

Scheme - G

## Sample Test Paper-I

Course Name : Diploma in Automobile Engineering

Course Code : AE

Semester : Fifth

Subject Title : Design of Automobile Components

Marks : 25

**17525**

Time:1 hour

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**Instructions:**

1. All questions are compulsory
2. Illustrate your answers with neat sketches wherever necessary
3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

**Q1. Attempt any Three**

**9 Marks**

- a. Define fatigue ,endurance limit and creep
- b. Describe maximum principal stress theory .
- c. Define whirling and critical speed .Why they should be considered for designing rotating shafts
- d. Compare joints and couplings.

**Q2. Attempt any Two**

**8 Marks**

- a. Write the design procedure of turn buckle.
- b. List and draw sketches of any four types of keys and write their applications
- c. Define standardization and state its advantages.
- d. Write design procedure for designing pin of bush pin flexible coupling.

**Q3. Attempt any One**

**8 Marks**

- a. Design the knuckle joint required to withstand a tensile load of 25000 N, if Permissible stress are  $\sigma_t = 56 \text{ N/mm}^2$ ,  $\tau = 40 \text{ N/mm}^2$ ,  $\sigma_c = 70 \text{ N/mm}^2$
- b. Write design procedure for bushed pin flexible coupling.

**Scheme - G**  
**Sample Test Paper-II**

**Course Name : Diploma in Automobile Engineering**

**Course Code : AE**

**Semester : Fifth**

**Subject Title : Design of Automobile Components**

**Marks : 25**

**17525**

**Time:1 hour**

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**Instructions:**

1. All questions are compulsory
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3. Figures to the right indicate full marks
4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

**Q1. Attempt any Three**

**9 Marks**

- a. Define lever. Describe any two basic types of levers.
- b. Define module, circular pitch and state relation between module, center distance and number of teeth on gear pair .
- c. Define I.P., B.P., F.P.
- d. Compare single plate clutch with multi plate clutch. (any three points)

**Q2. Attempt any Two**

**8 Marks**

- a. Design the connecting rod cross section for following data for petrol engine:  
Maximum pressure inside the cylinder =  $4.5 \text{ N/mm}^2$   
Piston diameter = 70 mm, Stroke length = 80 mm,  
Effective length of connecting rod = 140 mm  
Ultimate crushing stress in rod material =  $300 \text{ N/mm}^2$ , Factor of safety = 3  
Take rankine constant for steel =  $1/1600$
- b. Explain stepwise design procedure for bell crank lever .
- c. A single plate with both sides effective, has outer and inner diameter 300 mm and 200 mm respectively. the maximum intensity of pressure at any point of contact is not to exceed  $0.2 \text{ N/mm}^2$ . If the coefficient of friction is 0.3. Determine the power transmitted by clutch at shaft speed 2500 rpm.

**Q3. Attempt any One**

**8 Marks**

- a. A four stroke diesel engine has the following specifications :  
Brake power = 5 kW ; Speed = 1200 r.p.m. ; Indicated mean effective pressure =  $0.35 \text{ N/mm}^2$ , Mechanical efficiency = 80 %. Determine: 1. bore and length of the cylinder; 2. thickness of the cylinder head ; 3. Size of studs for the cylinder head.
- b. A truck springs has 12 numbers of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5.4 kN with a permissible stress of  $280 \text{ N/mm}^2$ . Determine the thickness and Width of steel spring leaves. The ratio of the total depth to the width of the spring is 3. Also determine the deflection of the spring.

**Scheme – G**  
**Sample Question Paper**

**Course Name : Diploma in Automobile Engineering**

**Course Code : AE**

**Semester : Fifth**

**Subject Title : Design of Automobile Components**

**Marks : 100**

**17525**

**Time: 4 Hrs.**

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1. All questions are compulsory
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4. Assume suitable data if necessary
5. Preferably, write the answers in sequential order

**Q1 A]. Attempt any Three**

**12 Marks**

- a. Describe modes of failure.
- b. Define Factor of Safety. What factors affect its selection?
- c. List the stress induced in cotter with the stress equation. Also give one application of the joint.
- d. Define Shaft, Axle, Spindle, Coupling.

