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Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S8 (S, FE) / S5 (PT) (S, FE) Examination May 2024 (2015-Scheme)

Course Code: ME402

Course Name: Design of Machine Elements-II

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Derive an expression for torque capacity of a single plate clutch based on the uniform wear theory assumption. (10)
- b) What is a self-energizing brake? When does a brake become self-locking? (5)
- 2 a) Derive Petroff's equation from fundamentals. Also write the assumptions made. (7)
- b) Explain the significance of bearing characteristic number in the design of journal bearing. (4)
- c) Distinguish between hydrostatic and hydrodynamic bearings (4)
- 3 A deep groove ball bearing having 60 mm bore and rotating at 1440 rpm is subjected to a radial load of 3 kN an axial load of 2 kN. The radial and thrust factors are 0.56 and 2 respectively. The service factor is 1.2. If the expected rating life is 20,000 hours, calculate the required basic dynamic capacity of the bearing and select the bearing from manufacturer's catalogue. (15)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) Derive Lewis beam strength equation from fundamentals. Write down the assumptions made also. (7)
- b) Define virtual number of teeth of helical gear. Deduce an expression for it. (5)
- c) Compare the merits and demerits of 20° involute full depth system with 14.5° system. (3)
- 5 Design a spur gear drive to transmit 22 kW at 1000 rpm. Speed reduction is 2.5. (15)
The centre distance between the gear shafts is approximately 350 mm. The materials are: pinion- C30 (H & T) steel, gear C45 (N). Design the drive using Lewis and Buckingham equations.
- 6 Design a helical gear pair to transmit 60 HP. The pinion runs at 6000 rpm and the (15)

speed ratio is 3. Using 20° full depth involute system design the gear pair and check the design against its surface durability.

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Discuss the merits and demerits of V-belts over flat belts. (6)
- b) How will you designate V-belt? (3)
- c) What is belt slip and creep? Clearly make a difference between the two. (5)
- d) What is polygonal action in roller chain? How will you reduce it? (6)
- 8 Design a connecting rod for four stroke petrol engine with the following data. (20)
- Piston bore diameter (D) : 100 mm
- Stroke (L) : 140 mm
- Length of connecting rod (l) : 315 mm
- Weight of reciprocating parts : 18.2 N
- Speed : 1500 rpm (with possible over-speed of 2500 rpm)
- Compression ratio: 4, Possible max. Explosion pressure: 2.45 MPa.
- 9 Design a flat belt drive for a fan running at 360 rpm which is driven by a 10 kW, (20)
- 1440 rpm motor.
