(Printed Pages 6) Roll No. .....

E-852

B.E. 3rd Semester Examination, Dec. 2018

ENGG. MECHANICS

Branch : CS, EC, ME

(Main & Re-Exam)

Time : Three Hours] *[Maximum Marks : 75*

[Minimum Marks : 30

Note : Attempt **all** questions from **Section-A**, **four** questions from **Section-B** and **three** questions from **Section-C.**

Section-A

(Objective Type Questions)

Attempt **all** parts :

1. The principle of transmissibility of forces states that, when a force acts upon a body its effect is

   (a) Same at every point on its line of action

   (b) Different at different points on its line of action

   (c) Minimum if it acts at the Centre of gravity of the body

   (d) Maximum if it acts at the Centre of gravity of the body.

2. Concurrent forces are those forces whose lines of action :

   (a) lie on the same line

   (b) meet at one point

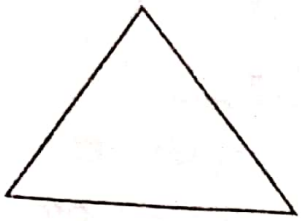
   (c) meet on the same plane

   (d) None of the above

P.T.O.

3. A framed structure as shown in figure 1. below is a

Fig. 1



(a) Perfect frame
(b) Deficient frame
(c) Redundant frame
(d) None of these

4. A framed structure is imperfect, if the number of members ar .....(2j-3).

(a) equal to
(b) less than
(c) greater than
(d) either (b) or (c)

5. The friction experienced by a body, when in motion is known as

(a) Rolling friction
(b) Dynamic friction
(c) Limiting friction
(d) Static friction

6. A ladder is resting on a rough ground and leaning against a smooth vertical wall. The force of friction will act :

(a) Downward at its upper end
(b) Upward at its upper end
(c) Zero at its upper end
(d) Perpendicular to the wall at its upper end

7. The frictional force is independent of

(a) The coefficient of friction
(b) The area of Contact
(c) The normal reaction
(d) The angle of friction

8. Moment of Inertia of a circular section about an axis perpendicular to the section is

(a) $\pi D^3/16$ (b) $\pi D^3/32$

(c) $\frac{\pi D^4}{32}$ (d) $\frac{\pi D^4}{64}$

9. The strength of the beam mainly depends upon

(a) Bending moment (b) Section Modulus

(c) Its weight (d) Centroid of section

10. The acceleration of a particle moving with S.H.M. is ..... at the mean position :

(a) Zero (b) Minimum

(c) Maximum (d) None of these

Section-B

(Short Answer Type Questions)

Note : Attempt any **four**.

1. Two rollers of the same diameter are supported by an inclined plane and a vertical wall as shown in Fig. 2. The upper and lower rollers are respectively 200N and 250N in weight. Assuming smooth Surfaces find the reactions induced at Points A, B, C and D.

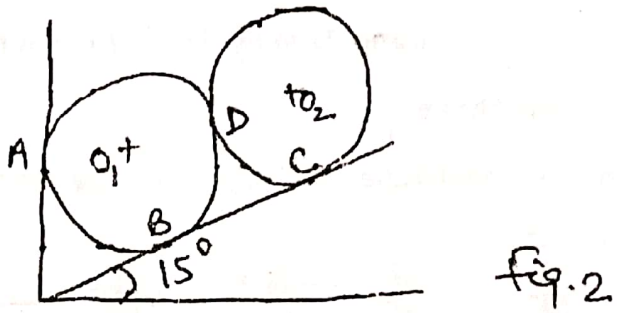


Fig. 2

2. What is a framed structure? Classify the frames giving suitable examples. Also state the assumptions which are used in the analysis of a frame.

3. Derive the relation for flat belt drive

$$\frac{T_1}{T_2} = e^{\mu\theta}$$

4. Determine the centre of gravity of a solid circular cone of height h and base circle radius R.

5. Determine the moment of Inertia of the area shown shaded in Fig. 3 about the axis XX which coincides with the base edge AB.

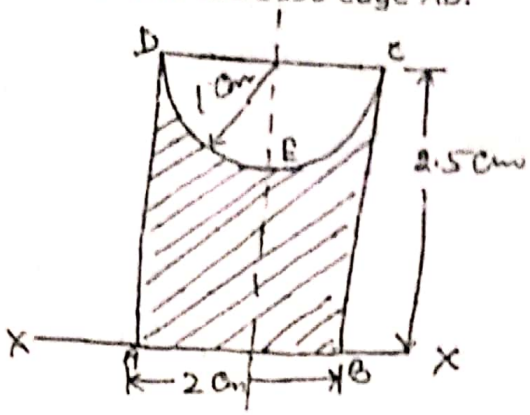


fig 3.

