



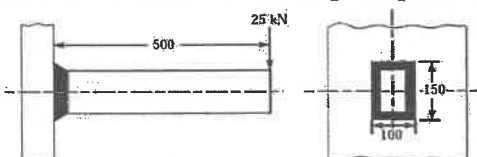
**B.Tech V Semester Supplementary Examinations, July 2024**  
**Design of Machine Members- I**  
**(Mechanical Engineering)**

**Maximum Marks: 70**

**Date: 22.07.2024 Duration: 3 hours**

- Note:**
1. This question paper contains two parts A and B.
  2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
  3. Part B consists of 5 Units. Answer any one full question from each unit.
  4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A		CO	Bloom Tx
All the following questions carry equal marks (10X2M=20 Marks)			
1	Draw the stress-strain curve for mild steel.	CO1	III
2	What are bending stresses?	CO1	I
3	Define Notch sensitivity and write down the formula.	CO2	I
4	Give the significance of endurance limit.	CO2	II
5	Mention the types of riveted joints.	CO4	I
6	What are the practical applications of welded joints?	CO4	I
7	List the purpose of Gib in cotter joint.	CO5	I
8	Differentiate between keys and splines.	CO5	II
9	What are the various stresses induced in a shaft?	CO3	I
10	Name any two of the rigid and flexible coupling.	CO3	I
Part-B			Bloom Tx level
Answer All the following questions. (5X10M=50Marks)			
11	A mild steel shaft of 50 mm diameter is subjected to a bending moment of 2000 Nm 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 according to (a) maximum principal stress (b) maximum shear stress and (c) maximum distortion strain energy theory of yielding. [10M]	CO1	III
OR			
12	A. Discuss the factors governing the selection of materials in design of machine members. [5M] B. Give an account of types of fits. [5M]	CO1	II
13	A transmission shaft of cold drawn steel 27Mn2 ( $S_{ut} = 500 \text{ N/mm}^2$ and $S_{yt} = 300 \text{ N/mm}^2$ ) is subjected to a fluctuating torque which varies from -100 Nm to +400 Nm. The factor of safety is 2 and the expected reliability is 90%. Neglecting the effect of stress concentration, determine the diameter of shaft. [10M]	CO2	IV
OR			
14	A machine component is subjected to a flexural stress which fluctuates	CO2	III

	between $+600 \text{ MN/m}^2$ and $-300 \text{ MN/m}^2$ . Determine the value of minimum ultimate strength according to (a) Gerber relation (b) Modified Goodman relation and (c) Soderberg relation. Take yield strength = 0.45 times ultimate strength and Endurance strength = 0.5 times ultimate strength. Factor of safety= 2. [10M]		
15	The end of a receiver, cylindrical in shape is closed by a lap joint using rivets. The maximum pressure in the receiver is 1 MPa. The axial length of the receiver is limited to 2 m, while its storing capacity is $2 \text{ m}^3$ . Design the suitable lap joint giving a neat sketch. The permissible stresses in shear and crushing of rivets may be taken as 30 MPa and 70 MPa. The permissible tensile stress for the plate material is 80 MPa. [10M]	CO4	IV
OR			
16	A rectangular cross-section bar is welded to a support by means of fillet welds as shown in figure. Determine the size of the welds, if the permissible shear stress in the weld is limited to 75 MPa. [10M]	CO4	V
 <p style="text-align: center;">All dimensions in mm.</p>			
17	Design a sleeve and cotter joint to resist a tensile load of 60 kN. All parts of joint are made of same material with the following allowable stresses: $\sigma_t = 60 \text{ MPa}$ , $\tau = 70 \text{ MPa}$ and $\sigma_c = 125 \text{ MPa}$ . [10M]	CO5	IV
OR			
18	A 15 kW, 960 rpm motor has a mild steel shaft of 40 mm diameter and the extension being 75 mm. The permissible shear and crushing stresses for the mild steel key are 56 MPa and 112 MPa. Design the keyway in the motor shaft extension. Check the shear strength of key against the normal strength of shaft. [10M]	CO5	III
19	A mild steel shaft has to transmit 70 kW at 240 rpm. The allowable shear stress in the shaft material is limited to 45 MPa. Design a cast iron flange coupling. The shear stress in the coupling bolt is limited to 30 MPa. [10M]	CO3	IV
OR			
20	Determine the diameter of hollow shaft having inside diameter 0.5 times the outside diameter. The permissible shear stress is limited to 200 MPa. The shaft carries a 900 mm diameter cast iron pulley. This pulley is driven by another pulley mounted on the shaft placed below it. The belt ends are parallel and vertical. The ratio of tensions in the belt is 3. The pulley on the hollow shaft weighs 800 N and overhangs the nearest bearing by 250 mm. The pulley is to transmit 35 kW at 400 rpm. [10M]	CO3	IV