Q.P. Code: 18ME0313 **R18**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Supplementary Examinations August-2021

DESIGN OF MACHINE ELEMENTS-I

(Mechanical Engineering)

Time: 3 hours Max. Marks: 60

PART-A

(Answer all the Questions **5 x 2 = 10** Marks)

1	a	Distinguish between brittle fracture and ductile fracture.	**2M**
	b	Define stress concentration and stress concentration factor.	**2M**
	c	How is a bolt designated?	**2M**
	d	What are the main functions of the knuckle joints?	**2M**
	e	Under what circumstances flexible couplings are used?	**2M**

PART-B

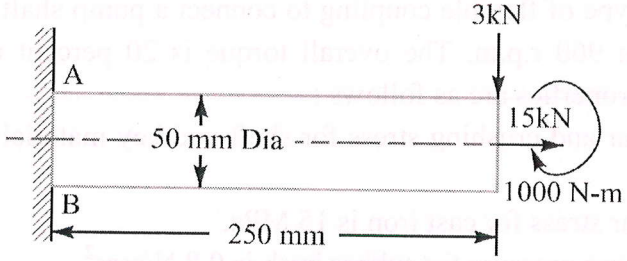
(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

2	a	How do you classify the machine design? Explain	**5M**
	b	Explain the general design procedure while designing a machine element	**5M**

OR

3		A shaft, as shown in Fig. is subjected to a bending load of 3 kN, pure torque of 1000 N-m and an axial pulling force of 15 kN. Calculate the stresses at A and B.	**10M**



UNIT-II

4	a	What are the fluctuating stress, repeated stress and reversed stress? Draw the Stress – Time sinusoidal curves	**5M**
	b	Determine the diameter of a circular rod made of ductile material with a fatigue strength (complete reversal), σ_e=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.	**5M**

OR

5		A machine component is subjected to a flexural stress which fluctuates between + 300 MN/m^2 and – 150 MN/m^2. 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.	**10M**

UNIT-III

6 Derive the expression for eccentric load acting parallel to the axis of bolts **10M**

OR

7 **a** Explain briefly the method of riveting? **5M**

b Show by neat sketches the various ways in which a riveted joint may fail. **5M**

UNIT-IV

8 **a** What are the applications of a cottered joint? **5M**

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. **5M**

OR

9 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. **10M**

UNIT-V

10 **a** What is the effect of keyway cut into the shaft? **5M**

b 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 maximum shear stress theory and assume a factor **5M**

OR

11 Design a bushed-pin type of flexible coupling to connect a pump shaft to a motor shaft transmitting 32 kW at 960 r.p.m. The overall torque is 20 percent more than mean torque. The material properties are as follows : **10M**

(a) The allowable shear and crushing stress for shaft and key material is 40 MPa and 80 MPa respectively.

(b) The allowable shear stress for cast iron is 15 MPa.

(c) The allowable bearing pressure for rubber bush is 0.8 N/mm^2.

The material of the pin is same as that of shaft and key. Draw neat sketch of the coupling.

END