Final Assessment Test (FAT) - July/August 2023

|			
Programme	B.Tech.		
Course Title	DESIGN OF MACHINE ELEMENTS	Semester	Fall Inter Semester 22-23
		Course Code	BMEE301L
Faculty Name	Prof. Gobinath N	Slot	C1+TC1+TCC1
		Class Nbr	CH20222232500183
Time	3 Hours	Max. Marks	100
PSG Design Data Book is Permitted			

Section - A (4 X 5 Marks)
Answer All questions

01. Discuss the significance of factor of safety for ductile and brittle materials   [5]

02. Explain the following parameters.   [5]
    (a) Notch sensitivity index
    (b) Spring index

03. Discuss the design procedure for flexible flange couplings.   [5]

04. Discuss about whipping stress.   [5]

Section - B (5 X 16 Marks)
Answer All questions

05. A machine element is subjected to the following stresses. $\sigma_x = 75$ MPa. $\sigma_y = 45$ MPa. $\tau = 30$ MPa. Find the factor of safety if it is made of C45 steel having yield stress as 350 MPa. using   [16]
    (a) Maximum principal stress theory
    (b) Maximum shear stress theory
    (c) Maximum strain theory, taking Poisson ratio as 0.28

06. A helical compression spring of circular cross section is subjected to an axial force that varies between 1000 N and 2000 N. Over this range of force, the spring deflection is expected to be of 15 mm. Spring index can be of 8. The spring has square and ground ends and it is made of patented and cold drawn steel ($\sigma_{ut}=1080$ N/mm²). Take shear modulus of the spring as 81700 N/mm². Design the spring and calculate.   [16]
    (a) Wire diameter
    (b) Mean coil diameter
    (c) Number of active coils
    (d) Total Number of coils
    (e) Solid length
    (f) Free length
    Pitch of the spring coil

07. For the bracket shown in the figure, determine the total shear load on each of the three bolts. All the bolts are of ISO 9.8 grade steel of permissible tensile stress 100 N/mm².   [16]
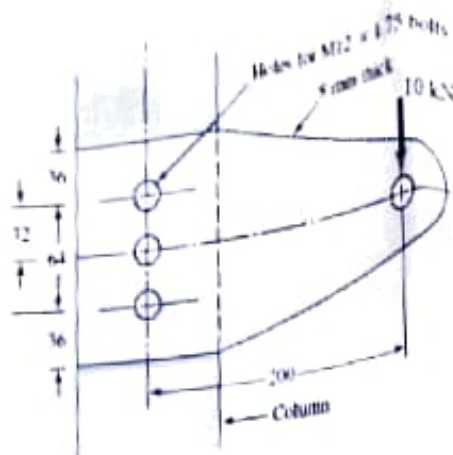
Dimensions in mm

08. A shaft is required to transmit a power of 30 kW at 150 rpm through a belt-pulley system. It [16] carries a 1000 N pulley at a distance of 650 mm inside from one of its ends and the shaft is supported at its ends by two ball bearings 1200 mm apart. The pulley is of 450 mm diameter The belt tensions are vertically downward and the maximum belt tension is found to be twice that of the minimum tension force. If the permissible stress for the shaft is 80 N/mm² in tension. design the diameter of the shaft as per the ASME code.

09. Design a Cast Iron piston for a single acting 4-stroke diesel engine with the following data. [16]

Cylinder bore = 300 mm

Stroke length = 450 mm

Engine Speed = 300 rpm

Indicated mean effective pressure = 0.8 MPa

Maximum gas pressure = 4.5 MPa

Brake specific fuel consumption = 0.33 kg/kW-hr

Higher calorific value of diesel fuel = 44000 kJ/kg.

Assume suitable data at appropriate situations and state the assumptions.

◇◇◇◇