Code No: 126VD JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD B. Tech III Year II Semester Examinations, December - 2018 DESIGN OF MACHINE MEMBERS – II (Common to ME, AME)

Time: 3 hours

Note: This question paper contains two parts A and B. Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

1.a) Define static load carrying capacity of ball bearing. [2] What is bearing characteristic number as applied to journal bearing? b) [3] Why are more number of thin piston rings preferred over small number of thick rings? c) [2] d) What is the difference between centre and overhung crankshafts? [3] What are the advantages of fabric rubber belts? e) [2] Explain the designation of V-belt with the help of examples. f) [3] What is the minimum number of teeth on spur gear? Why? [2] **g**) Why are crossed helical gears not used for high power transmission? h) [3] Why are V threads not used in power screws? i) [2] What is 'self locking' of power screw? What is the condition for it? i) [3]

PART - B

(50 Marks)

- 2.a) What is meant by L_{10} life and L_{50} life?
- b) A single-row deep groove ball bearing is subjected to a pure radial force of 3 kN from a shaft that rotates at 500 rpm. The expected life L_{10h} of the bearing is 30000 h. The minimum acceptable diameter of the shaft is 40 mm. Select a suitable ball bearing for this application. [5+5]

OR

- 3. The following data is given for a full hydrodynamic bearing: Radial load = 10 kN; journal speed = 1440 rpm; unit bearing pressure = 1000 kPa; Clearance ratio (r/c) = 800; viscosity of lubricant = 30 MPa-s. Dimensions of the bearing 100×100 mm. Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, calculate the temperature rise. [10]
- 4. Explain the procedure to design centre crankshaft when it is at top dead centre position. [10]

OR

WWW.MANARESULTS.CO.IN

Max. Marks: 75

(25 Marks)

- 5. The following data is given for the piston of a four-stroke diesel engine: The cylinder bore = 250 mm Maximum gas pressure = 4 MPa Bearing pressure at small end of connecting rod = 15 MPa Length of piston pin in bush of small end = 0.45D Ratio of inner to outer diameter of piston pin = 0.6 Mean diameter of piston boss = 1.4 *x* outer diameter of piston pin Allowable bending stress for piston pin = 84 N/mm² Calculate:

 a) Outer and inner diameters of the piston pin
 b) Mean diameter of the piston boss and Check the design for bending stresses.
- 6. A belt pulley made of grey cast iron FG 150, transmits 10 kW of power at 720 rpm. The diameter of the pulley is 500 mm. The pulley has four arms of elliptical cross-section, in which the major axis is twice of the minor axis. Determine the dimensions of the cross-section of the arm, if the factor of safety is 5. [10]

OR

- 7. A temporary elevator is assembled at the construction site to raise building materials to a height of 20 m. It is estimated that the maximum weight of material to be raised is 5 kN. It is observed that the acceleration in such applications is 1 m/s^2 . 10 mm diameter, 6×19 construction wire ropes with fibre core are used for this application. The tensile designation of the wire is 1570 and the factor of safety should be 10 for preliminary calculations. Determine the number of wire ropes required for this application neglecting bending stresses. Also determine the true factor of safety taking into account the bending stresses. The sheave diameter can be taken as 45 times the rope diameter.
- 8. The lead screw of a lathe has single-start ISO metric trapezoidal threads of 52 mm nominal diameter and 8 mm pitch. The screw is required to exert an axial force of 2 kN in order to drive the tool carriage during turning operation. The thrust is carried on a collar of 100 mm outer diameter and 60 mm inner diameter. The values of coefficient of friction at the screw threads and the collar are 0.15 and 0.12 respectively. The lead screw rotates at 30 rpm. Calculate

a) The power required to drive the lead screw and

b) The efficiency of the screw.

OR

[5+5]

9. A differential type of screw jack is shown in figure. In this construction, the two screws do not rotate and the nut is rotated by the operator by applying a force of 100 N at a mean radius of 500 mm. The coefficient of friction at the threads is 0.15. Calculate a) The load that can be raised and

b) The efficiency of the screw jack.

[5+5]



10. A pair of spur gears with 20^{0} full-depth involute teeth consists of a 20 teeth pinion meshing with a 41 teeth gear. The module is 3 mm while the face width is 40 mm. the material for pinion as well as gear is steel with an ultimate tensile strength of 600 N/mm². The gears are heat-treated to a surface hardness of 400 BHN. The pinion rotates at 1450 rpm and the service factor for the application is 1.75. Assume that velocity factor accounts for dynamic load and the factor of safety is 1.5. Determine the rated power that the gears can transmit. [10]

OR

11. Derive the expression to estimate beam strength in bevel gears. [10]

---00000----

WWW.MANARESULTS.CO.IN