

Time: 3 Hours

Marks: 80

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

- Q1.** Answer any four from the following.
- a.** State the types of gear tooth failure and corrective measure for it. **5**
  - b.** Explain why an I – section with  $I_{xx} \leq 4 I_{yy}$  is selected for connecting rods of an I.C. Engine? **5**
  - c.** Why cleaning of belt is necessary in belt conveyor? list down different types of cleaners. **5**
  - d.** Give the basic constructional details of different types ropes used in EOT crane. And what do you understand by  $6 \times 37$  rope? **5**
  - e.** Explain Methodology for mechanical system design with suitable example? **5**
- Q2.** A pair of bevel gear is required to transmit 8 KW power from a pinion shaft rotating at 400 rpm with reduction ratio 3.5. The shaft angle is 90 degree and drive is subjected to moderate shock and operates at 12 hrs/day. Design gear pair in strength and check for wear, also perform arm design. **20**
- Q3.** The following specification refers to an EOT crane.
- Application - Class II  
load to be lifted - 80 KN  
Hoisting Speed - 6 m/min  
Maximum lift – 10 m
- a.** Select a standard hook, material and design stresses induced at the most critical section. **5**
  - b.** Select suitable type and size of the wire rope for an expected life of 12 months. **5**
  - c.** Design the pulley axle and select suitable bearing. **5**
  - d.** Design the rope drum. **5**
- Q4.** The specification of belt conveyor system are, **5**
- Capacity = 200 TPH  
Material to be conveyed = Lime stone.  
Maximum lump size = 90 mm.  
Inclination =  $12^\circ$ .  
Center to centre distance = 100 m.
- a.** Find motor capacity. **5**
  - b.** Design conveyor belt. **5**
  - c.** Check the belt conveyor system for arresting mechanism. **5**
  - d.** Determine the number of troughing and returning idlers required for the conveyor system. **5**

- Q5 a.** Distinguish between gear pump and the centrifugal pump. **5**
- b.** A centrifugal pump directly coupled to a motor is required to deliver 1000 LPM of water at 30°C against a total head of 25 m. **15**
- I. Select the type of motor, speed.
  - II. Determine the impeller diameter, inlet and outlet vane angles and no. of vanes.
  - III. Design the volute casing.
- Q6** Design following components of single cylinder, two stroke and water-cooled Petrol Engine to develop 40 KW at a speed of 1000 rpm by making suitable assumption and neat sketches. Assume Compression Ratio as 7.
- a.** Determine the design pressure considering explosion ratio 3.25 and FOS as 1.3. **5**
  - b.** Determine the standard bore and length of cylinder. **5**
  - c.** Design connecting rod and check it for bending. **10**
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