

**B.Tech. - VIEP - MECHANICAL ENGINEERING
(BTMEVI)**

Term-End Examination

00204

June, 2017

BIME-008 : MACHINE DESIGN - I

Time : 3 hours

Maximum Marks : 70

Note : Attempt any **five** questions. All questions carry equal marks. Assume missing data suitably, if any. Use of calculator is permitted. Use of Machine Design Data Handbook is allowed.

1. (a) What is meant by fatigue strength of a material ? How can it be improved ? Explain.
- (b) The shaft of an axial flow rotary compressor is subjected to a maximum torque of 2400 Nm and a maximum bending moment of 3200 Nm. Design the shaft as per ASME code. Also design a suitable coupling to connect this shaft. 6+8

2. (a) Design a vertical screw jack to lift or lower a load of 40 kN to a height of 250 mm. Select suitable materials from the design data handbook.
- (b) Explain how a toggle (horizontal) screw jack is different from a vertical screw jack. ADS 10+4
3. Draw the flow diagram for a systematic design procedure for a machine element. What is meant by design for manufacture ? Explain and discuss how the design can be computerised. 14
4. Design a knuckle joint to transmit 160 kN. The design stress may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. 14
5. Find the diameter of a solid steel shaft to transmit 20 kW at 200 rpm. The ultimate shear stress for steel may be taken as 360 MPa and factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameters when the ratio of inside to outside diameter is 0.5. 14
6. (a) What information do you obtain from Soderberg diagram ?
- (b) Design a helical spring to support a tensile load of 10 kN and to have a stiffness of 100 kN/mm. The spring is made of steel having allowable stress of 300 MPa. Take $G = 80 \text{ GPa}$. 6+8

7. Write short notes on any **four** of the following : $4 \times 3 \frac{1}{2} = 14$

- (a) Stress Concentration
 - (b) Reverse Engineering
 - (c) Welded Joints used in Pressure Vessels
 - (d) Factors considered in selection of materials for the design of machine elements
 - (e) Design for Assembly
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