Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 07-10-2025 **Time:** 09.30am to 11.00am

School: SOE	**Program:** B. Tech. (Mechanical)	
Course Code: MEC3004	**Course Name:** Design of Machine Elements-I	
Semester: V	**Max Marks**: 50	**Weightage**: 25%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**20**	**30**	**-**	**-**	**-**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

(iii) Use of Design Data Handbook permitted.

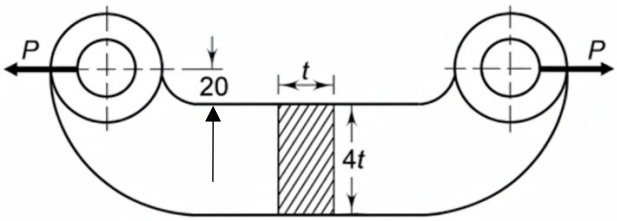
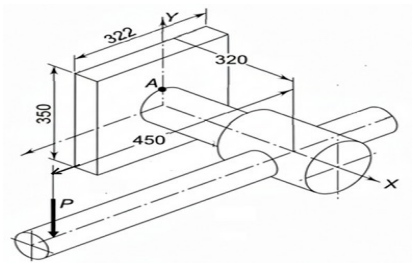
Part A

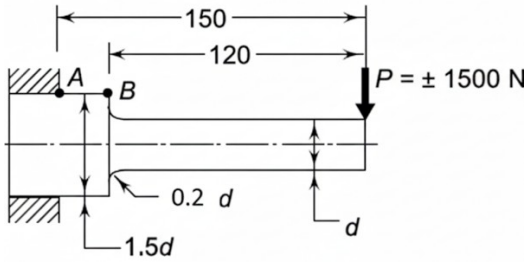
Answer ALL the Questions. Each question carries 2marks. **5Q x 2M=10M**

1	What is endurance limit?	**2 Marks**	**L1**	**CO1**
2	What is the maximum Principal stress theory?	**2 Marks**	**L1**	**CO1**
3	What is the surface finish factor for a cylindrical component subjected to torsion, having sharp circular grooves & having an ultimate tensile strength of 300 MPa?	**2 Marks**	**L1**	**CO1**
4	What is the theoretical stress concentration factor (Kt)?	**2 Marks**	**L1**	**CO1**
5	What are the key elements of a machine?	**2 Marks**	**L1**	**CO1**

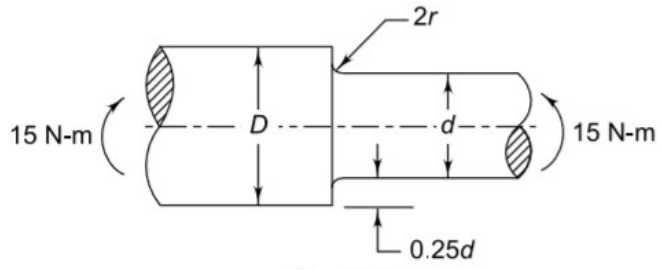
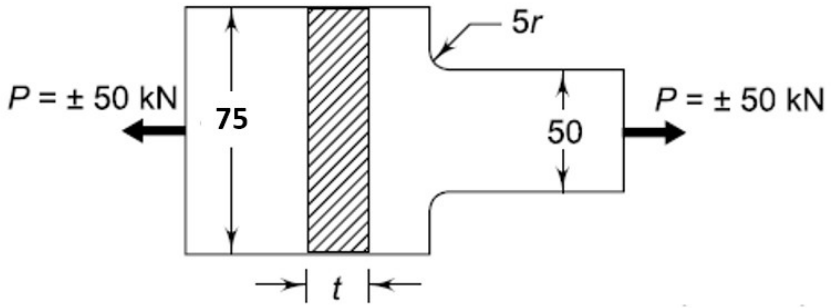
Part B

Answer the Questions. **Total Marks 40M**

6.	**a.**	**An offset link subjected to a force of 75 kN is shown in Fig. It is made of grey cast iron FG300 and the factor of safety is 2.5. Solve for the cross-section of the link.** 	**10 Marks**	**L3**	**CO1**
		Or			
7.	**a.**	**The shaft of an overhang crank subjected to a force P of 3 kN is shown in Fig. The shaft is made of plain carbon steel 45C8 and the tensile yield strength is 500 MPa. The factor of safety is 2.5. Solve for the diameter of the shaft using the maximum shear stress theory** 	**10 Marks**	**L3**	**CO1**

8.	**a.**	**A cantilever beam made from hot rolled steel 20C8 (Sut = 540 N/mm^2) is subjected to a completely reversed load of 1000 N as shown in Fig. The notch sensitivity factor q at the fillet can be taken as 0.85 and the expected reliability is 90%. Solve for the diameter d of the beam for a life of 8000 cycles.** 	**15 Marks**	**L3**	**CO2**
		Or			
9.	**a.**	**Hot rolled steel bar, 50 mm in diameter, is subjected to a reversed bending stress of 300 N/mm^2. The bar is made of steel 40C8 (σ_{ut} = 600 N/mm^2). Solve for the life of the bar**	**15 Marks**	**L3**	**CO2**

		for a reliability of 90%.			

10.	**a.**	**A round shaft made of a brittle material and subjected to a bending moment of 15 N-m is shown in Fig. The stress concentration factor at the fillet is 1.5 and the ultimate tensile strength of the shaft material is 200 N/mm^2. Solve for the diameter d.**  	**15 Marks**	**L3**	**CO2**
		Or			
11.	**a.**	**A component Rough finished made of steel 45C8 (σ_{ut} = 530 N/mm^2) is shown in Fig. It is subjected to a completely reversed axial force of 50 kN. The expected reliability is 90% and the factor of safety is 2. The size factor is 0.85. Solve for the plate thickness t for infinite life, if the notch sensitivity factor is 0.8.**  	**15 Marks**	**L3**	**CO2**