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BME-060

DIPLOMA IN MECHANICAL ENGINEERING (DME)

Term-End Examination

December, 2015

BME-060 : MACHINE DESIGN

Time : 2 hours *Maximum Marks : 70*

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

1. Answer/Select suitable alternative from the given ones : *10×2=20*

(i) Toughness for mild steel under uniaxial loading is given by the area under the stress-strain curve upto

(a) proportional limit

(b) yield point

(c) ultimate stress

(d) fracture

(ii) The stress produced due to suddenly applied load as compared to gradually applied one is

(a) the same

(b) double

(c) 1·5 times

(d) three times

(iii) Two shafts A and B are made of the same material. The diameter of the shaft B is twice that of shaft A. The ratio of power which can be transmitted by shaft A to that of shaft B is

(a) $\frac{1}{2}$

(b) $\frac{1}{4}$

(c) $\frac{1}{8}$

(d) $\frac{1}{16}$

(iv) The shearing area of a rectangular key of length 'l', thickness 't' and width 'w' is

(a) $l \times t$

(b) $l \times \frac{t}{2}$

(c) $l \times w$

(d) $l \times \frac{w}{2}$

(v) The tearing, shearing and crushing efficiency of a riveted joint are 75%, 65% and 60%. The joint efficiency is close to

(a) 60%

(b) 65%

(c) 75%

(d) 30%

(vi) The ratio of the size of the weld in transverse fillet to butt welded joint is

(a) 1·0

(b) 0·707

(c) $\sqrt{2}$

(d) 0·5

(vii) Usual taper in cotter is

(a) 1 in 25

(b) 1 in 8

(c) 1 in 30

(d) 1 in 15

(viii) Knuckle joints are used to transmit

(a) axial tensile load

(b) axial compressive load

(c) twisting load

(d) All of the above

(ix) Couplings are used to

(a) connect two shafts that are manufactured separately

(b) reduce transmission shock

(c) improve the mechanical flexibility

(d) All of the above

(x) A circular shaft of diameter 'd' subjected to torque 'T', the maximum shear stress is

(a) $\frac{64\ T}{\pi d^3}$

(b) $\frac{32\ T}{\pi d^3}$

(c) $\frac{16\ T}{\pi d^3}$

(d) $\frac{8\ T}{\pi d^3}$.

2. Design a rectangular key for the following application :

A shaft 65 mm diameter transmits power at maximum shear stress of 67 MPa. The shear stress in the key should not exceed 75% of the stress developed in the shaft. The key should be at least 2·5 times strong in crushing compared to shear failure of the key. *10*

3. Design a solid shaft to transmit 20 kW at 870 rpm. The shaft material properties are

Yield strength = 390 MPa

Ultimate strength = 600 MPa

Factor of strength = 2·0. *10*

4. A 100 mm wide and 12·5 mm thick plate is joined to another plate by two parallel fillet welds. A load of 50 kN acts along the axis of the plate. Find the length of each weld, if the permissible shear stress is 82 MPa. *10*

5. Design the riveted joint the bracket shown in figure 1. Allowable shear stress is 110 MPa. *10*

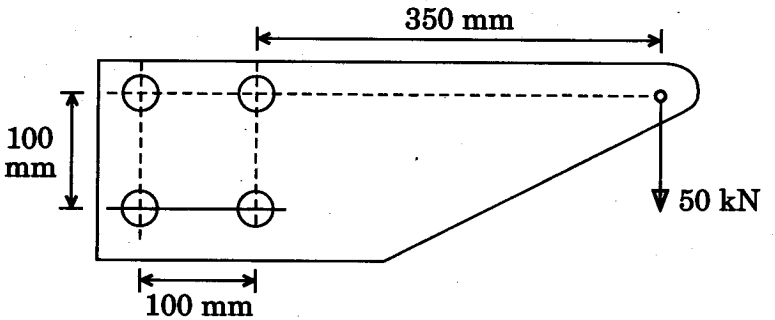

Figure 1

6. Design a knuckle joint for a tie rod of circular section to sustain a maximum load of 70 kN. The ultimate strength of the rod material is 420 MPa. The ultimate strength in tension and shear of pin material are 700 and 400 MPa, respectively. Use factor of safety of 4·0. *10*

7. Answer any ***two*** of the following : $2 \times 5 = 10$

(a) What is overhauling of power screw ? What is the condition for overhauling ?

(b) Define welding. How does welding joint differ from riveted joint ?

(c) What do you mean by alloy steel ? Write the effect of the following elements on steel :

(i) Nickel

(ii) Chromium

8. Write short notes on any ***two*** of the following : $2 \times 5 = 10$

(a) Heat Treatment Process

(b) Cotter Joint

(c) Design of Screw and Nut

(d) Couplings