

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– VIII (New) EXAMINATION – WINTER 2019****Subject Code: 2180206****Date: 29/11/2019****Subject Name: Automobile system Design****Time: 02:30 PM TO 05:00 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) Which properties should clutch fluid have? **03**
- (b) What is the requirement of automobile clutch? **04**
- (c) A single plate clutch (both side effective) is required to transmit 27KW at 1600 rpm. The outer diameter of the plate is limited to 30 cm and intensity of pressure between the plates is not to exceed 7 N/cm². Assuming uniform wear and a co-efficient of friction 0.3., find the required inner diameter of the plates and axial force necessary to engage the clutch. **07**
- Q.2**
- (a) What is a self-energizing brake? When a brake becomes self-locking? **03**
- (b) Why the critical speed of propeller shaft is important? **04**
- (c) A motor car has a wheel base of 225 cm. the height of its C.G. above the ground is 0.55 m and it is 100 cm in front of the rear axle. If the car is travelling at 45 km/hr on a level track, determine the minimum distance in which the car may be stopped, when
1. The rear wheels are braked
 2. The front wheels are braked
 3. All wheels are braked
- The coefficient of friction between tyre and road may be taken as 0.6.
- OR**
- (c) An automobile weighing 16 kN is travelling at the rate of 100 km/h. it is to be stopped in a distance of 90 m. the tyre diameter is 80 cm. calculate the following: **07**
1. Average braking torque applied to stop the automobile.
 2. Co-efficient of friction between tyre and road.
 3. Average temperature rise of the drum if the frictional energy is momentarily stored in 200 N C.I. drum.
- Assume that the weight of the automobile is equally distributed among the wheels. Neglect all frictional energy except for the brake.
- Q.3**
- (a) Explain the function of limited slip differential. **03**
- (b) Explain fully floating axle with neat sketch. **04**
- (c) What is the function of universal joints? Where are the universal joints used in automobile? List down the different types of universal joints and draw schematic diagram. **07**
- OR**
- Q.3**
- (a) Explain the Ackermann steering principle. **03**
- (b) Explain double wishbone type suspension system with neat sketch. **04**
- (c) Explain different types of axles used in automobile and give function of differential used in automobile. **07**
- Q.4**
- (a) Write advantages and disadvantages of the internal expanding shoe brake. **03**

- (b) Explain function of brake proportioning valve. **04**
- (c) An automobile engine develops a maximum torque of 165 N. the low gear ratio of transmission is 2.75, while the back axles ratio is 4.25. The effective wheel radius is 0.325m and the coefficient of friction between the tire and the road surface is 0.6. If the permissible shear stress is 33000 N/cm², determine the maximum shaft diameter, assuming that the load is nearly torsional. What is the maximum load permissible on each wheel? **07**

OR

- Q.4** (a) Write the condition for correct steering. **03**
- (b) Differentiate the drum brake and disc brake. **04**
- (c) Explain Johnson's method of optimum design with suitable example. **07**
- Q.5** (a) Which factors affecting the selection of material for spring wires? **03**
- (b) Explain various rubber springs with neat sketch. **04**
- (c) It is required to design a helical compression spring subjected to a maximum force of 1250 N. the deflection of the spring corresponding to the maximum force should be approximately 30 mm. the spring index can be taken as 6. The spring is made of patented and cold-drawn steel wire of Grade-1. The constant A and m can be taken as 1753 and 0.182 respectively ($G = 81370 \text{ N/mm}^2$). The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring and calculate:
 1. Wire diameter 2. Mean coil diameter 3. No. of active coils 4. Total no. of coils **07**

OR

- Q.5** (a) Explain the components of leaf spring with neat sketch. **03**
- (b) Differentiate the rigid axle suspension & independent suspension. **04**
- (c) A carriage spring is to be 100 cm long and build-up of 7.5 cm wide and 1 cm thick plates required for the spring if a central load of 17500 N is to be carried without exceeding the bending stress of 11500 N/cm², What should be the central deflection and the initial radius to which the plates must be bent so that they straighten out under the load? Take $E = 21 \times 10^6 \text{ N/cm}^2$. **07**
