Q.P. Code: 19ME0311 **R19**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Supplementary Examinations July-2022

DESIGN OF MACHINE ELEMENTS-I

(Mechanical Engineering)

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	**a**	How do you classify materials for engineering use?	**L1**	**6M**
	b	What are the general design consideration should be followed while designing amachine element	**L1**	**6M**

OR

2		The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt required according to 1. Maximum principal stress theory; 2.Maximum shear stress theory; 3.Maximum principal strain theory;4.Maximum strain energy theory; and 5.Maximum distortion energy theory.	**L2**	**12 M**

UNIT-II

3	**a**	What are the fluctuating stress, repeated stress and reversed stress? Draw the Stress – Time sinusoidal curves	**L3**	**6M**
	b	Determine the diameter of a circular rod made of ductile material with a fatigue strength (complete reversal), σe=265 MPa and tensile yield strength of 350 MPa. The member is subjected to a varying axial load from W min =-300 KN to W max = 700 KN and has a stress concentration factor is 1.8. Use factor of safety as 2.	**L2**	**6M**

OR

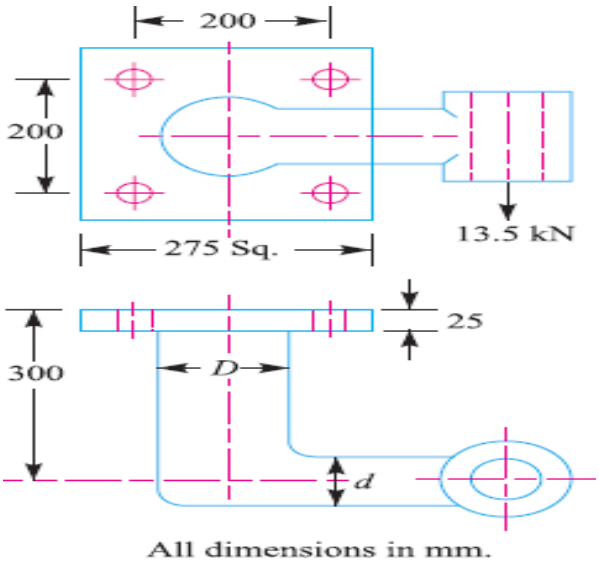
4		A machine component is subjected to a flexural stress which fluctuates between + 300 MN/m2 and – 150 MN/m2. Determine the value of minimum ultimate strength according to 1. Gerber relation; 2. Modified Goodman relation; and 3. Soderberg relation. Take yield strength = 0.55 Ultimate strength; Endurance strength = 0.5 Ultimate strength; and actor of safety = 2.	**L1**	**12 M**

UNIT-III

5	**a**	Two machine parts are fastened together tightly by means of a 24 mm tap bolt. If the load tending to separate these parts is neglected, find the stress that is set up in the bolt by the initial tightening.	**L2**	**6M**
	b	A lever loaded safety valve has a diameter of 100 mm and the blow off pressure is1.6 N/mm2. The fulcrum of the lever is screwed into the cast iron body of the cover. Find the diameter of the threaded part of the fulcrum if the permissible tensile stress is limited to 50 MPa and the leverage ratio is 8.	**L2**	**6M**

OR

6	Fig. shows a solid forged bracket to carry a vertical load of 13.5 kN applied through the centre of hole. The square flange is secured to the flat side of a vertical stanchion through four bolts. Calculate suitable diameter D and d for the arms of the bracket, if the permissible stresses are 110 MPa in tension and 65 MPa in shear. Estimate also the tensile load on each top bolt and the maximum shearing force on each bolt.	**L3**	**12 M**



UNIT-IV

7	**a**	What are the applications of a cottered joint?	**L1**	**6M**
	b	A knuckle joint is required to withstand a tensile load of 25 kN. Design the joint if the permissible stresses are :σt= 56 MPa ; τ = 40 MPa and σc= 70 MPa.	**L6**	**6M**

OR

8		Design a sleeve and cotter joint to resist a tensile load of 60 kN. All parts of the joint are made of the same material with the following allowable stresses: Tensile stress = 60 MPa; shear stress = 70 MPa; and compressive stress = 125 MPa.	**L6**	**12 M**

UNIT-V

9	**a**	What is a key? State its function with neat sketch.	**L1**	**6M**
	b	Design the rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa.	**L6**	**6M**

OR

10	**a**	Discuss the function of a coupling. Give at least three practical applications.	**L2**	**6M**
	b	Design and make a neat dimensioned sketch of a muff coupling which is used to connect two steel shafts transmitting 40 kW at 350 r.p.m. The material for the shafts and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40 MPa and 80 MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15 MPa.	**L6**	**6M**

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