(Please write your Enrolment No. immediately) Enrolment No.....

MID TERM EXAMINATION

4th Semester, April, 2024

Paper Code: MEC-212 **Subject: Machine Design -I**

Time: $1\frac{1}{2}$ Hrs. **Max. Marks: 30**

Note: Attempt Q.No. 1 which is compulsory and any two more questions from the remaining.

Q1. *Attempt any five:* *(5X2=10)*

(a) What do you mean by factor of safety? *(CO1)*

(b) What do you mean by stress concentration? *(CO1)*

(c) Illustrate how the stress concentration in a component can be reduced. *(CO1)*

(d) How are the keys classified? Draw neat sketches of different types of keys and state their applications. *(CO2)*

(e)What is a lever? Explain the principle on which it works. Also explain Mechanical Advantage and leverage. *(CO2)*

(f) Explain what you understand by A.M. Wahl's factor and state its importance in the design of helical springs? *(CO2)*

Q2. What is fatigue or Endurance limit of a material? Explain the mechanism of such failure. Draw the S-N curve. Also list practical examples of fatigue failure. *(CO1) (10)*

Q3. Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. *(CO1) (10)*

Q4. 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: (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. (d) The material of the pin is same as that of shaft and key. Draw neat sketch of the coupling. *(CO2) (10)*