

Con. 5436-09.

(4 Hours)

[Total Marks : 100

- N. B. :** (1) Question No. 1 is **compulsory**.
 (2) Solve any **three** questions from **remaining** questions.
 (3) If **required** assume the data with **justification**.
 (4) Use of standard data books like PSG, Mahadeon, Khandare-Kale is **permitted**.

1. (a) The following specifications refer to an EOT crane :— 20
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|----------------|---|----------|
| Mechanism | – | Class II |
| Capacity | – | 100 kN |
| Lift | – | 10 m |
| Hoisting Speed | – | 8 m/min |
- (i) Select a standard hook, material and design stresses. Check the stresses induced of the most critical section.
 (ii) Select suitable type and size of the Wire Rope and find its life.
 (iii) Design the Crosspiece with bearing and nut.
 (iv) Design the drum and find its induced stresses.
- (b) Write a short note on 'Material of Wire Rope'. 5
2. (a) For the Crane in Q. No. 1 the additional data is as follows :— 20
- | | | |
|-----------------------|---|----------|
| Cross Girder Span | – | 10 m |
| Weight of the trolley | – | 25 kN |
| Cross travel speed | – | 30 m/min |
- (i) Select standard rail section and design the trolley wheels.
 (ii) Design the shaft of the trolley wheels.
 (iii) Select suitable type, power and speed of the trolley travelling mechanism motor.
 (iv) Design the cross girders considering strength and rigidity.
- (b) Explain the concept of compensating pulley with reference to six fall system. 5
3. (a) Design in detail the gear pump for the following specifications :— 20
- | | | |
|--------------------|---|------------|
| Fluid to be pumped | – | Oil SAE 40 |
| Discharge | – | 150 LPM |
| Delivery Pressure | – | 30 bar |
- The pump is directly coupled to an electric motor.
- (b) Explain clearly the working of gear pump. 3
- (c) Explain the pressure distribution along the gear of gear pump. 2

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4. (a) A 20° throughing belt conveyor has the following specification :— 20
- | | | |
|-------------------------|---|------------|
| Material to be conveyed | – | Lime Stone |
| Maximum pump size | – | 100 mm |
| Capacity | – | 200 TPH |
| Inclination | – | 12° |
| Centre distance | – | 50 m |
- (i) Determine width, number of plies and the thickness of the belt.
(ii) Select a proper motor for the conveyor.
(iii) Design the drive pulley along with its shaft.
(iv) Design the throughing idler for the belt.
- (b) Why cleaning of belt is necessary for belt conveyor ? List down the usual types of cleaners. 5
5. (a) A centrifugal pump is to be designed for the specifications :— 20
- | | | |
|------------|---|--------------------------|
| Total head | – | 50 meters |
| Discharge | – | 100 m ³ /hour |
| Medium | – | Water at 25°C |
- The pump is directly coupled to an electrical motor. Select suitable motor for the pump and design impeller, impeller shaft, Bearing and the casing with volute profile.
- (b) State the significance of specific speed and NPSH in the design of centrifugal pump. 5
6. (a) Design on I.C. Engine to develop 15 kW of a speed of 1200 rpm. Design includes the following parts :— 20
- (i) Determine bore and stroke of engine.
(ii) Design liner, cylinder and cylinder head and bolts.
(iii) Select suitable material and design stresses for the connecting rod and determine its cross-section.
(iv) Design the big end bearings, cap and cap bolts.
- (b) Explain, 'Design Methodology', step by step. Give suitable examples. 5
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