22564

24225

4 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

(8) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. Attempt any FIVE of the following : **10**

a) Define Machine design.

b) List four properties desirable for spring material.

c) List application of cotter joint.

d) State functions of key.

e) Write application of power screw.

f) Classify springs.

g) Give four application of gear drive.

Marks

2. Attempt any THREE of the following : **12**

a) Explain steps involved in general design procedure.

b) Draw neat sketch of knuckle joint and state its strength equation. (Any four)

c) Prove that for a square key crushing stress is twice of shearing stress.

d) Draw freehand sketches of thread profiles (Any four) with full details.

3. Attempt any THREE of the following : **12**

a) Sketch S – N curve and explain the term endurance limit.

b) Explain the term self locking and overhauling of screw.

c) State any four application of spring.

d) Define stress concentration. Explain any four method to reduce it with neat sketch.

e) Show that the efficiency of self locking screw is less than 50%.

4. Attempt any TWO of the following : **12**

a) Explain importance of shape and size in aesthetic design.

b) Draw a neat sketch of cotter joint. Explain its design procedure.

c) A shaft is required to transmit 1 Mw power at 240 r.p.m. The shaft must not twist more than 1° on a length of one metre. The modulus of rigidity for the material of the shaft is 80 KN/mm^2. Find diameter of the shaft.

Marks

5. Attempt any TWO of the following : **12**

a) Sketch protective type flange coupling and explain its design procedure.

b) The lead screw of a lathe has Acme threads of 50 mm outside diameter and 8 mm pitch. The screw must exert an axial pressure of 2500 N in order to drive the tool carriage. The thrust is carried on a collar 110 mm outside diameter and 55 mm inside diameter and lead screw rotates at 30 r.p.m. Determine –

i) The power required to drive the screw.

ii) Efficiency of the lead screw.

Assume $\mu = 0.15$ for screw $\mu = 0.12$ for collar.

c) State the steps involved in selection of proper ball bearing from manufacturer's catalogue.

6. Attempt any TWO of the following : **12**

a) The pull in the tie rod of a roof truss is 44 KN. Design a suitable adjustable screw joint. The permissible tensile and shear stresses are 75 MPa and 37.5 Ma respectively.

b) Design a closed coil helical spring for a service load ranging from 2207 N to 2698 N. The axial deflection of spring is 6 mm. Assume spring index as 5. The permissible shear stress is 420 N/mm^2 modulus of rigidity 84×10^3 N/mm^2. Neglect effect of stress concentration.

c) A mild steel shaft is supported in two bearings 1 m apart, transmits 20 Kw at 250 r.p.m. to a pulley of diameter 200 mm at a distance of 300 mm from one end. The belt passing over the pulley is vertical. The ratio of the belt tension is 2.1. The weight of the pulley is 500 N. Design the diameter of the shaft if permissible stresses are $\sigma t = 70$ N/mm^2 and $\tau = 56$ N/mm^2.