BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: B.TECH **SEMESTER : VI**
BRANCH: PROD. **SESSION : SP2023**

SUBJECT: PE303 DESIGN OF MACHINE ELEMENTS

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1	What do you mean by the factor of safety? List the important factors that influence the magnitude of the factor of safety.	[5]	1	2
Q.2	The diameter of the shaft in Fig. 1 is 60 mm. The material used is 50C4 steel, having a yield tensile strength of 400 MPa. Using the factor of safety = 2.5, find the load P applying maximum shear stress theory.	[5]	1	3

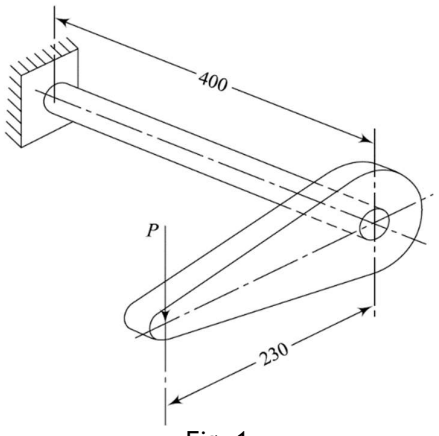

Fig. 1
All dimensions in mm

Q.3	Two rods are connected utilizing a cotter joint. The inside diameter of the socket and the outside diameter of the socket collar are 50 and 100 mm, respectively. The rods are subjected to a tensile force of 50 kN. The cotter is made of steel 30C8 with a tensile yield strength of 400 MPa, and the factor of safety is 4. The width of the cotter is five times of thickness. Calculate the width and thickness of the cotter based on shear and bending failure.	[5]	2	3
Q.4	A bracket, as shown in Fig. 2, carries a load of 10 kN. Find the size of the weld if the allowable shear stress is not to exceed 80 MPa.	[5]	2	3

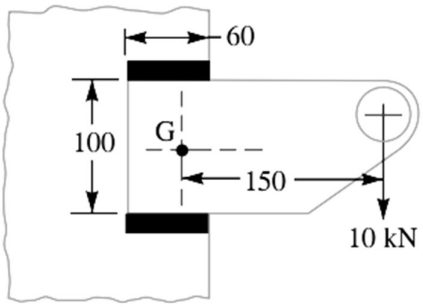

Fig. 2
All dimensions in mm

PTO

Q.5 A crane-runway bracket is fastened to the roof truss employing two identical bolts, as shown in Fig. 3. Select the size of the bolts, if the permissible tensile stress in the bolts is limited to 75 MPa. [5] 3 4

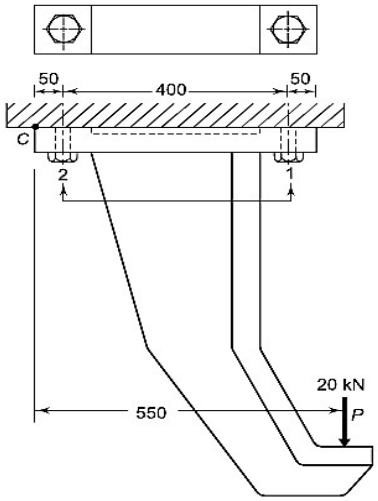

Fig. 3
All dimensions in mm

Basic dimensions for ISO metric screw threads (coarse series)

Designation	*Nominal or major dia d/D (mm)*	*Pitch (p) (mm)*	*Pitch diameter d_P/ D_P (mm)*	*Minor diameter (mm)*		*Tensile stress area (mm^2)*
				d_c	D_c	
M 4	4	0.70	3.545	3.141	3.242	8.78
M 5	5	0.80	4.480	4.019	4.134	14.20
M 6	6	1.00	5.350	4.773	4.917	20.10
M 8	8	1.25	7.188	6.466	6.647	36.60
M 10	10	1.50	9.026	8.160	8.376	58.00
M 12	12	1.75	10.863	9.853	10.106	84.30
M 16	16	2.00	14.701	13.546	13.835	157
M 20	20	2.50	18.376	16.933	17.294	245
M 24	24	3.00	22.051	20.319	20.752	353
M 30	30	3.50	27.727	25.706	26.211	561
M 36	36	4.00	33.402	31.093	31.670	817
M 42	42	4.50	39.077	36.479	37.129	1120

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