

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III • EXAMINATION – WINTER 2013

Subject Code: 131902**Date: 28-11-2013****Subject Name: Machine Design and Industrial Drafting****Time: 02.30 pm - 05.30 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Define following: **03**
 (1) Proof Resilience
 (2) Preferred number
 (3) Principle stress
- (b)** Explain following AutoCAD command with Example: **06**
 (1) Offsetting
 (2) Trimming
 (3) Chamfering
- (c)** Determine the thickness of a 120 mm wide uniform plate for safe continuous operation of the plate is to be subjected to tensile load that has maximum value of 250 KN and minimum value of 100 KN. The properties of the plate material are as follows: **05**
 Endurance limit = 225 N/mm^2 ,
 Yield point stress = 300 N/mm^2 ,
 Factor of safety = 1.5
- Q.2 (a)** A double riveted double cover butt joint in plates 20mm thick is made with 25mm dia. Rivets at 100mm pitch. The permissible stress are $f_t = 120 \text{ N/mm}^2$, Shear stress = 100 N/mm^2 , $f_c = 150 \text{ N/mm}^2$. Find the Efficiency of joint, taking the strength of the rivets in double shear as twice than that of single shear. **07**
- (b)** The shaft and the flange of a marine engine are to be designed for flange coupling in which the flange is larger at the end of the shaft. **07**
 Power of the engine = 3mw
 Speed of the engine = 100r.p.m.
 Permissible shear stress in bolts and shafts = 60 N/mm^2
 No. of bolts used = 8
 Pitch circle dia. Of bolts = $1.6 \times \text{dia. Of shaft}$
 Find
 (1) Dia. Of shaft
 (2) Dia. Of bolt
 (3) Thickness and dia. Of flange.
- OR**
- (b)** Design a knuckle joint for a tie rod of a circular section to sustain a max. pull of 70kN. The ultimate strength of the material of the rod against tearing is 420 N/mm^2 . The ultimate tensile and shearing strength of the pin material are 510 N/mm^2 and 396 N/mm^2 respectively. Determine the tie rod section and pin section. Take F.S.=6. **07**
- Q.3 (a)** Why are square threads preferable to V threads for power transmission? **03**
- (b)** Show that the efficiency of self locking screws is less than 50% **04**
- (c)** The lead screw of a lathe has Acme threads of 50mm outside dia. And 8mm pitch. The screw must exert an axial pressure of 2500N in order to drive the tool carriage. The thrust is carried on a collar 110mm outside dia. And 55mm inside dia. And the lead screw rotates at 30r.p.m. **07**

Determine (1) The power required to drive the screw.
 (2) The efficiency of the lead screw.
 Take C.O.F.= 0.15 for screw
 C.O.F.= 0.15 for collar

OR

- Q.3** (a) What do you understand by tensional rigidity and lateral rigidity? **03**
 (b) A hollow shaft has greater strength and stiffness than solid shaft of equal weight. Explain. **04**
 (c) A steel spindle transmits 4Kw at 800r.p.m. The angular deflection should not exceed 0.25° per metre of the spindle. If the modulus of rigidity for the material of the spindle is $84 \times 10^3 \text{ N/mm}^2$. Find the dia. Of spindle and the shear stress induced in the spindle. **07**

- Q.4** (a) Define following : **07**
 (1) Arm of lever,
 (2) Leverage,
 (3) Displacement ratio
 Differentiate between simple and compound lever.
 (b) Why a boss is needed at the fulcrum of the levers. **04**
 (c) State the application of hand and foot levers. **03**

OR

- Q.4** (a) State the applications of splined shaft **03**
 (b) How does the working of a clamp coupling differ from that of a muff coupling ? **04**
 (c) A 45mm diameter shaft is made of steel with a yield strength of 400 N/mm^2 . A parallel key of size 14 mm wide and 9 mm thick made of steel with a yield strength of 340 N/mm^2 is to be used. Find the required length of key, if the shaft is loaded to transmit the max. permissible torque. Use max. shear stress theory and assume F.O.S. = 2 **07**

- Q.5** (a) What is surface roughness ? How it is indicated on drawing ? **03**
 (b) Explain in brief creating 3D objects using Autocad by suitable example. **04**
 (c) What is fit ? Explain different types of fits with applications. **07**

OR

- Q.5** (a) Draw the assembly drawing of steam stop valve or Tailstock. **07**
 (b) Explain with neat sketch design procedure of coupler. **07**
