

**III B. Tech I Semester Regular Examinations, February-2022**  
**AUTOMOTIVE COMPONENTS DESIGN**  
**(Automobile Engineering)**

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**  
All Questions Carry Equal Marks

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**UNIT-I**

1. a) Discuss briefly basic procedure of machine design with a simplified flow chart. [8M]  
b) Explain about the basic requirements of machine elements. [7M]
- (OR)**
2. a) Label the stress strain diagram of ductile materials and explain the information obtained from it. [8M]  
b) Discuss briefly about the following terms [7M]  
i) Stress concentration  
ii) Factor of Safety. Also explain the importance of FOS consideration in design aspects.

**UNIT-II**

3. a) Illustrate the causes of failure and stresses in shafts and also the materials used for shafts and axles. [8M]  
b) Discuss briefly how the stresses can be calculated when the shafts subjected to combined torsion and bending. [7M]
- (OR)**
4. a) A machinery shaft is to transmit 61.5 kW at a speed of 1150 rev/min with mild shock. The shaft is subjected to a maximum bending moment of 900 Nm and an axial thrust of 70 kN. The shaft is supported at intervals of 2.5 metres. What should be its diameter when designed according to code? [8M]  
b) Explain the procedure of designing a shaft for critical speed. [7M]

**UNIT-III**

5. a) Classify the clutches based on various considerations. [8M]  
b) Deduce an expression for torque transmitted by a clutch using uniform pressure theory. [7M]

**(OR)**



6. a) A plate clutch consists of one pair of contacting surfaces and transmits 20 kW power at 750 rpm. The ratio of outer diameter to inner diameter is 2. The coefficient of friction is 0.2 and the permissible intensity of pressure is 1 N/mm<sup>2</sup>. Assuming uniform wear theory, calculate the inner and outer diameters. [8M]
- b) Discuss the steps in obtaining the total energy absorbed by the brake and deduce the expression for it. [7M]

**UNIT-IV**

7. a) Explain the classification of gears. [8M]
- b) Discuss briefly the desirable properties for gear materials and state some materials used for gears. [7M]

**(OR)**

8. a) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20°, while the helix angle is 25°. The face width is 40 mm and the normal module is 4 mm. The pinion as well as the gear is made of steel 40CB ( $S_{ut} = 600$  N/mm<sup>2</sup>) and heat treated to a surface hardness of 300 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculate the power transmitting capacity of gears. [8M]
- b) Show the nomenclature by drawing a simplified sketch of gear and explain the terms: [7M]
- (i) Circular pitch (ii) Diametral pitch and (iii) Module.

**UNIT-V**

9. a) Classify bearings based on various considerations. [8M]
- b) Explain the working of hydrostatic bearing system with the help of a simplified sketch. [7M]

**(OR)**

10. a) Discuss the advantages and disadvantages of Rolling contact bearings. [7M]
- b) Discuss briefly some of the important types of Rolling contact bearing and their applications. [8M]

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