Date- 4/12/19

Paper / Subject Code: 53301 / Design of Mechanical Systems

B.E. (Mechanical) (Sem-VIII) (CBSGS)

Time: 3 Hours **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) State the importance of Ray Diagram in the design of multi speed gear box. **5**

(b) Describe the significance of the pulleys for a gain in force and pulleys for a gain in speed. **5**

(c) State the importance of the take up arrangements in the belt conveyor system, also explain the gravity take up unit with neat sketch. **5**

(d) Draw a flow chart for the morphology of design and explain each phase. **5**

(e) Describe the terms NPSH required and NPSH available associated with centrifugal pump design. **5**

Q.2 It is required to design a 2 X 3 multi speed gear box for a lathe machine operation with following specification.
N_{min} = 120 rpm, N_{motor} = 1500 rpm, GP ratio = 1.41

a) Write structural formulae and draw structural diagrams, **5**

b) Draw ray diagram and speed chart **5**

c) Find the number of teeth of each gear. **5**

d) Draw the deviation chart. **5**

Q.3 A single cylinder, two stroke, and water cooled diesel engine is required to develop 20KW at a speed of 1500rpm. Assume the compression ratio as 12.

a) Find the standard bore and length of a cylinder. **4**

b) Estimate the cylinder liner thickness also check for pressure and thermal criteria. **4**

c) Estimate the cylinder head dimensions and water jacket thickness. **4**

d) Select suitable size and number of bolts for the cylinder head. **4**

e) Estimate the crown thickness of the piston. **4**

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B.E. (Mechanical) (Sem - VIII) (CBSGS)

Q.4 For the specification of an EOT Crane ,

Application - Class II

Load to be Lifted - 15 tonne

Hoisting speed - 5 m/min

Maximum Lift - 6 m

a) Design a 6 X 37 type of rope and find its life in months. **5**

b) Select suitable standard sheave and design axle. **5**

c) Select suitable hook and check at critical cross section. **8**

d) Select standard thrust bearing for the hook. **2**

Q.5 (a) Derive an expression for the breaking strength of 6 X 7 type of rope used in hoisting application. **5**

(b) Belt conveyor system is to be designed for the following specifications: **15**
Material conveyed up : Coal
Capacity : 200 TPH
Horizontal distance : 30m
Vertical distance :5m
Troughing angle : 20 degree
i. Estimate the width of the belt based on capacity.

ii. Estimate the motor power.

iii. Find the number of ply in the belt cross section.

Q.6 (a) State the causes and remedies for the vibration and noise in centrifugal pump. **5**

(b) Illustrate the working of the external gear pump with neat sketches. **5**

(c) A Gear Pump required to deliver 25LPM of SAE20 oil at a pressure of 25 bar. Efficiency of the gear pump is 80%. **10**
i. Select suitable standard motor.

ii. Design gear and check for bending failure.

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