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Question Paper Code : 20154

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Sixth Semester

Automobile Engineering

AT 6602 — AUTOMOTIVE CHASSIS COMPONENTS DESIGN

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the design requirements of frame.
2. How do you determine the good suspension system?
3. How do you select bearings for wheel?
4. Mention the basic functions and design requirements of a steering system.
5. List the parameters influencing torque capacity of a clutch.
6. Write the merits and demerits of cone clutch and multiplate clutch.
7. How do you select gears for a gear box?
8. How do you achieve reverse gear in an automobile gear box?
9. List the forces acting on a propeller shaft
10. State the necessity of final drive.

PART B — (5 × 13 = 65 marks)

11. (a) Discuss the forces acting on chassis with their effects.

Or

(b) Calculate the maximum bending moment and maximum section modulus assuming the following particulars. Wheel base = 180 cm, overall length = 360 cm. Equal overhang on either side. 270 kgf acting at CG of load 45 cm in front of the front axle. 180 kgf acting at CG of load 45 cm behind front axle. 180 kgf acting at CG of load 45 cm in front of rear axle. 67.5 kgf acting at CG of load 45 cm behind the rear axle. In addition there is a uniformly distributed load of 1.75 kgf per cm run over the entire length of the chassis.

12. (a) The distance between the king-pins of a car is 1.3 m. The track arms are 0.1525 m long and the length of the track rod is 1.2 m. For a track of 1.42 m and a wheel base of 2.85 m, find the radius of curvature of the path followed by the near-side front wheel at which correct steering is obtained when the car is turning to the right.

Or

(b) Explain the types of steering linkages with respect to their significance with neat sketch.

13. (a) Explain the construction and working of sprag type clutch with neat sketch.

Or

(b) A plate clutch has three discs on the driving shaft and two discs on the driven shaft, providing four pairs of conduct surfaces. The outside diameter of the contact surfaces is 240 mm and inside diameter 120 mm. Assuming uniform pressure and μ = 0.3, find the total spring load pressing the plates together to transmit 23 kW power at 1475 rpm. If there are 6 springs each of stiffness 13 kN/m and each of the contact surfaces has worn away by 1.25 mm, find the maximum power that can be transmitted, assuming uniform wear condition.

14. (a) Explain the method of calculation of total resistance to vehicle motion and gear ratios of a vehicle.

Or

(b) In a gear box, the clutch shaft pinion has 14 teeth and the low gear main shaft pinion 30 teeth. The pinions which gear with them on the lay shaft have 32 and 18 respectively. The gear axle ratio is 6 to 1 and overall diameter of rear tyre 0.195 m. If the engine rpm is 1500, what is speed of the vehicle in kmph in low gear?

15. (a) An automobile engine develops a maximum torque of 162 Nm. The low gear ratio of transmission is 2.75, while the back axle ratio is 4.25. The effective wheel radius is 0.325 m and the coefficient 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 the maximum load permissible on each wheel?

Or

(b) At an engine speed 2250 rpm a torque of 50 Nm is applied to the gear box. If the gear box and final drive ratios are 3.4:1 and 5:1 respectively, and the vehicle is travelling in a straight line, Calculate (i) the speed of each road wheel (ii) the torque applied to each road wheel if the efficiency is 100%.

PART C — ($1 \times 15 = 15$ marks)

16. (a) A vehicle spring of semi-elliptic type has leaves of 75 mm width and 10 mm thickness and effective length 900 mm. If the stress is not to exceed 220725 kPa when the spring is loaded to 4905 N, estimate the required number of leaves and the deflection under this condition. If the spring is just flat under load, what is the initial radius? Take $E = 196.2 \times 10^6$ kPa.

Or

(b) A typical coil suspension spring has 10 effective coils of a mean diameter 125 mm and made out of wires of diameter 15 mm. The spring is designated to carry a maximum static load of 3531.6 N. Calculate the shear stress and the deflection under the above loading. If a maximum shear stress of 637650 kPa is allowable in the material, then what is the possible clearance in the spring? Take the value of $G = 73575 \times 10^3$ kPa.