Dec-23 Total papers 5

BE Sem VII (R2019, C Scheme) "Mechanical" Dec' 2023

26/12/2023 updated on 10/1/2024

Paper / Subject Code: 42871 / Design of Mechanical Systems

Time: 3 Hours **Marks: 80**

- Question 1 is compulsory.
- Attempt any three questions from remaining.
- Design data book PSG, Mahadevan, Kale and Khandare are permitted to use.

Q1. **Answer any four from the following.**

a) What do you mean by morphology of mechanical design? Explain any three phases of it. 5

b) What are the different types of piston rings? Explain the function of them. 5

c) Why cleaning of belt is necessary in belt conveyor? list down different types of cleaners. 5

d) Draw a neat sketch of centrifugal pump and explain its principle of working? 5

e) State the assumptions made in Lewis's bending strength equation and its significance. 5

Q2. A single stage helical gear box is used to transmit 12.5 kw power at 1440 rpm of pinion. The desire transmission ratio is 5:1. Assume 20-degree FD tooth profile and material C50 for pinion and gear.

a) Determine the module. 5

b) Check gear for dynamic load. 5

c) Check gear for contact stresses. 5

d) Determine the gear teeth proportions and write constructional details. 5

Q3. The following specification refers to an EOT crane. **(20 Marks)**

Application - Class II
load to be lifted - 100 KN
Hoisting Speed - 10 m/min
Maximum lift – 5 m

a) Design 6*37 type of rope and find its life. 5

b) Select a standard hook, material and design stresses induced at the most critical section. 5

c) Select suitable motor for hoisting. 5

d) Design the rope drum. 5

Q4 a) Define Lead, Lead Angle, Normal pitch and Helix angle with respect to the worm gearing. 5

Q 4 b) The specification of belt conveyer system are

Capacity = 300 TPH,
Material to be conveyed = Lime stone,
Maximum lump size = 80 mm,
Inclination = 12°,
Center to Center distance = 50 m,
Troughing angle 25°,

I. Design conveyor belt. 10
II. Find motor capacity 5

Q5.a) A centrifugal pump directly coupled to a motor is required to deliver 1000 LPM of water at 30 degree C against a total head of 25 m.

I. Select the suitable type of motor power and speed. 5
II. Determine the impeller diameter, inlet and outlet vane angles and no. of vanes. 5

Q5. b) A Gear pump required to deliver 25 LPM of SAE20 oil at a pressure of 25 bar. Efficiency of the gear pump is 80 %.

I. Select suitable standard motor. 5
II. Design gear and check for bending failure. 5

Q6. a) Explain why an I – section with Ixx ≤ 4 Iyy is selected for connecting rods of an I.C. Engine? 5

Q6. b) A four-stroke single cylinder water cooled Diesel engine develops 7.5 KW brake power when operating at 1000rpm.

I. Determine the bore and stroke of a cylinder. 5
II. Design wet liner. 5
III. Design piston with pin and piston rings. 5

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