**B] Attempt any One**

**06 Marks**

- a. Derive the relation for torque to be transmitted by single plate clutch considering uniform wear condition
- b. Compare Clutch and Coupling from design point of view (Any Six Point )

**Q2. Attempt any Four**

**16 Marks**

- a. Draw thrust and non-thrust sides of I.C. Engine piston.
- b. Draw a stress strain diagram for ductile material and state its importance.
- c. Write the design procedure for cotter only.
- d. Figure I shows a lever. Determine leverage, M.A. and reaction at fulcrum, identify type of lever .

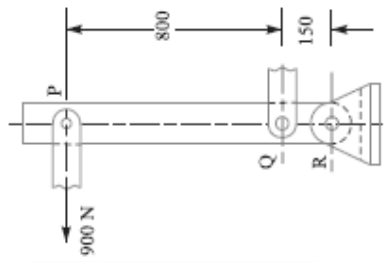


Figure I

- e. Classify levers and give example of each.

### Q3. Attempt any Four

**16 Marks**

- A knuckle joint transmits a load of 150 kN. The rod diameter is 52 mm. Determine all dimensions of knuckle joint and induced shear stress, bending stress in knuckle pin.
- Draw a labeled sketch of four speed sliding mesh gear box.
- Estimate length of piston.
- Design the turn buckle rod diameter only to withstand a load of 1600 N, permissible stresses are  $70 \text{ N/mm}^2$  and  $60 \text{ N/mm}^2$  in tension and shear respectively.
- State types of keys with their appropriate applications.

### Q4 A] Attempt any Three

**12 Marks**

- Describe Nipping of leaf springs with neat sketch. Why it is carried out?
- Recommend suitable material with justification for I.C. Engine
  - piston
  - cylinder head
  - piston pin
  - connected rod
- State two applications of each of knuckle joint and turn buckle in an automobile.
- Write design stepwise procedure for propeller shaft. Why propeller shafts are generally made hollow?

### B] Attempt any One

**06 Marks**

- Explain aesthetic considerations in designing automobile components.
- Write stepwise design procedure for flange coupling.

### Q5. Attempt any Two

**16 Marks**

- A mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 N-m and a torque  $T$ . If the yield point of the steel in tension is 200 MPa, find the maximum value of this torque without causing yielding of the shaft as per;
  - Maximum principal stress theory And
  - Maximum shear stress theory.
- Draw the neat sketch of the fully floating rear axle. And design the diameter of rear axle shaft for fully floating type with the following data  
 Engine Power = 10 kW at 300 rpm. Gear box ratio = 4:1, 2.4:1, 1.5:1 And 1:1

Differential Reduction =6:1. Shear stress for the shaft =  $70 \text{ N/mm}^2$

- c. Determine the thickness of plain cylinder head for 0.3 m cylinder diameter. The maximum gas pressure is  $3.2 \text{ N/mm}^2$ . Design the studs and cylinder cover. Take allowable tensile stress for cylinder cover and bolt equal to  $42 \text{ N/mm}^2$  and  $63 \text{ N/mm}^2$  respectively

**Q6. Attempt any Two**

**16 Marks**

- a. Write design procedure for connecting rod.
- b. Design of piston pin with following data. Maximum gas pressure =  $4 \text{ N/mm}^2$ . Diameter of piston = 70 mm, allowable stresses due to bearing, bending and shear are given  $30 \text{ N/mm}^2$ ,  $80 \text{ N/mm}^2$ ,  $60 \text{ N/mm}^2$  respectively.
- c. A multiple disc clutch has five plates having four pairs of active friction surfaces. If the intensity of pressure is not to exceed  $0.127 \text{ N/mm}^2$ , find the power transmitted at 500 r.p.m. The outer and inner radii of friction surfaces are 125 mm and 76 mm respectively. Assume uniform wear and take coefficient of friction = 0.3.