Paper / Subject Code: 42871 / Design of Mechanical Systems

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 Explain flow chart for design morphology with suitable examples a) (5)Derive relation between average module and transverse module for bevel gear. **(5)** b) Differentiate between the involute tooth profile and cycloidal tooth profile. **(5)** c) Explain optimum design and system concept in design. **(5) e**) Derive the hydraulic force equation for the gear pump. f) **(5)** 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 (10)condition by selecting suitable material. ii) Check the worm wheel for bending failure under static load. **(5)** iii) Determine the estimated projected area for the gear box using AGMA **(5)** relation. 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 (15)for fleet angle.

ii) Select suitable motor power and speed. 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. 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. ii) Determine minimum liner thickness. Also, check for pressure and thermal criteria. iii) Determine cover thickness of the cylinder head. (5) Q. 6 a) With neat sketch, explain the working of external gear pump. 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. ii) Inlet and exit blade angle. (5)	Q. 4	a)	Explain the construction of wire rope and its designation.	(5)
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 ii) Select suitable motor power and speed. iii) Determine number of ply for the conveyor belt. (5) 4) State the types of gear tooth failure and corrective measure for it. 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. ii) Determine minimum liner thickness. Also, check for pressure and thermal criteria. iii) Determine cover thickness of the cylinder head. (5) 4) With neat sketch, explain the working of external gear pump. 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)		b)	A belt conveyor to be designed for the following specification:	N.T.
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		1		