Tech ADE **Time : 03 hrs.**

Course Code: MEAD 3011 **Max. Marks: 100**

Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Classify the loading conditions for which vehicle chassis are designed.	**4**	**CO1**
Q 2	Explain the difference between torsional and bending stiffness of the chassis.	**4**	**CO2**
Q 3	Differentiate between single plate and multiplate clutch.	**4**	**CO1**
Q 4	Explain true rolling and Ackermann steering principle.	**4**	**CO2**
Q 5	Differentiate between dependent and independent suspension system. Give the example of each.	**4**	**CO2**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Explain the difference between laminated and coiled springs. Derive the expression for central deflection of a leaf spring acted upon by a weight W.	**10**	**CO3**
Q 7	State the loading applications under which different components of chassis are designed. Assuming medium size saloon car is taking a left turn across a sharp corner, derive the expression for lateral loads acting on the tyres.	**10**	**CO2**
Q 8	A solid cast iron disk, 1 m in diameter and 0.2 m thick, is used as a flywheel. It is rotating at 350 rpm. It is brought to rest in 1.5 s by means of a brake. Calculate: (a) Energy absorbed by the brake, (b) the torque capacity of the brake.	**10**	**CO3**
Q 9	Derive the expression for maximum bending stress and central deflection of a laminated spring subjected to a load W acting at the center. **OR**	**10**	**CO3**

	Explain torque transmission capacity of single plate clutch. Deduce the expression for maximum load and torque transmission capacity using uniform pressure theory.		
SECTION-C (2Qx20M=40 Marks)			
Q	Explain clearly the difference between closed coiled and open coiled helical springs. What type of springs passenger cars employ in their suspension systems. Derive the expression for max shear stress and deflection induced in a helical spring subjected to a vertical downward force W. A closely coiled helical spring of round steel wire 10 mm in diameter having 10 complete turns with a mean diameter of 120 mm is subjected to an axial force of 200 N. Determine the max deflection and shear stress in the wire. Take C = 8 x 104 N/mm^2.	**20**	**CO3**
Q 11	A bus chassis, 5.4 m long, consists of two side member and a number of cross members. Each side member can be considered as a beam, simply supported at two points A&B, 3.6m apart, A being positioned 0.9 m from the front end of the frame and subjected to the following concentrated loads. Engine support (front) 2 KN, engine support(rear) 2.5KN gear box support 0.5KN, and body W, KN. The distance of these loads from the front end of the frame are respectively 0.m, 1.8m, 2.4m and 3m. If the frame are respectively 0.6m,1.8m,2.4m and 3m. If the reaction at A is 8.5KN, determine a) The magnitude of the load 'W' due to vehicle body, b) The magnitude of the support reaction at B.  **OR** Illustrate the following with appropriate figures: (a) Effects and Comparisons of Payload on spring frequency for various types of spring media. (b) Effect of static load on spring height.	**20**	**CO4**

	(c) Effect of static payload on spring air pressure for various spring static heights.		