Code No: **R1631033** **R16** SET - 1

III B. Tech I Semester Supplementary Examinations, August - 2021

DESIGN OF MACHINE MEMBERS– II

(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**
Data Book allowed

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PART –A **(14 Marks)**

1. a) Differentiate between radial life and average life of the roller bearing. [2M]
   b) Describe the type and nature of stress in crankshaft during operation. [2M]
   c) Discuss the concept of bending stresses and write its equation. [2M]
   d) Why are ISO metric threads rarely used for the power screw while they are invariably used for fasteners? [3M]
   e) Define the formative number of teeth in case of helical gears. [3M]
   f) What are the advantages of Regular lay ropes? [2M]

PART –B **(56 Marks)**

2. a) Explain the steps involved in selection of bearing from manufacturer's catalogue. [7M]
   b) A bearing is subjected to the radial load of 2500 N at 500 rpm for one half of the time and 700 N at 3600 rpm for the remaining time. The inner ring rotates and the load is steady. Find the rating life at 6 hrs per day. [7M]

3. a) Explain the working of a floating gudgeon pin. Why the diameter of the piston pin always smaller than the crank pin in the same engine? [7M]
   b) Design a connecting rod for a petrol engine from the following data: Diameter of the piston= 120 mm, Weight of the reciprocating part = 2.0 kg, Length of the connecting rod = 300mm, Stroke length = 140 mm, Speed = 2000 r.p.m, Maximum explosion pressure = 2.25 N/mm^2. [7M]

4. a) Derive the equations of H section in terms of moment of inertia, section modulus and radius of gyration. [7M]
   b) A hollow shaft is required to transmit 600 kW at 110 rpm, the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 MPa and twist in a length of 3 meters not to exceed 1.4 degrees. Find the external diameter of the shaft, if the internal diameter to the external diameter is 3/8. Assume modulus of rigidity as 84 GPa. [7M]
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5. a) Explain the different forms of screw threads with neat sketches. [7M]
   b) A V- belt drive is used to transmit 35 kW at 760 rpm of the driver pulley of 350 mm effective diameter. The driven pulley diameter is 1400 mm and the centre distance is 2 m, groove angle is 40°, mass of the belt is 0.45 kg/m and μ = 0.27. The B type belt with a cross section area of 140 mm^2 is used. The permissible tensile stress is 5.7 MPa . Find the number of belt required and the length of the belt. [7M]

6. a) Explain how and why the Lewis equation is modified in case of helical teeth? [7M]
   b) It is required to design a pair of spur gears with 20º full depth in volute teeth based on the Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to a 10 kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4:1. The pinions as well as gear is made of plain carbon steel 40C8 (S_{ut} =600 N/mm^2) safe. The factor of safety can be taken as 1.5. Design the gears and specify the dimensions and suggest suitable surface hardness for the gears. [7M]

7. a) Describe the applications of rope sheaves and drums. [7M]
   b) Design a suitable wire rope for a bucket to lift water from a well which is 50 m deep. The weight of bucket is 1 kN. The water is to be drawn with a maximum speed of 100 m/min which is to be attained in 1.5 sec. Also take into consideration the initial slack of 100 mm. [7M]

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