1T01437 - B.E.(Mechanical) Engineering)(SEM-VII)(Choice Base Credit Grading System) ((R- 19-20) (C Scheme) / 42871 - Design of Mechanical Systems

QP CODE : 10028244   DATE: 14/06/2023

Duration: 03 Hrs	**Maximum marks: 80 marks**

Note   :

- **Question No.1 is compulsory.**
- Solve **ANY THREE** questions from the **remaining** five questions.
- Figure to the right indicates full marks.
- Assume suitable data wherever required, but justify the same.
- Design data book by PSG, Mahadevan and ICE design data book by Kale and Khandare is permitted to use.

Q. 1   Solve **ANY FOUR** questions from following.   **Marks**

   a)   Explain flow chart for design morphology with suitable examples   **(5)**

   b)   Derive relation between average module and transverse module for bevel gear.   **(5)**

   c)   Differentiate between the involute tooth profile and cycloidal tooth profile.   **(5)**

   e)   Explain optimum design and system concept in design.   **(5)**

   f)   Derive the hydraulic force equation for the gear pump.   **(5)**

Q. 2   a)   A worm and wormwheel drive is to be designed for the following specification.

Power to be transmitted: 12 kW

Worm speed: 900 rpm

Velocity ratio: 30

   i)   Determine the axial module of worm based on the wear failure under static condition by selecting suitable material.   **(10)**

   ii) Check the worm wheel for bending failure under static load.   **(5)**

   iii) Determine the estimated projected area for the gear box using AGMA relation.   **(5)**

Q. 3   a)   Explain the pulleys for gain in speed and gain in force.   **(5)**

   b)   Design a hoisting rope for lifting load of 8 tonne. Select suitable sheave and check for fleet angle.   **(15)**

Q. 4 **a)** Explain the construction of wire rope and its designation. **(5)**

b) A belt conveyor to be designed for the following specification:

Capacity	: 120 TPH
Material to be conveyed	: Coal
Inclination	: 10 degree
Lump size	: 80 mm
Centre to Centre distance	: 100 m

   i)   Determine the width of the belt **(5)**

   ii) Select suitable motor power and speed. **(5)**

   iii) Determine number of ply for the conveyor belt. **(5)**

Q. 5 **a)** State the types of gear tooth failure and corrective measure for it. **(5)**

b) A single cylinder, water cooled four stroke diesel engine is to be designed for the following specification.

Brake power : 22 kW

Speed : 1500 rpm

Compression ratio : 14

By making suitable assumptions,

   i)   Determine a standard cylinder bore diameter. **(5)**

   ii) Determine minimum liner thickness. Also, check for pressure and thermal criteria. **(5)**

   iii) Determine cover thickness of the cylinder head. **(5)**

Q. 6 **a)** With neat sketch, explain the working of external gear pump. **(5)**

b) A centrifugal pump is to be designed for 1000 LPM discharge and 25 m total manometric head. Determine,

   i) Inlet and tip diameter of an impeller. **(5)**

   ii) Inlet and exit blade angle. **(5)**

   iii) Number of blades. **(5)**