

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-VII Examination-Nov/Dec.-2011

Subject code: 170202

Date: 22/11/2011

Subject Name: Automobile System Design

Time: 10.30 am-01.00 pm

Total marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Write down the characteristics of brake lining materials. **07**
(b) An automobile engine develops 28 kW at 1500 rpm and its bottom gear ratio is 3.06. If a propeller shaft of 40 mm outside diameter is to be used, determine the inside diameter of mild steel tube to be used, assuming a safe stress of 55×10^3 kPa for the mild steel. **07**

- Q.2** (a) A motor car has a wheel base of 2.743 m and pivot centre of 1.065 m. the front and rear wheel track is 1.217 m. 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° . **07**

- (b) Discuss in detail the Ackermann steering mechanism for automobile. **07**

OR

- (b) Explain the design consideration of differential. **07**

- Q.3** A single dry plate clutch is to be designed to transmit 7.5 kW at 900 r.p.m. Find: **14**

1. Diameter of the shaft.
2. Mean radius and face width of the friction lining assuming the ratio of the mean radius to the face width as 4,
3. Outer and inner radii of the clutch plate, and
4. Dimensions of the spring, assuming that the number of springs are 6 and spring index = 6.

The allowable shear stress for the spring wire may be taken as 420 MPa.

OR

- Q.3** Design a multiplate clutch from the following data. **14**

Power transmitted = 10 kW

Speed = 2000 rpm. Maximum outside dia. = 180 mm

No. Of spring = 1, Spring compression = 2 mm

Spring force = 18%

Allowable shear stress = 40 N/mm²

Modulus of rigidity = 8.3×10^4 N/mm²

Co-efficient of friction = 0.3, Pressure for living = 0.25 N/mm²

- Q.4 (a)** Explain design procedure for an internal expanding shoe brake with graphical representation of forces acting on brake shoes. **10**
- (b)** Compare the Disc type brake with Drum type of brake. **04**
- OR**
- Q.4 (a)** Why the wheel alignment is required in vehicle? Explain the front wheel alignment in vehicle. **07**
- (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 designed to carry a maximum static load of 3531.6 N. Calculate the shear stress and the deflection under the above loading. **07**
- 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
- Q.5 (a)** Explain in detail the function and construction of a leaf spring and show how it is mounted on rear and front. Illustrate your answer with simple sketches. **07**
- (b)** What is a self – energizing brake? When a brake becomes self locking? **07**
- OR**
- Q.5 (a)** An engine develops 29.5Kw at 2000 rpm when the torque is maximum. The bottom gear ratio is 3:1 and the back axle reduction is 4.5:1. The load on each driving axle is 7357.5 N when the car is fully loaded. Diameter of road wheel over the tyres, is 0.71 m and the coefficient of adhesion between tyre and road is 0.6. If the permissible stress in the material of the shaft is not allowed to exceed 22072.5×10^4 Pa , find the diameter of the axle shaft. **07**
- (b)** Explain the laboratory testing method of following components of vehicle. **07**
1. Suspension system
 2. Automotive clutch
