College of Engineering, Pune.

End Semester Examination

(ME 202) Machine Drawing & Computer Graphics

Programme : S.Y.B. Tech.
Course : Mechanical

Date : 29th Nov 2011
Year : 2011 –12

Max. Marks : 50
Duration : 03 Hours

Instructions :- 1) This question paper contains five questions only. **Solve all questions.**
2) Figures to the right indicate full marks.
3) Draw neat figures and assume suitable data wherever required.

Q.1 a) Explain the terms 'Machine Drawing' and 'Production Drawing' in details. Also explain the term " Bill of Material" associated with the assembly drawing. **[05]**

Machine Drawing: It is pertaining to machine parts or components. It is presented through a number of orthographic views, so that the size and shape of the component is fully understood.

A duction drawing is also referred to as working drawing, should furnish all the dimensions, limits and special finishing processes such as heat treatment, honing, lapping, surface finish, etc., to guide the craftsman on the shop floor in producing the component. The title should also mention the material used for the product, number of parts required for the assembled unit, etc. Since a craftsman will ordinarily make one component at a time, it is advisable to prepare the production drawing of each component on a separate sheet.

b) Differentiate between

i) Tolerance vs Allowance and ii) Hole basis system vs Shaft basis system **[05]**

Sr	Tolerance	Allowance
1	It is permissible variation in dimension of a shaft or hole	It is the prescribed difference between the dimensions of two matting parts.
2.	It is difference between higher and lower limits of a part	It is intentional difference between lower limit of hole and higher limit of shaft
3.	Tolerances are provides as it is impossible to make identical parts	It is provided to obtain desired types of fit.
	It has absolute value	Allowance is positive for clearance fit and negative for interference fit.
5.	For ex.-for hole size 50 $^{+}$0.02 , tolerance is 0.04mm and for shaft size 50 +0.01 , tolerance is 0.02mm.	For ex.- If matting component shaft is of 50+0.01 and hole of 50 +0.02, then allowance is positive i.e. .03mm or 30 microns. (As max. clearance = HLH – LLS = 50.02 – 49.99 = 0.03)
6.	Tolerance may be unilateral or bilateral.	By providing allowance we may get clearance, transition or interference fit.

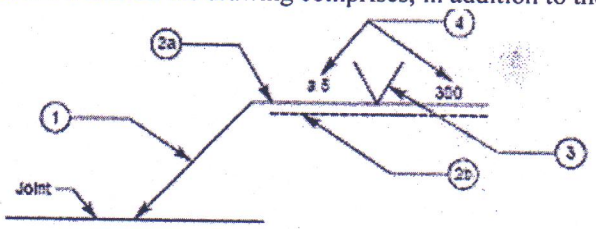
Sr.	Hole Basis System	Shaft Basis System
1.	Lower deviation of H-hole is assumed as zero,	Upper deviation of h-shaft is assumed zero, .
2.	To get different fits, shaft sizes are varied by keeping hole size constant	To get different fits, hole sizes are varied by keeping shaft size constant

3.	In this lower deviation of hole (EI) is zero i.e. lower limit of hole is same as basic size.	In this upper deviation of shaft (es) is zero.
4.	Hole basis system is the most commonly used because shaft size can be easily changed and it is convenient to make correct hole of fixed size by using drills, reamers etc.	It is not commonly used because it is difficult to get different size holes according to the fit required.
5.	It is preferred in mass production system due to standard drills, reamers, broaches availability	It is not suitable for mass production system
6.	It requires less inventory cost and tool storage cost	It requires large amount of inventory and storage cost
7.	Gauging of shafts can be easily done with adjustable snap gauge	Gauging of hole can not be done easily for different holes by plug gauges

OR for Q.1 (b)

b) Explain the significance of a "Generalised Welding Symbol" used for giving the details of various parameters associated with welding. [Do not draw the symbols for various types of weld joints] **[05]**

