

DIPLOMA IN MECHANICAL ENGINEERING

Term-End Examination

December, 2011

00192

BME-060 : MACHINE DESIGN

Time : 2 hours

Maximum Marks : 70

Note : *Question No. 1 is compulsory. Attempt any five questions from remaining questions. Use of scientific calculator and Machine Design Data Book is permitted.*

1. Select the most appropriate answer and write your answer in your answer book. **10x2=20**
- (a) The ability of a material to resist softening at high temperatures is known as :
- (i) creep
 - (ii) hot tempering
 - (iii) hot hardness
 - (iv) fatigue
 - (v) super hardening
- (b) The ultimate tensile strength of low carbon steel by working at a high strain rate will :
- (i) decrease
 - (ii) increases
 - (iii) remain constant
 - (iv) first increase then decrease
 - (v) first decrease then increase

- (c) Cast iron has :
 - (i) high tensile strength
 - (ii) its elastic limit close to the ultimate breaking strength
 - (iii) high ductility
 - (iv) all of the above
 - (v) none of the above
- (d) Basic constituents of Monel metal are :
 - (i) nickel, copper
 - (ii) nickel, molybdenum
 - (iii) zinc, tin, lead
 - (iv) nickel, lead and tin
 - (v) none of the above
- (e) Factor of safety is the ratio of :
 - (i) yield stress/working stress
 - (ii) tensile stress/working stress
 - (iii) compressive stress/working stress
 - (iv) bearing stress/working stress
 - (v) bearing stress/yield stress
- (f) A riveted joint may fail due to :
 - (i) failure of the rivets
 - (ii) failure of the plates
 - (iii) either failure of the rivets or failure of the plates
 - (iv) failure of both rivets and plates
 - (v) none of the above

- (g) In the welded joint the throat of the weld as compare to the size of weld is :
- (i) about same size
 - (ii) about 0.7 times
 - (iii) about 0.5 times
 - (iv) about 0.25 times
 - (v) about 1.25 times
- (h) Universal coupling is used to join two shafts :
- (i) which have lateral misalignment
 - (ii) whose axes intersect at small angle
 - (iii) which are not in exact alignment
 - (iv) which is the simplest types of rigid coupling
 - (v) all of the above
- (i) Diameter of washer is generally :
- (i) equal to nut size
 - (ii) less than nut size
 - (iii) bigger than nut size
 - (iv) any size irrespective of nut size
 - (v) none of the above
- (j) Keys are normally made from :
- (i) cold rolled mild steel bars
 - (ii) forged steel
 - (iii) hot rolled mild steel bars
 - (iv) cold rolled carbon steel
 - (v) machined stainless steel

2. What is a cotter joint ? Explain with the help of a neat sketch, how a cotter joint is made. Describe the modes of failures considered while designing a cotter joint. 10
3. Describe different types of shafts. Find the diameter of a solid steel shaft to transmit 20 kW at 200 rpm. The ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0.5. 10
4. What is a key ? How are the keys classified ? Draw neat sketches of different types of keys and state their applications. What is the effect of key way cut into the shaft ? 10
5. Distinguish between square and Acme threads. 10
A square threaded screw is required to work against an axial force of 7.0 kN and has following dimensions :
Major diameter $d = 32$ mm; pitch $p = 4$ mm with single start, $\mu = 0.08$. Calculate (a) torque required when screw moves against the load, (b) efficiency of the screw.

6. What do you understand by the term welded joint ? How it differs from riveted joint ? 10

A plate 100 mm wide and 10 mm thick is to be welded to another plate by means of double parallel fillets. The plates are subjected to a static load of 80 kN. Find the length of weld if the permissible shear stress in the weld does not exceed 55 MPa.

7. Write short notes on *any two* of the following : 10

- (a) Stiffness of shaft
 - (b) Flange coupling
 - (c) Failure of Bolts and screws
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