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

- Question No. 1 is compulsory.
- Attempt any three questions from the remaining.
- Assumption made should be clearly stated.
- Design Data Book by PSG, Mahadevan, Kale & Khandare are permitted to use.

Q.1 **Answer any four**

(a) Draw flow chart for design methodology and explain with example. 5

(b) What is mean by 6 X 37 rope in hoisting mechanism, elaborate with neat sketch. 5

(c) List different types of piston rings and their functions. 5

(d) Draw a neat sketch of centrifugal pump and explain its principle of working. 5

(e) List the various laws of speed range distribution, explain arithmetic progression law with example. 5

Q.2 (a) What is cavitation in centrifugal pump? How to avoid it. 5

(b) For the specification of an EOT Crane ,
Application - Class II
Load to be Lifted - 100 KN
Hoisting speed - 10 m/min
Maximum Lift - 5 m

i. Design a 6 X 37 type of rope and find its life. 6 ~~8~~

ii. Design hook and check it at most critical cross section. 6 ~~8~~

iii. Select suitable motor for hoisting. 3 ~~4~~

Q.3 (a) State the advantages of multi fall pulley systems. 4

(b) Belt conveyor system is to be designed for the following specifications:
Material conveyed up : Coal
Capacity : 200 TPH
Lump size : 80mm
Horizontal distance : 20m
Vertical distance :3m
Troughing angle : 15 degree

i. Design conveyor belt. 8

ii. Select suitable motor for conveyor. 4

iii. Design the upper roller and bottom roller. 4

TURN OVER

Q.4 Design following components of single cylinder, two stroke, and water cooled Petrol Engine to develop 40 KW at a speed of 1000rpm by making suitable assumption and neat sketches. Assume Compression Ratio as 7.

i. Find the standard bore and length of a cylinder. 5

ii. Calculate the design pressure considering explosion ratio as 3.25 and FOS as 1.3. 5

iii. Design connecting rod and check it for bending. 10

Q.5 (a) It is required to design a 2 X 2 machine tool gear box with following specification. 10
N_{min} = 100rpm, N_{motor} = 960 rpm, GP ratio = 1.26

i. Draw structural diagrams,
ii. Draw ray diagram and speed chart,
iii. Find the number of teeth of each gear.

(b) A centrifugal pump is required to design for the total manometric head of 20 m and discharge of 900LPM of water at room temperature.

i) Find the inlet and outlet diameter of an Impeller of the centrifugal pump. 6
(Draw neat sketch of impeller and assume $D_2 = 2D_1$)

ii) Find the inlet and outlet diameter of pipes. 4

Q.6 A Gear Pump required to deliver 75LPM of SAE20 oil at a pressure of 120 bar. By making suitable assumption,

i. Select suitable standard Motor. 3

ii. Select suitable flexible bush pin coupling. 3

iii. Design gear and check for bending failure. 10

iv. Design casing of the gear pump. 4
