USN ☐☐☐☐☐☐☐☐☐☐   **15AU63**

Sixth Semester B.E. Degree Examination, Jan./Feb. 2023
Design of Machine Elements – II

Time: 3 hrs.   Max. Marks: 80

Note: 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
      2. *Design Data Handbook may be permitted.*

Module-1

1   The frame of a punch press in shown in Fig Q1. Find the stresses at the inner and outer surface at section X-X of the frame, if W = 5000N.
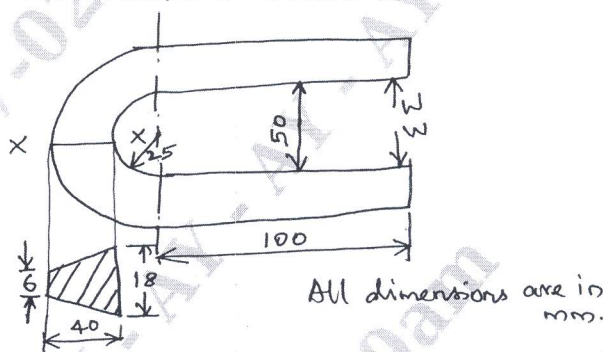

Fig Q1   **(16 Marks)**

OR

2   A semi elliptical laminated vehicle spring to carry a load of 6000N is to consist of seven leaves 65mm wide, two of the leaves extending the full length of the spring. The spring is to be 1.1m in length and attached to the axle by two U bolts 80mm apart. The bolts hold the central portion of the spring so rigidity that they may be considered equivalent to a band having a width equal to the distance between the bolts. Assume a design stress for spring material as 350 MPa. Determine :
    i) Thickness of leaves
    ii) Deflection of springs
    iii) Diameter of eye
    iv) Length of leaves   **(16 Marks)**

Module-2

3   Design a pair of spur gears to transmit 20kW from a shaft rotating at 1000rpm to a parallel shaft which is to rotate at 310 rpm. Assume number of teeth on pinion 31 and 20° full depth tooth form. The material for pinion is C_{45} Steel untreated and for gear cast steel 0.20%C untreated.   **(16 Marks)**

OR

4   Design a pair of helical gears to transmit power of 15kW at 3200 rpm with speed reduction 4 : 1 pinion in made of cast steel 0.4% e untreated. Gear is made of high grade CI. Helix angle is limited to 26° and not less than 20 teeth are to be used on either gear. Suggest suitable surface hardness for the gear pair.   **(16 Marks)**

Module-3

5   With necessary equations write the procedural steps for the design of level gear.   **(16 Marks)**

OR

6   With neat sketches, explain the worm gear forces.   **(16 Marks)**

Module-4

7   a.   Determine the power transmitted by a single pair plate clutch assuming uniform pressure distribution. The friction surfaces have an outside diameter of 350mm and an inner diameter of 280mm. The coefficient of friction is 0.25 and the maximum allowable pressure is 0.85MPa.   **(08 Marks)**

    b.   A multiple clutch has 2 bronze and 3 steel discs. The friction material can withstand a pressure of 0.1N/mm^2 and $\mu = 0.15$. The outside and inside diameters of friction lining are 200mm and 120mm respectively. Determine the power that can be transmitted by this clutch at 1000rpm.   **(08 Marks)**

OR

8   a.   Explain the design considerations for block brake.   **(08 Marks)**

    b.   With neat sketches, explain simple band brake.   **(08 Marks)**

Module-5

9   a.   Write the important factors that influence the choice of lubricants.   **(08 Marks)**

    b.   What is Summerfield number and explain.   **(08 Marks)**

OR

10   a.   Explain life of a bearing.   **(08 Marks)**

    b.   Explain Reliability of a bearing.   **(08 Marks)**

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