(Time: 3 Hours) **[Total Marks: 80]**

N.B. 1) **Question No. 1 is compulsory**
2) Solve **Any Three** from remaining **Five** questions.
3) Use of standard data book like PSG, Mahadevan and Kale Khandare is permitted
4) Assume suitable data if necessary, giving justification.

Q1 Answer any **FOUR** from the following:

a) Explain concept of number of bends of wire rope with example of four fall system. **05**

b) Explain Design Methodology and Optimum Design. **05**

c) Derive the hydraulic force equation for the gear pump. **05**

d) What is the significance of NPSH in designing of Centrifugal Pump? **05**

e) What are the assumptions made in Lewis beam strength equation and derive it. **05**

Q2 The following specification refers to an EOT crane. **20**

Application - Class II
Load to be lifted - 8 tonne
Hoisting Speed - 7 m/min
Maximum lift - 10 m
Span - 8m

1) Select a suitable hook with trapezoidal cross section and check it at most critical cross section.
2) Select suitable type and size of the wire rope and check it for an expected rope life. If rope life is less than expected rope life then suggest design modification required.
3) Design the pulley axle and select suitable bearing.
4) Design the cross piece.

Q3 a) The centrifugal pump has to work with following specification.

Total Head: 30 Meter
Discharge : 1000LPM
Medium : Water at 25^0C

1) Select suitable type, speed of motor and determine the power required **05**
2) Determine the inlet and exit diameter of impeller **05**
3) Determine the number of blades if inlet and exit angles are 17 and 25 degree respectively. **05**

Q3 b) Why does cavitation occur in a centrifugal pump? Suggest suitable remedial measure. **05**

Q4 a) Belt conveyer system is to be designed for the following specifications. **15**
Material to be conveyed = lime stone, Maximum lump size = 125mm, Capacity = 300 TPH, Centre distance = 50m, Troughing angle = 20^0, Inclination = 12^0.

1) Determine the width, number of plies and thickness of belt.
2) Select the proper motor power
3) Design the drive pulley along with its shaft.

Q4 b) Explain the Ovality of the piston with neat sketch. **05**

X525YF7C5C6X525YF7C5C6X525YF7C5C6X525YF7C5C6

Q5 A pair of spur gear is used to transmit power of 7.5KW from a motor rotating at 960 rpm to a machine with approximate reduction ratio of 3.5

1) Select suitable material for pinion and gear, determine the module and face width of the gear to satisfy strength and wear. **10**
2) Check the gear for dynamic load using Barth velocity factor. **05**
3) Decide the constructional detail of gear and pinion. **05**

Q6 a) Design the following components of single cylinder, four stroke and water cooled Diesel Engine to develops 7.5 KW at a speed of 1000 rpm by making suitable assumption and neat sketches. **15**

1) Size of engine (bore and stroke) and cylinder liner.
2) Piston with piston pin and piston rings.

Q6 b) Explain different types of gear tooth failures. **05**

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