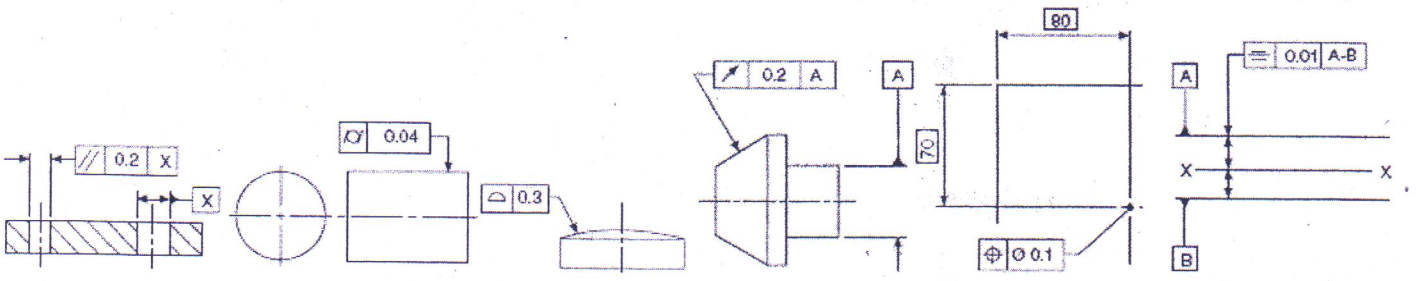
The complete method of representation of the welds on the drawing comprises, in addition to the symbol (3), the following Fig.



(*i*) An arrow line (1) per joint,
(*ii*) A dual reference line, consisting of two parallel lines; one continuous and one dashed (2*a*, 2*b*) and
(*iii*) A certain number of dimensions (4) and conventional signs (3).
NOTE The dashed line may be drawn either above or below the continuous line (Fig. 11.8). For symmetrical welds, the dashed line is omitted.

Q.2 a) With the help of sketches, show how the geometrical tolerances are indicated, for any five cases:
i) Parallelism, ii) Symmetry, iii) Cylindricity, iv) Axial run-out and v) Profile vi) Position **[05]**

i) The axis of the hole on the left-hand side must be contained between two straight lines 0.2 apart, parallel to the datum axis X and lying in the same vertical plane.
ii) The specified line XX must lie in a tolerance zone formed by two parallel straight lines 0.01 apart and disposed symmetrically between datums A and B.
iii) The whole curved surface of the feature must lie between an annular tolerance zone 0.04 wide formed by two cylindrical surfaces coaxial with each other.
iv) Circular run-out must not exceed 0.2 measured at any point normal to the surface, without axial movement.
v) The tolerance zone is to be contained by upper and lower surfaces which touch the circumference of spheres 0.3 diameter Whose centres lie on the theoretical form of the surface.
vi) The point must be contained within a circle of 0.1 diameter in the plane of the surface. The circle has its centre at the intefsection of the two theoretically exact dimensions. If the point were to be located by three dimensions, the tolerance zone would be a sphere.



b) Write a short note in detail for ***any one*** of the following. **[05]**

i) Types of rivet joints and different arrangements of rivet joints.

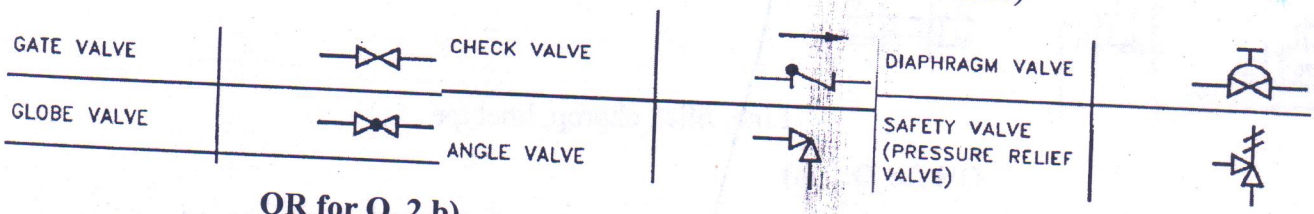
Lap joint and strap joint, Chain riveting : If the rivets are used along a number of rows such that the rivets in the adjacent rows are placed directly opposite to each other, it is known as chain riveting (Fig. 10.10). Zig-zag riveting : In a multi-row riveting, if the rivets in the adjacent rows are staggered and are placed in between those of the previous row, it is known as zig-zag riveting

ii) Stuffing Box and Glands

Structure: Stuffing box, bush in stufing box, Gland, Gland bush, packing material is pressed against the moving component by annular portion of two bush. Gland bush is pushed against packing material by tightining bolt with stuffing box and gland.

