(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

Q 1   Answer any **Four** from the following

a) What is bend in rope pulley system of hoisting mechanism? State the effect of bend on the rope life.   **5**
b) Explain the optimum design concept in system design.   **5**
c) Why cavitation occurs in a centrifugal pump? State the remedial measures for the same.   **5**
d) List the different types of piston rings and their functions.   **5**
e) Why geometric progression is preferred for the speed selection in the multi speed gear box design?   **5**

Q 2   a) Explain the rope construction in hoisting rope with example.   **5**
b) Select a suitable hook with trapezoidal cross section and check it at most critical cross section for design hoisting load of 50 kN. Also select the suitable thrust bearing for it.   **15**

Q 3   a) State the fanning effect in the belt conveyor system.   **5**
b) Determine the width of the conveyor belt and motor capacity for the following specification   **15**

Material to be conveyed   : Coal
Capacity   : 150 TPH
Inclination   : 10 degree
Centre to Centre distance   : 60 m

Q 4   a) Explain the ovality of the piston with neat sketch.   **5**
b) Determine bore diameter and design a piston for a 4-stroke, single cylinder, water cooled, vertical diesel engine with following specifications: **15**
Indicated power = 20 kW
Speed = 1200 rpm
Compression Ratio = 14

Q 5   a) Describe the working of the gear pump with neat sketch.   **5**
b) Design a volute casing for a centrifugal pump having impeller with outer diameter 320 mm and inner diameter 160 mm. The specifications for the pump are   **15**
Total manometric head: 20 m
Discharge: 900 LPM
Motor speed : 1440 rpm

Q 6   a) A six speed gear box is to be designed for a machine tool with geometric progression ratio as 1.41 and N_{max} = 1440 rpm   **20**
i.   Draw and Select suitable structural diagram.
ii.   Draw a ray diagram and speed chart
iii. Determine the number of teeth on each gear
iv.   Draw the deviation diagram

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