

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

**Term-End Examination**

**December, 2018**

00413

**BIME-008 : MACHINE DESIGN - I**

*Time : 3 hours*

*Maximum Marks : 70*

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

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1. Design a double rivetted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5 m in diameter subjected to a steam pressure of  $0.95 \text{ N/mm}^2$ . Assume joint efficiency as 75%, allowable tensile stress in the plate 90 MPa, compressive stress 140 MPa and shear stress in the rivet 56 MPa.

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2. Design a compression helical spring to carry a load of 500 N with a deflection of 25 mm. The spring index may be taken as 8. Take the following values for the spring material :

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Permissible shear stress = 350 MPa

Modulus of rigidity = 84 kN/mm<sup>2</sup>

$$\text{Wahl's factor} = \frac{4C - 1}{4C - 4} + \frac{0.615}{C},$$

where C = Spring index.

3. A mild steel shaft transmits 20 kW at 200 r.p.m. It carries a central load of 900 N and is simply supported between the bearings 2.5 m apart. Determine the size of the shaft, if the allowable shear stress is 42 MPa and the maximum tensile or compressive stress is not to exceed 56 MPa. What size of the shaft will be required, if it is subjected to gradually applied loads ?

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4. Design and make a neat dimensioned sketch of a muff coupling which is used to connect two steel shafts transmitting 40 kW at 350 r.p.m. The material for the shafts and key is plain carbon steel for which allowable shear stress and crushing stress may be taken as 40 MPa and 80 MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15 MPa.

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5. Draw a flow diagram for a systematic design procedure of a machine element. What is meant by 'Design for Manufacturing' ? Explain and discuss how designing can be computerised. 14

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

- (a) Reverse Engineering
  - (b) Concept of Creep and Fatigue in Design
  - (c) Designing Lead Screw of Lathe Machine
  - (d) Concurrent Engineering
  - (e) Design for Environment
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