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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