

**DIPLOMA IN MECHANICAL ENGINEERING  
(DME)**

**Term-End Examination**

**December, 2017**

**BME-060 : MACHINE DESIGN**

*Time : 2 hours*

*Maximum Marks : 70*

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**Note :** *Question no. 1 is **compulsory**. Answer any **four** questions from the remaining part. All questions carry equal marks. Use of scientific calculator is permitted.*

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1. Select the suitable alternative from the given choices of the following questions :  $7 \times 2 = 14$
- (a) The property of a material which enables it to be drawn into wires with the application of tensile force is called
- (i) Elasticity
  - (ii) Plasticity
  - (iii) Ductility
  - (iv) Malleability
- (b) A rivet is specified by
- (i) type of head
  - (ii) length of rivet
  - (iii) length of tail
  - (iv) shank diameter

- (c) **The Maximum Shear Stress Theory is applied for**
- (i) **brittle materials**
  - (ii) **ductile materials**
  - (iii) **plastic materials**
  - (iv) **non-ferrous materials**
- (d) **A sliding bearing which can support steady loads without any contact between the journal and the bearing is called**
- (i) **Zero film bearing**
  - (ii) **Boundary lubricated bearing**
  - (iii) **Hydrodynamic lubricated bearing**
  - (iv) **Hydrostatic lubricated bearing**
- (e) **Gears are termed as medium velocity gears, if their peripheral velocity is**
- (i) **1 – 3 m/sec**
  - (ii) **3 – 15 m/sec**
  - (iii) **15 – 30 m/sec**
  - (iv) **30 – 50 m/sec**
- (f) **The difference between the tooth space and the tooth thickness measured on the pitch circle is called**
- (i) **Clearance**
  - (ii) **Face width**
  - (iii) **Backlash**
  - (iv) **Working depth**

- (g) In a partial journal bearing, the angle of contact of the bearing with the journal is
- (i)  $120^\circ$
  - (ii)  $180^\circ$
  - (iii)  $270^\circ$
  - (iv)  $360^\circ$
2. (a) Explain the general design procedure for designing of machine elements. 7
- (b) How would you select good materials for designing of machine elements ? Explain. 7
3. (a) What are the common modes of failures in riveted joints ? Explain with suitable example. 7
- (b) Two plates, 12 mm thick and 100 mm wide are to be joined by a double riveted lap joint having 12 mm fillet welds. Determine the necessary length of the weld for a load of 13.6 kN. Assume permissible shear stress is limited to  $80 \text{ N/mm}^2$ . 7
4. (a) What is a key ? State its function. What are the effects of keyway cut into the shaft ? 7
- (b) Why are square threads preferable to V-threads for power transmission ? What are the advantages of screw threads ? 7

5. (a) Why are couplings employed in mechanical power transmission ? State their applications. 7
- (b) Determine the safety margins (factor of safety) in different modes of failure for a key used to transmit 3.5 kN at 225 rpm. The diameter of shaft is 30 mm. The key may be assumed to be made of steel with maximum shear stress 360 N/mm<sup>2</sup>. 7
6. (a) How does a cotter joint differ from a knuckle joint ? What are the applications of a cotter joint and a knuckle joint ? 7
- (b) Two rods connected by a knuckle joint sustain a maximum load of 11 kN. Using the following design stresses
- Tensile stress = 80 N/mm<sup>2</sup>
- Shear stress = 50 N/mm<sup>2</sup>
- Bending stress = 35 N/mm<sup>2</sup>
- determine the dia of the rods. Check the bending stresses in the pin joint. Justify whether the joint is safe or not. 7
7. Write short notes on any *four* of the following :  $4 \times 3 \frac{1}{2} = 14$
- (a) Reliability of Bearing
- (b) Thrust Ball Bearing
- (c) Creep
- (d) Piston Ring and Gudgeon Pin
- (e) Dynamic Tooth Load
- (f) Proof Resilience