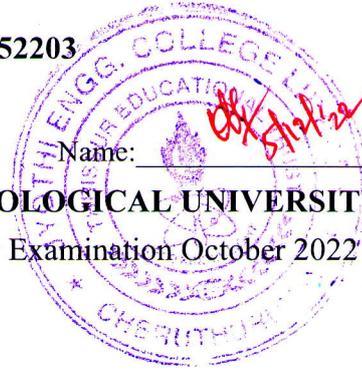Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Eighth Semester B.Tech Degree Supplementary Examination October 2022 (2015 Scheme)

Course Code: ME402
Course Name: Design of Machine Elements-II

Max. Marks: 100   Duration: 3 Hours

Use of approved design data book is permitted
Missing data may be suitably assumed

PART A
Answer any two full questions, each carry 15 marks.   **Marks**

1 a) Design a cone clutch to transmit 7.5 kW at 900 rpm. The face angle is 12.5 0. The   (12)
      cone face is lined with leather and the normal pressure between contact face is not
      to exceed 0.09 N/mm ^{2} The width of the face is half of the mean radius. Co-
      efficient of friction is 0.2. Determine the main dimension of clutch and axial force
      required to engage clutch. Assume uniform wear theory.

   b) Differentiate between uniform wear theory and uniform pressure theory applied   (3)

      for clutch design

2 a) A ball bearing operates on the following cycle   (12)

         (i)   Radial load of 3000N at 720 rpm for 30%
         (ii)   Radial load of 7000N at 1440 rpm for 40%
         (iii) Radial load of 5000N at 900 rpm for 30 %

      The dynamic capacity of the bearing is 16500 N Calculate (i)Average speed of
      rotation (ii) Equivalent radial load (iii) Bearing life
   b) List out the advantages of rolling contact bearing over sliding contact bearings   (3)

3 a) Design the main bearing of a 4-stroke diesel engine to sustain a load of 6 k N. The (15)
      operating speed of the shaft is 100 rpm.

PART B
Answer any two full questions, each carry 15 marks.

4 a) A cast steel spur gear pinion having 21 teeth and rotating at 1500 rpm is required   (15)
      to transmit 9kW to high grade CI gear to run at 500 rpm. The teeth are at 14.5^0
      involute form. Design the gear completely

5 a) Design a pair of helical gears to transmit 20kW from a pinion speed of 4000rpm.   (15)
      The gear is to rotate at 800 rpm. The helix angle is not to be greater than 30 degrees.
      The teeth are 20 ^{0}stub involute in diametral plane Design the drive and check the
      design from the standpoint of dynamic load and wear

6 a) Design a pair of bevel gear to connect two shafts at 60 degrees. Power transmitted   (15)
      is 25 kW at 900rpm of pinion. The speed reduction is 5:1. The teeth are 20-degree
      full depth involute and pinion has 24 teeth. Check the design for dynamic and wear
      consideration

PART C
Answer any two full questions, each carry 20 marks.

7 a) A horizontal drive is required to drive a compressor by means of electric motor. Select a suitable flat belt drive from the following details Power to be transmitted 6 kW. Slip 2.5%. Speed of the motor pulley =1400 rpm. Speed of compressor 500 rpm. Allowable stress 2 MPa, Service factor 1.2   (20)

8 a) Select a suitable roller chain drive to transmit 9 kW from a 1200 rpm motor to a compressor at 400 rpm. The center distance is adjustable to 800mm. The service factor is 24 hours per day. Assume a factor of safety as 14   (20)

9 a) A cast iron cylinder of internal diameter 200 mm and thickness 50 mm is subjected to an internal pressure of 5 N/mm^2.Calculate the tangential and radial stress at inner middle and outer surfaces and plot the stress distribution across the thickness   (14)

   b) Differentiate the terms spring index and spring rate in design of helical compression springs. List out the desired properties for spring material   (6)

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