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**Total No. of Pages: 2**  
**Total No. of Questions: 9**

**B.TECH (Sem.-5<sup>th</sup>)**  
**DESIGN OF AUTOMOTIVE COMPONENTS**  
**Subject Code: BTAE-504**  
**Paper ID: [A2064]**

**Time: 3 Hrs.****Max. Marks: 60****INSTRUCTIONS TO CANDIDATE:**

*Section - A is compulsory. Attempt any Four questions from Section - B and any Two questions from*

*Section - C. Design data hand book is allowed. Assume any missing data.*

**SECTION-A****2x10**

- a) Define optimum design.
- b) What is meant by preliminary design?
- c) Name the material used for crank shaft.
- d) What do you understand by stress concentration?
- e) Define factor of safety.
- f) What is meant by eccentric loading?
- g) What is the function of a flywheel?
- h) Why is it necessary to dissipate the heat generated when clutch operates?
- i) What are the materials used for brake lining?
- j) Name different types of rear axles.

**SECTION -B****5x4**

2. Discuss the role of ergonomics in designing the automotive parts.
3. Discuss the mechanical properties of the automotive component materials.
4. A plate 100 mm wide and 12.5 mm thick is to be welded to another plate by means of parallel fillet welds. The plates are subjected to a load of 50 kN. Find the length of weld so that the maximum stress, does not exceed 56 MPa. Consider the joint first under static loading and the under fatigue loading.
5. A universal coupling is used to connect two mild steel shafts transmitting a torque of 6000 N-m. Assuming that the shafts are subjected to torsion only, find the diameter of the shaft and pin. The allowable shear stresses for the shaft and pin may be taken as 55 MPa and 30 MPa respectively.

6. What are different design considerations for fully floating rear axle? Discuss.

**SECTION – C**

**2x10**

7. Determine the size of the clutch plate suitable for a car employing a single plate type of friction clutch and developing 37.5 kW at 4200 r.p.m. The inside diameter of the clutch plate is 0.6 times its outside diameter and it is to be ensured that even after a loss of 30% of the engine torque due to wear of the clutch facing, the clutch does not slip. The intensity of pressure on the facing is not to exceed 70 kPa. Assume coefficient of friction 0.3.
8. The disc brakes at the front of a car have pistons of 1500 mm<sup>2</sup> cross sectional area each, whereas the drum brakes at each of the rear wheels have pistons of 300 mm<sup>2</sup> cross sectional area. The master cylinder has piston of 500 mm<sup>2</sup> area. Determine i) the ratio in which the braking force is divided between front and rear axles and ii) the total force magnification if the brake pedal has a leverage of 5.
9. Discuss various failures in eccentrically loaded bolts.

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