No. of Printed Pages : 5 **BME-060**

DIPLOMA IN MECHANICAL ENGINEERING

Term-End Examination 02250

June, 2012

BME-060 : MACHINE DESIGN

Time : 2 hours *Maximum Marks : 70*

Note : *Question **1** is **compulsory**. Attempt **five** questions from remaining questions. Use of scientific calculator and Machine Design Data Book is **allowed**.*

1. Select the most appropriate alternative and write the alternative in your answer book. **10x2=20**

(a) The property of a material which enables it to resist fracture due to high impact loads is known as :

(i) elasticity (ii) endurance
(iii) strength (iv) toughness
(v) resilience

(b) Tensile strength of a mild steel specimen can be roughly predicted from following hardness test :

(i) Brinell (ii) Rockwell
(iii) Vicker (iv) Shore's Scleroscope
(v) None of the above

(c) If the longitudinal strain in a material is double in comparison to lateral strain, then ratio of modulus of rigidity to elasticity will be :

(i) 0.20 (ii) 0.25 (iii) 0.33 (iv) 0.40
(v) 0.50

(d) Stress concentration is caused due to :
   (i) variation in properties of material from point to point in a member.
   (ii) pitting at points or areas at which loads or a member are applied.
   (iii) abrupt change of section
   (iv) all of the above
   (v) none of the above

(e) Hardness of steel depends on :
   (i) amount of carbon it contains
   (ii) the shape and distribution of the carbides in iron.
   (iii) method of fabrication
   (iv) contents of alloying elements
   (v) the quality of ore from which it is made.

(f) In which of following cases, consideration of creep is important ?
   (i) flywheel of steam engine
   (ii) cast iron pipes
   (iii) cycle chains
   (iv) gas turbine blades
   (v) piston of I.C. engine

(g) Machining properties of steel are improved by adding :
   (i) sulphur, lead, phosphorous
   (ii) silicon, aluminium, titanium
   (iii) vanadium, aluminium
   (iv) chromium, nickel
   (v) lubricants

(h) Railway rails are normally made of :
   (i) mild steel (ii) alloy steel
   (iii) high carbon steel (iv) tungsten steel
   (v) cast iron

(i) If a material fails below its yield point, failure would be due to :
   (i) straining (ii) fatigue
   (iii) creep (iv) sudden loading
   (v) impact loading

(j) Rivets are generally specified by :
   (i) thickness of plates to be riveted
   (ii) length of rivet
   (iii) diameter of head
   (iv) nominal diameter
   (v) all of the above

2. Under what conditions the use of a knuckle joint is recommended ? Name at least three engineering applications of a knuckle joint. How do you differentiate between a knuckle and a cotter joint ? **10**

3. A double riveted lap joint is made between 15 mm thick plates. The rivet diameter and pitch are 25 mm and 75 mm respectively. If the ultimate stresses are 400 MPa in tension, 320 MPa in shear and 640 MPa in crushing, find the minimum force per pitch which will rupture the joint. If the above joint is subjected to a load such that the factor of safety is 4, find out the actual stresses developed in the plates and the rivets. **10**

4. Two 35 mm shafts are connected by a flanged coupling. The flanges are fitted with 6 bolts on 125 mm bolt circle. The shafts transmit a torque of 800 N-m at 350 rpm. For the safe stresses mentioned below, calculate **10**

(a) diameter of bolts (b) thickness of flanges

(c) key dimensions; (d) hub length ; and

(e) power transmitted.

Safe shear stress for shaft material = 63 MPa

Safe stress for bolt material = 56 MPa

Safe stress for cast iron coupling = 10 MPa

Safe stress for key material = 46 MPa

5. What are the advantages and disadvantages of key joints ? **10**

A 16 kW, 975 rpm motor has a mild steel shaft of 40 mm diameter and the extension being 75 mm. The permissible shear and crushing stresses for the mild steel key are 56 MPa and 112 MPa respectively ? Design the key way in the motor shaft extension.

6. (a) What is difference between a shaft and an axle ? Classify the shafts.

(b) Enumerate the causes of shaft failures. Name the various shaft materials. **5+5**

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

(a) Threaded Fastener

(b) Eccentrically load welded joint

(c) Steps involved in designing screw.
