



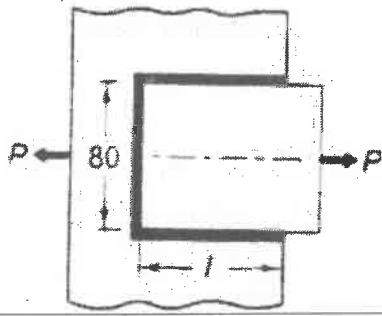
B.Tech V Semester Regular/Supplementary Examinations, February 2024
Design of Machine Members- I
(Mechanical Engineering)

Maximum Marks: 70

Date: 17.02.2024 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	Present the mechanical properties of materials considered for the design of machine members.	CO1	I
2	What are torsional stresses?	CO1	I
3	Enlist the factors influencing fatigue stress concentration factor.	CO2	II
4	Give the use of Goodman & Soderberg diagrams.	CO2	II
5	Mention the types of welded joints.	CO4	I
6	List the advantages and limitations of bolted joints.	CO4	I
7	Write the applications of knuckle joint.	CO5	II
8	What are the various forces acting on a key?	CO5	I
9	Sketch a protective type flange coupling.	CO3	II
10	What do you understand by lateral rigidity and torsional rigidity?	CO3	I
Part-B			
Answer All the following questions. (5X10M=50Marks)			Bloom Tx level
11	Calculate the tolerances, fundamental deviations and limits of sizes for the shaft designated as 40 H8 / f7. [10M]	CO1	III
OR			
12	An unknown weight falls through 12 mm, on to a collar rigidly attached to the lower end of a vertical rod, 2.8 m long and 510 mm ² in cross section. The maximum instantaneous extension is 2.1 mm. Find the magnitude of weight and corresponding stress induced. [10M] Take E = 2.1 x 10 ⁵ MPa.	CO1	IV
13	A torsion bar spring has a solid round 20 mm diameter section which blends smoothly at each end with a larger splined section. It is subjected to a completely reversed nominal torsional stress of 210 MN/m ² . Stress concentration is negligible and the surfaces are machined. Estimate the fatigue life corresponding to each of the following materials (a) Steel- 250 HB and (b) Cast iron, Su= 350 MN/m ² . [10M]	CO2	V
OR			

14	Derive an expression for Soderberg equation. [10M]	CO2	II
15	A double riveted double cover butt joint in plates, 20 mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are: $\sigma_t = 120$ MPa, $\tau = 100$ MPa, $\sigma_c = 150$ MPa. Find the efficiency of joint, taking the strength of rivet in double shear as twice than that of single shear. [10M]	CO4	IV
OR			
16	A steel plate, 80 mm wide and 10 mm thick, is joined to another steel plate by means of a single transverse and double parallel fillet weld as shown in figure. The strength of welded joint should be equal to the strength of the plate to be joined. The permissible tensile and shear stresses for the weld material and the plates are 100 MPa and 70 MPa respectively. Find the length of each parallel fillet weld. Assume that the tensile force passes through the centre of gravity of three welds. [10M]	CO4	V
			
17	Design a cotter joint to connect piston rod to the crosshead of a double acting steam engine. The diameter of the cylinder is 280 mm and the steam pressure is 1.1 N/mm^2 . The allowable stresses for the material of cotter and piston rod are as follows: $\sigma_t = 55$ MPa, $\tau = 38$ MPa and $\sigma_c = 80$ MPa. [10M]	CO5	IV
OR			
18	A 45 mm diameter shaft is made of steel with yield strength of 400 MPa. A parallel key of size 14 mm wide and 9 mm thick made of steel with yield strength of 340 MPa is to be used. Find the required length of key, if the shaft is loaded to transmit the maximum permissible torque. Use a factor of safety of 2. [10M]	CO5	III
19	A shaft is transmitting 99 kW at 180 rpm. If the allowable shear stress in the material is 65 MPa, find the suitable diameter for the shaft. The shaft is not to twist more than 1.1° in a length of 3.1 metres. Take $C = 80 \text{ GPa}$. [10M]	CO3	III
OR			
20	Two shafts are connected by means of a flange coupling to transmit torque of 25 Nm. The two flanges of the coupling are fastened by four bolts of the same material at a radius of 30 mm. Find the size of the bolts, if the allowable shear stress for the bolt material is 30MPa. [10M]	CO3	IV