6. A particle moves along a straight line with an acceleration prescribed by the relation $a = (4t^2-3t+2)$ where a is in m/s^2 and t is in seconds. The particle has a velocity of 10m/s at t=3 seconds, and it is located 12m to the right of origin at t=2 seconds. Determine the position and velocity of the particle after 5 seconds.

Section-C

(Long Answer Type Questions)

Note : Attempt any **three** :

1. Determine the magnitude and nature of forces in the various members of the truss shown in fig. 4.

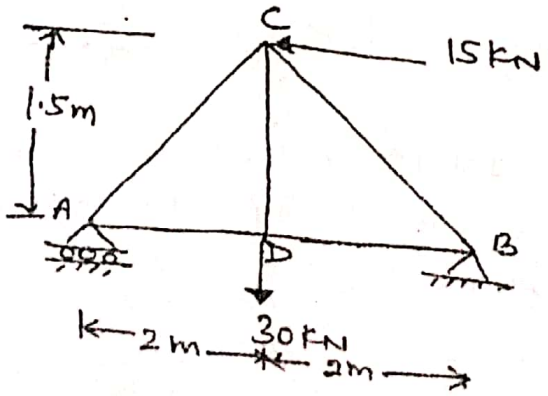


fig 4.

2. Determine the mass moment of inertia of a solid sphere of radius R about its diametral axis.

3. A ladder of length 4 m weighing 200N is placed against a vertical wall. The coefficient of friction between the wall and ladder is 0.2 and that between the floor and ladder is 0.3. The ladder in addition to its own weight has to support a man weighing 600N at a distance of 3m from A. Calculate the minimum horizontal force to be applied at 'A' to prevent slipping Refer fig. 5

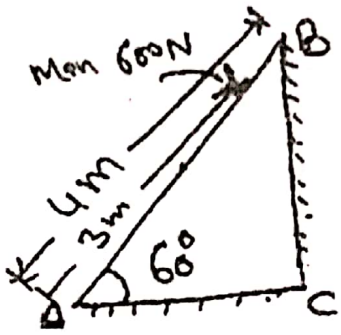


Fig 5.

4. Draw SFD & BMD for the beam shown in Fig. 6. Also locate point of contraflexene, and maximum bending moment.

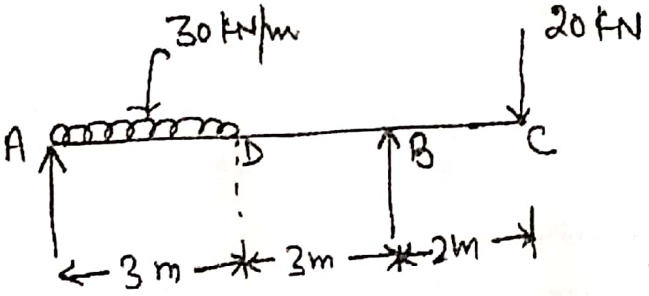


Fig 6.

5. Two bodies weighing 300N and 450 N are hung to the ends of a rope passing over an ideal pulley. With what acceleration would the heavier body come down? What is the tension in the rope. Obtain your solution by using D'Alembert's

principle and by principle of work and energy Refer Fig. 7

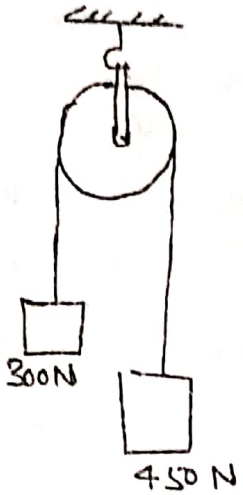


fig :7

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E-853

B.E. III Semester Examination, Dec. 2018

ENGG. THERMODYNAMICS

Branch : CSE, ECE & Mech. Engg.

(Main & Re-Exam Only)

Time : Three Hours] *[Maximum Marks : 75*

[Minimum Marks : 30

Note : Attempt **all** the questions of Section-A, **four** questions from Section-B and **three** questions from Section-C.

Section-A

(Objective Type Questions)

Note : Attempt **all** questions. Each question carries equal marks. 1.5×10=15

1. A thermodynamic system which exchanges both the mass and energy with its surroundings is known as.

   (a) Open system

   (b) Closed system

   (c) Isolated system

   (d) None of these

2. Which of the following is an intensive property?

   (a) Mass (b) Enthalpy

   (c) Density (d) Entropy

3. PMM–1 Stands for :

   (a) Perfect motion machine of first kind

   (b) Perpetual Machanism and Machine of first kind

P.T.O.

