* K C - 8 1 2 3 *

KC-8123

B. E. - II (Sem. III) (Mech.) Examination

November / December – 2012

Machine Design & Industrial Drafting

(New Syllabus)

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 2 (SEM. 3) (MECH.)**

Name of the Subject :

☛ **MACHINE DESIGN & INDUSTRIAL DRAFTING (NEW)**

☛ Subject Code No. : **8 1 2 3** ☛ Section No. (1, 2,.....) : **NIL**

Seat No. :

Student's Signature

(2) Attempt all questions.

(3) Assume suitable data if necessary.

(4) Figures to the right indicate full marks.

(5) Programmable calculator is not allowed.

1 Answer the following questions : **22**

(a) Answer any five : **10**

(1) Define factor of safety.

(2) Define Residual stress.

(3) List various types of design.

(4) List types of fits.

(5) Explain in brief types of tolerances.

(6) Define Eccentric loading.

(7) Distortion energy theory of failure.

(8) Steps for selection of material in design.

(b) Answer the following : **12**

A right angled bell-crank lever is designed to raise a load of 5 kN at the short arm end. The lengths of short and long arms are 100 and 450 mm respectively. The lever and the pins are made of steel 30C8 $\left(\sigma_{yt\,(\text{yield})} = 400\,MPa\right)$ and the factor of safety is 5. The permissible bearing pressure on the pin is 10 MPa. The lever has rectrangular cross-section and the ratio of width to thickness is 3 : 1. The length to diameter ratio of fulcrum pin is 1.25 : 1.

Calculate :

(i) The diameter and the length of fulcrum pin.

(ii) The shear stress in pin.

(iii) The dimensions of the boss of the lever at the fulcrum.

(iv) The dimensions of the cross-section of the lever.

Assume that the arm of bending moment on the lever extends up to the axis of the fulcrum.

OR

(b) Write down the sequence of Auto-CAD commands to draw the following figure with proper illustrations. **12**

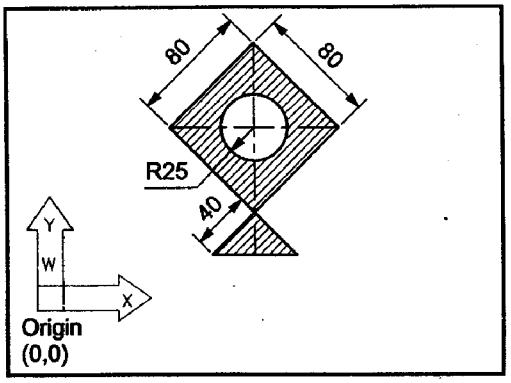

Fig. 1

2 Answer the following : 12

A welded connection, as shown in fig. 2 is subjected to an eccentric force of 7.5 kN. Determine the size of welds if the permissible shear stress for the weld is 100 MPa. Assume static conditions.

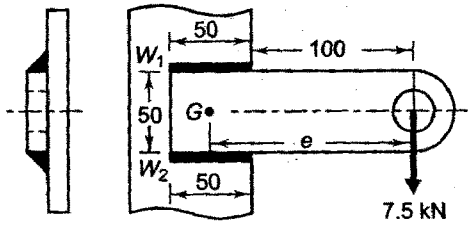

Fig. 2

OR

2 Explain the design procedure to design the longitudinal but joint for a steam boiler. 12

3 It is required to design a knuckle joint to connect two circular rods subjected to an axial tensile force of 50 kN. The rods are co-axial and a small amount of angular movement between their axes is permissible. Design the joint and specify the dimensions of its components. 16

Use following data :

- Two rods and pin is made from plain carbon steel of grade 30C8 $\left(\sigma_{yield} = 400\,MPa\right)$
- Take F.O.S. = 5

4 Attempt any **four** : 20

(1) What is the surface roughness ? Write down its characteristics and draw its symbol.

(2) Types of Shafts Couplings.

(3) What is self locking property of threads and where it is necessary ?

(4) What is a key ? State its function.

(5) Under what circumstances are hollow shafts preferred over solid shafts ?

(6) How the shaft is designed when it is subjected to twisting moment only ?

5 A vertical screw with single start square threads of 50 mm mean diameter and 12.5 mm pitch is raised against a load of 10 kN by means of a hand wheel, the boss of which is threaded to act as a nut. The axial load is taken up by a thrust collar which supports the wheel boss and has a mean diameter of 60 mm. The coefficient of friction is 0.15 for the screw and 0.18 for the collar. If the tangential force applied by each hand to the wheel is 100 N, find suitable diameter of the hand wheel. **15**

OR

5 A shaft made of mild steel is required to transmit 100 kW at 300 r.p.m. The supported length of the shaft is 3 metres. It carries two pulleys each weighing 1500 N supported at a distance of 1 metre from the ends respectively. Assuming the safe value of stress 60 N\mm^2, Determine the diameter of the shaft. **15**

6 Design a cast iron protective type flange coupling to transmit 15 kW at 900 r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible' stresses may be used : Shear stress for shaft, bolt and key material = 40 MPa Crushing stress for bolt and key = 80 MPa
Shear stress for cast iron = 8 MPa **15**

OR

6 Design a shaft to transmit power from an electric motor to a lathe head stock through a pulley by means of a belt drive. The pulley weighs 200 N and is located at 300 mm from the centre of the bearing. The diameter of the pulley is 200 mm and the maximum power transmitted is 1 kW at 120 r.p.m. The angle of lap of the belt is 180° and coefficient of friction between the belt and the pulley is 0.3. The shock and fatigue factors for bending and twisting are 1.5 and 2.0 respectively.
The allowable shear stress in the shaft may be taken as 35 MPa. **15**