

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 $I_{xx} \leq 4 I_{yy}$ 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
