

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(AE) (Sem.-5th)
AUTOMOTIVE DESIGN-I
Subject Code : AE-301
Paper ID : [A0713]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A** is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. **SECTION-B** contains **FIVE** questions carrying **FIVE** marks each and students has to attempt any **FOUR** questions.
3. **SECTION-C** contains **THREE** questions carrying **TEN** marks each and students has to attempt any **TWO** questions.
4. Use of only **P.S.G.** design data book is permitted.
5. Assume appropriate value of missing data, if any.

SECTION-A**1. Write briefly :**

- (a) Why the semi cone angle is set between 10° to 15° in cone clutches?
- (b) What is self-energizing and self-locking brake?
- (c) Define the term Standardization.
- (d) What do you understand by the term Fatigue?
- (e) Define notch sensitivity.
- (f) List the important factors that influence the magnitude of factor of safety.
- (g) Design is an iterative process. Explain.
- (h) What are the functions of the frame?
- (i) State the requirements of a steering geometry.
- (j) What is the assumption made in the design of welded joint subjected to an eccentrically load?

SECTION-B

2. What are the various design considerations in selecting a proper material for a particular use?
3. Discuss the design procedure for Eccentrically loaded riveted joint.
4. Describe the various failure modes of a Knuckle Joint.
5. A centrifugal clutch is to be designed to transmit 15 kW at 900 r.p.m. The shoes are four in number. The speed at which the engagement begins is $\frac{3}{4}$ th of the running speed. The inside radius of the pulley rim is 150 mm. The shoes are lined with Ferrodo for which the coefficient of friction may be taken as 0.25. Determine mass of the shoes.
6. What are the various design considerations for frame of passenger and commercial vehicles?

SECTION-C

7. What do you understand by Engineering Design? What are the different phases of Engineering Design?
8. A simple band brake operates on a drum of 600 mm in diameter that is running at 200 r.p.m. The coefficient of friction is 0.25. The brake band has a contact of 270° , one end is fastened to a fixed pin and the other end to the brake arm 125 mm from the fixed pin. The straight brake arm is 750 mm long and placed perpendicular to the diameter that bisects the angle of contact.
 - (a) What is the pull necessary on the end of the brake arm to stop the wheel if 35 kW is being absorbed? What is the direction for this minimum pull?
 - (b) What width of steel band of 2.5 mm thick is required for this brake if the maximum tensile stress is not to exceed 50 MPa?
9. (a) An automobile engine develops a maximum torque of 16.5 Kgf-m. 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 3300 Kgf/cm², determine the maximum shaft diameter, assuming that the load is nearly torsional. What is the maximum load permissible on each tyre?
 - (b) With the help of neat sketch, explain the analysis of bearing loads acting on the front axle.