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B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019

Sixth Semester

AE16602 – AUTOMOTIVE CHASSIS COMPONENTS DESIGN*(Automobile Engineering)***(Regulation 2016)****Time: Three Hours****Maximum : 100 Marks**Answer **ALL** questions**PART A - (10 X 2 = 20 Marks)**

	CO	RBT
1. Why channel sections are preferred for the side members of the frames used in heavy vehicles?	1	U
2. Define spring rate and spring index of a coil spring.	1	R
3. What type of sections is provided at the middle and at the ends of the front ax	2	U
4. What is the significance of steering error curve in an Ackerman's steering system?	2	U
5. A cone clutch is more effective than a plate clutch. Justify.	3	U
6. What is the principle of an overrunning clutch?	3	U
7. Name the different types of gears used in automotive transmission and give their relative merits.	4	U
8. What is a reverted gear train?	4	U
9. What are the different types of final drives used in a vehicle?	5	R
10. Draw a neat sketch of three quarter floating axle.	5	R

PART B - (5 X16 = 80 Marks)

11. (a) Calculate the maximum bending moment and maximum section modulus for the side member of a vehicle frame having channel section and assuming the following particulars:
- Wheel base = 2 m
- Overall length = 4 m
- Equal overhang on either side.
- 3000 N acting at c.g. of load 0.5 m in front of front axle

2000 N acting at c.g. of load 0.5 m behind front axle

2000 N acting at c.g. of load 0.5 m in front of rear axle

800 N acting at c.g. of load 0.5 m behind the rear axle.

In addition there is a uniformly distributed load of 1800 N/m run over the entire length of the chassis. Assume dynamic stress is twice of the static stress induced. Also assume allowable bending stress is 60000 kN/m^2 .

(OR)

- (b) A locomotive semi-elliptical laminated spring has an overall length of 1 m and sustains a load of 70 kN at its centre. The spring has 3 full length leaves and 15 graduated leaves with a central band of 100 mm width. All the leaves are to be stressed to 400 MPa, when fully loaded. The ratio of the total spring depth to that of width is 2. Modulus of Elasticity = 210 kN/mm^2 . Determine :
1. The thickness and width of the leaves.
 2. The initial gap that should be provided between the full length and graduated leaves before the band load is applied.

12. (a) The load distribution between the front and the rear axle of a motor vehicle weighing 15000 N is that 48% of the total load is taken by the front axle. The width of the track is 1.60 m and the distance between the centers of the spring pads is 0.8 m. Design a suitable I-section for the front axle assuming that the width of the flange and its thickness are 0.6 and 0.2 of the overall depth of the section respectively and the thickness of the web 0.25 of the width of the flange. Assuming a working stress of 91500 kN/m^2 .

(OR)

- (b) A motor car has a wheel-base of 2.743m and pivot centre of 1.065m. The front and rear wheels track is 1.217m. Calculate the correct angle of outside lock and turning circle radius of the outer front and inner rear wheels when the angle of inside lock is 40° .

13. (a) Calculate the inner radius and outer radius of the friction lining of a single plate two sided dry type clutch and the axial spring thrust

exerted by the clutch springs to keep it engaged from the following data:

Maximum torque transmitted = 13.56 Nm

Co efficient of friction surface = 0.3

Maximum axial pressure = 8.29×10^4 Pa. The external radius of friction surface is 1.25 times internal radius.

(OR)

- (b) A multi-disc clutch has three discs on the driving shaft and two on the driven shaft. The inside diameter of the contact surface is 120 mm. The maximum pressure between the surface is limited to 0.1 N/mm². Design the clutch for transmitting 25 kW at 1575 r.p.m. Assume uniform wear condition and coefficient of friction as 0.3. **(16) 3 AN**

14. (a) Discuss in detail about the various types of gear boxes. Also mention its advantages and limitations. **(16) 4 U**

(OR)

- (b) Find the number of teeth on various gear wheels and the exact gear ratios for a 4 speed gear box with assumed gear ratios of 1, 1.5, 2.48 and 3.93. The centre distance between the main shaft and lay shaft being 73.12 mm and the smallest gear wheel having 12 teeth with an inverse of diametral pitch 3.25 mm. **(16) 4 AN**

15. (a) Discuss the factors to be considered in the design of a propeller shaft and clearly explain the design procedure involved in it. **(16) 5 AN**

(OR)

- (b) An automobile engine develops a maximum torque of 162 Nm. The bottom gear ratio of transmission is 2.75, while the back axle ratio is 4.25. The effective wheels radius is 0.325m and the co-efficient of friction between the tyre and the road surface is 0.6. If the permissible shear stress is 32373×10^4 Pa. Determine the maximum shaft diameter. Assuming that the load is nearly torsional. What is maximum load permissible on each wheel? **(16) 5 AN**