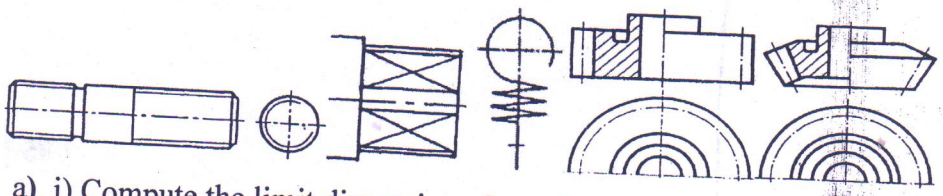
Function: It prevents leakage while of movement of shaft or spindle.

iii) Various types of control valves and their respective symbols (at least five)



OR for Q. 2 b)

b) Sketch the conventional representation of a) external threads, b) splined shaft, c) square on shaft,d) tension spring, e) spur gear, f) helical gear **[05]**



Q. 3 a) i) Compute the limit dimensions for a clearance fit on the hole basis system for a basic size of 40 mm diameter, with a minimum clearance of 0.05 mm, tolerance on the hole 0.021 mm and the tolerance on the shaft 0.15 mm. ii) Find the limit dimensions for an interference fit (i.e. Minimum interference is 0.05) on the shaft basis system for the above problem. iii) Compare the dimensions of shaft and hole from problem i) and ii). **[05]**

Tolerance on hole = 0.021, Tolerance on shaft = 0.15, Basic size = 40 mm

i) Hole basis system, Clearance = 0.05 mm, Lower limit size of hole = 40

Upper limit size of hole = L.L size of hole + Tolerance = 40 + 0.021 = 40.021 mm

Upper limit size of shaft = Lower limit size of hole – Clearance = 40 – 0.05 = 39.95 mm

Lower limit size of shaft = U. L size of shaft – Tolerance = 39.95- 0.15 = 39.80 mm

Max. clearance = Max. size of hole – Min. size of shaft = 40.021 – 39.80 = 0.221 mm

ii) Shaft basis system, Minimum interference = - 0.05, Upper limit of shaft = 40 mm,

L. L of shaft = U. L of shaft – Tolerance of shaft = 40 – 0.15 = 39.85 mm

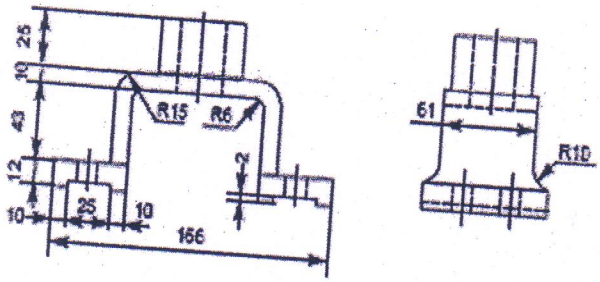
Minimum interference = Max. size of hole – Min. size of shaft

Max. size of hole = Min. size of shaft + Min. interference = 39.85 - 0.05 = 39.80 mm

Min. size of hole = Max. size of hole – Tolerance = 39.80 – 0.021 = 39.779 mm

Max. Interference = Min. size of hole – Max. size of shaft = 39.779 – 40 = - 0.221 mm

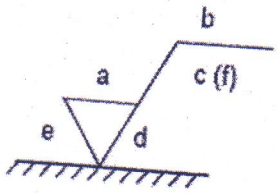
b) Write the AutoCAD commands (specific commands, as displayed in the command prompt area) in logical sequence, required for completion of the following drawing [Fig 1] . Using optimum and more quickly performing commands of AutoCAD write sequential appearance of the commands. Assume suitable proportionate dimensions. Writing the dimensions in the answer is not necessary. **[05]**



Line, fillet, chprop, linetype

OR for Q. 3 b)

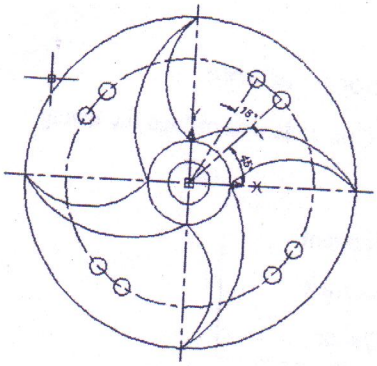
b) What is importance of surface roughness? Indicate how various surface roughness specifications are placed relative to the symbol.



[05]

Q. 4 a) Write the AutoLISP programme required for completion of the sketch given in the following Fig. 2. Minimum inputs from user at the start of the programme are compulsory. Elaborations for the important stage or command in the programming is must. Assume starting point, suitable data, required dim….. etc. wherever necessary.

