

(3 Hours)

[Total Marks: 80]

NB: 1. Question No. 1 is compulsory

2. Solve any three questions from remaining questions

3. Assume suitable data with proper justification if required

4. Use of standard design data book like PSG, Kale and Khandare is permitted.

Q.1) Answer any four 20

- (a) Explain the morphology of mechanical system design with neat flow chart.
- (b) State the significance of structural formula and structural diagram in the multispeed gear box design.
- (c) State the function of different type of piston rings.
- (d) State the churning phenomenon and its effect in a centrifugal pump.
- (e) Classify and compare wire rope according to twisting direction and according to wire size.

Q.2) For the specification of an EOT Crane,

Application - Class II

Load to be Lifted - 70 KN

Hoisting speed - 5 m/min

Maximum Lift - 10 m

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

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

iii. Design rope drum and select suitable motor for hoisting. 6

Q.3.A) Design belt conveyor for following specification

Material to be handled -: Gypsum Stone,

Grain type -: Non standard

Working Capacity -: 125 TPH,

Length of conveyor -: 100 m

Inclination with horizontal -: 10°

Lump size -: 60 mm

i. Determine width and thickness of a conveyor belt 8

ii. Select suitable motor for conveyor. 4

iii. Determine length and diameter of top and bottom idler. 4

Q.3.B) Write a short note on take up arrangement in case of belt conveyor. 4

Q.4.A) The following data are pertaining to a 4-stroke single cylinder, water cooled petrol engine.

Brake power= 7.5 KW

Mass of reciprocating parts = 8 kg.

Length of connecting rod = 310 mm.

Stroke length = 150mm.

Speed = 3000 RPM.

Compression ratio = 5:1

Over speed= 10%

Design the following,

i. Piston and piston pin 8

ii. connecting rod for forged steel having "I" cross section with proportion 8
being depth = 6t and width = 4t, where "t" is thickness of web and flange.

- Q.4.B) Sketch different types of valves used in internal combustion engine 4
- Q.5.A) The following data refers to centrifugal pump for pumping water. 16
 Static suction head= 4 m, Length of suction pipe= 8 m,
 Static delivery head = 25 m, Delivery pipe length= 30 m,
 Discharge = 1500 LPM,
 i) Select suitable motor
 ii) Determine inlet and tip diameter of an impeller
 iii) Determine inlet and exit angle of an impeller
 iv) Determine number of blades for an impeller.
- Q.5.B) Which shaft is heavily loaded in case of gear pump, Explain. 4
- Q.6) Design a layout of 6 speed gear box of milling machine having output speed ranging from 160 to 1000 rpm approximately. Power applied to the gear box is 6 KW at 960 rpm.
 i. Choose standard step ratio and construct structural diagram. 8
 ii. Construct ray diagram by deciding various reduction ratios. 6
 iii. Determine the no of teeth on each gear. 6
