PRN:		Course Code :	MET2503

Third Year **B. Tech** End Semester Examination Winter 2023

Design of Machine Elements

Day and Date: Monday 04/12/2023 Max Marks: **50**

Time : 10.30am to 12.30PM Duration: **02** hrs

Instructions: All questions are compulsory.

		Marks	Bloom's Level	CO
Q.1	**Attempt any two from the following**			
a)	Differentiate between static load and dynamic load. Define factor of safety and its significance in mechanical design	06	II	01
b)	Explain what do you mean by direct shear stress and torsional shear stress with equations.	06	II	01
c)	Suggest suitable material for following components and give reasons for your selection; a) Car Chassis b) Helmet c) turbine blades	06	II	01
Q.2	**Attempt any two from the following**			
a)	Design a knuckle joint to connect two circular rods subjected to an axial pull of 50 kN. The joint is made up of 30C8 (Syt=400 N/mm^2) with factor of safety as 5. Assume yield strength in tension equal to yield strength in compression (Syt= Syc).	06	III	02
b)	State step by step design procedure for turnbuckle with sketch	06	III	02
c)	A right-angled bell crank lever is to be designed to raise a load of 5 kN at the short arm end. The length of short and big arm ends are 150 mm & 500 mm respectively. The lever & pin are made of 30C8 steel (Syt=400 N/mm^2) & factor of safety is 5. The lever has rectangular c/s and ratio of width to thickness is 3:1. The length & diameter of fulcrum pin is 1.25:1. The permissible bearing pressure is 10 N/mm^2.	06	III	02
Q.3	**Attempt the following**			
a)	Design a shaft to transmit power from an electric motor to machine head stock through a pulley by means of belt drive. Pulley weighs 200 N and is located at 300 mm from the center of bearing. The diameter of the pulley is 200 mm and the maximum power transmitted is 1 KW at 1000 rpm. The angle of lap of the belt is 180^0 and coefficient of friction between the belt and pulley is 0.3. the shock and fatigue factors for bending and twisting are 1.5 and 2.0 respectively. The permissible shear stress in the shaft material may is taken as 35MPa. The pulley is mounted overhung on shaft.	06	III	03

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b)	Explain the different stresses induced while designing helical compression spring	07	III	03
	OR			
b)	Explain design procedure of muff coupling with sketch	07	II	03
Q.4	**Attempt the following**			
a)	Draw sketches of forms of threads used in power screws and state their relative advantages and disadvantages.	06	II	04
b)	What is self-locking and overhauling properties of the power screw? explain the conditions with the required equations	07	II	04
	OR			
b)	A double-threaded power screw with ISO metric trapezoidal threads are used to raise a load of 300 kN. The nominal diameter is 100mm and the pitch is 12 mm. the coefficient of friction at the screw threads is 0.15. Neglecting collar friction, calculate i) torque required to raise the load ii) torque required to lower the load & iii) efficiency of screw	07	III	04

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