[06]



```
(defun dtr(deg)
  (setq deg (/ (* deg pi) 180.0))
)

;FUNCTION TO DRAW CENTER LINES FOR A CIRCLE
(defun drcl(centerpoint circleradius)
  (setq clext (* 0.4 circleradius)
        ptop (polar centerpoint (dtr 90) (+ circleradius clext))
        pbot (polar centerpoint (dtr 270) (+ circleradius clext))
        plef (polar centerpoint (dtr 180) (+ circleradius clext))
        prig (polar centerpoint (dtr 0) (+ circleradius clext))
  )
  (command "linetype" "s" "center" ""
           "line" ptop pbot ""
           "line" plef prig ""
           "linetype" "s" "continuous" ""
  )
)

(defun arlast()
  (command "-array" "l" "" "p" p1 4 "" "")
)

(defun C:IMP()
  (setq r (getreal "\nEnter the bore radius : ")
        rh (* 2.0 r)
      rout (* 8.0 r)
        ri (* 4.0 r)
        ro (* 6.0 r)
       pcr ro
      hrad (* 0.4 r)
        p1 (list 0 0)
        p2 (list 0 rh)
        p3 (list 0 rout)
        p4 (list (- 1.0 rh) 0)
        p5 (polar p1 (dtr 45) pcr)
        p6 (polar p1 (dtr 60) pcr)
        p7 (polar p1 (dtr 135) pcr)
        p8 (polar p1 (dtr 150) pcr)
        p9 (polar p1 (dtr -135) pcr)
       p10 (polar p1 (dtr -120) pcr)
       p11 (polar p1 (dtr -30) pcr)
       p12 (polar p1 (dtr -45) pcr)
  )
  (setvar "ltscale" 1)
  (command "limits" (list -400 -400) (list 400 400)
           "zoom" "a"
           "circle" p1 r ""
           "circle" p1 rh ""
           "circl " p1 rout ""
           "circl " p1 pcr ""
           "arc"  3 "e" p2 "r" ri
  )
  (arlast)
  (command "arc"  3 "e" p4 "r" ro)
  (arlast)
  (command "circl " p5 hrad "")
  (arlast)
  (command "circle" p6 hrad "")
  (arlast)
(drcl p1 rout)
  (command "zoom" "e"
           "zoom" "0.8x"
  )
)
```

b) Explain tolerance of form and position. Write any four uses of geometric tolerances. **[04]**

Form variation :It is a variation of the actual condition of a form feature (surface, line) from geometrically ideal form. Position variation : It is a variation of the actual position of the form feature from the geometrically ideal position, with reference to another form (datum) feature.

Geometrical tolerance is defined as the maximum permissible overall variation of form or position of a feature.

Geometrical tolerances are used,

(*i*) to specify the required accuracy in controlling the form of a feature,
(*ii*) to ensure correct functional positioning of the feature,
(*iii*) to ensure the interchangeability of components, and
(*iv*) to facilitate the assembly of mating components.

Q. 5 Write a short note on **any two** of the following with suitable examples and essential sketches. **[10]**

i) Various functions used for filtering of list.

Car-This function returns the first item of a list. **cdr** - This function returns a list that includes everything but the first item in a list. **cadr** - This function returns the second item in a list. **caddr** - This function returns the third item in a list. **caar** - This function returns the first item of the first item in a list. **cddr** - This function returns a list that includes everything after the second item in a list. **foreach** - This function steps through each item in the list and returns the last value. **nth** - This function returns the Nth item in a list.

ii) List various system variables. Explain meaning of few codes used for osmode variable.

When setvar is used with the osmode system variable, a numeric code must also be supplied. This code determines the osnap mode to be used.

	Endpoint	32	Intersection	8	Node	256	Tangent
	Midpoint	64	Insertion	16	Quadrant	512	Nearest
	Center	128	Perpendicular			1024	Quick

iii) Various data conversions in LISP programming

x - This function returns an integer. **float** - This function returns a real number. **itoa** - This function changes an integer to a string. **toi** - This function changes a string into an integer. **atof** - This function changes a string into a real number. **rtos** - This function onverts numbers to a formatted string representing a distance. Syntax : **(rtos number mode precision) angtos** - This function onverts a number to a formatted string representing an angle. Syntax : **(angtos number mode precision)**

iv) Need and different ways of customization in Autocad software

Customizing AutoCAD can speed up your work, make it easier, create standards for all drawings where you work, and automate often-used or repetitive tasks. You can customize the process of issuing commands as well as customize toolbars and tool palettes, create macros and slide shows with script files, create your own linetypes and hatch patterns, create your own fonts and other shapes, and customize AutoCAD's menus.

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