(c) Perpetual motion machine of first kind

(d) None of these

4. If m_g=mass of vapour or gas, M_f=mass of liquid, then dryness fraction is given as :

(a) m_g/m_f+m_g (b) m_f-m_g / m_g

(c) m_f+m_g / m_g (d) $m_g/m_f - m_g$

5. Efficiency of carnot cycle is given as :

(a) $T_{max} + T_{min} / T_{max}$ (b) $T_{max} - T_{min} / T_{max}$

(c) $T_{min} / T_{max} + T_{min}$ (d) $T_{max} / T_{max} - T_{min}$

6. In an irreversibe process, there is a

(a) Heat loss

(b) No loss of heat

(c) Heat gained

(d) No gain of heat

7. In case of a free expansion process, the work done is :

(a) Zero (b) Maximum

(c) Minimum (d) Positive

8. Latent heat of vapourization of critical point is :

(a) < 0 (b) > 0

(c) $= 0$ (d) None of these

9. Enthalpy is given as :

(a) U+Pv (b) U – Pv

(c) U.Pv (d) P.dv

10. Helmholtz function is expressed as :

(a) U–TS (b) h–TS

(c) VdP–SdT (d) U+Pv

Section-B

(Short Answer Type Questions)

$4 \times 5 = 20$

Note : Attempt any **four** questions.

1. Explain First Law of thermodynamics. Also explain its limitations.
2. A closed system undergoes a reversible process at constant pressure process of 3.5 bar and its volume changes from $0.15m^3$ to $0.06\ m^3$, 25kJ of heat is rejected by system during the process. Find the change in internal energy of the system.
3. Derive Steady Flow Energy Equation (SFEE) for boilers.
4. In a steam power cycle, the steam supply is at 15 bar and dry and saturated. The condenser pressure is 0.4 bar. Calculate the Carnot & Rankine efficiency of cycle. Neglect the pump work?
5. Describe clausius inequality and also state the third law of thermodynamics.
6. 0.42 kg of air at 160^0C expands adiabasically to three times its original volume and during the process, there is a fall in temperature to 10^0C. The work done during the process is 54KJ. Calculate C_p and C_v.

Section-C

(Long Answer Type Questions)

$10 \times 3 = 30$

Note : Attempt any **three** questions.

1. A reversible heat engine operator between 800^0C and 500^0C. Engine drives a generator and a reversed Carnot engine using the work output from heat engine for each unit equality. Reversed carnot engine abstracts heat from 773k reservoir and rejects that to a thermal reservoir at 715^0C. Find the heat rejected to reservoir by reversed engine as a fraction.
2. Explain carnot theorem and its corollarie, and deduce the equation of efficiency.

3. A system at 500k receiver 7200KJ/min. from a source at 1000k. Temperature of atmosphere is 300k. Calculate entropy during heat transfer and decrease in available energy affer heat transfer. Assuming the temperature of system and source remain constant.

4. In a power plant working on an ideal Rankine cycle the dry saturated steam is supplied to turbine at 30 bar. If the condenser pressure is 10 kPa, then find the quality of steam leaving tuvbine and thermal efficiency of an ideal Rankine cycle.

5. Write short notes on the following :

   (i) Critical point

   (ii) Mollier chart

   (iii) PMM-2

   (iv) Saturated State

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E-854

B.E. III Semester Examination, Dec. 2018

MATHEMATICS - III

(Main & Re-Exam.)

Branch : CS, EC, ME.

Time : Three Hours] *[Maximum Marks : 75*

[Minimum Marks : 30

Note : Attempt **all** questions from Section-A, **four** questions from Section-B and **three** questions from Section-C.

Section-A $1.5 \times 10 = 15$

(Objective Type Questions)

1. The period of sin nx is :

   (a) π/n (b) 2π

   (c) n (d) $2\pi/n$

2. Laplace's equation is :

   (a) $u_{xx} + u_{yy} = 0$ (b) $u_{xx} + u_{yy} + u_{zz} = 0$

   (c) $u_{rr} + \frac{1}{r}u_r + \frac{1}{r^2}u_{\theta\theta} = 0$ (d) None of these

3. The residue of the function $f(z) = \frac{z^3}{z^2 - 1}$ at $z = \infty$ is :

   (a) 1 (b) -1

   (c) ∞ (d) 0

4. The value of the integral : $\int_C \frac{1}{z}\cos z dz$

   where C is the ellipse $9x^2 + 4y^2 = 1$ is :

   (a) πi (b) $-2\pi i$

   (c) $2\pi i$ (d) $\frac{\pi i}{2}$

P.T.O.

5. Particular integral of $(2D^2-3DD'+D'^2)z = e^{x+2y}$:

(a) $-\frac{x}{2}e^{x+2y}$ (b) $\frac{x}{2}e^{x+2y}$

(c) xe^{x+2y} (d) $\frac{x^2}{2}e^{x+2y}$

6. The partial differential equation of $z = (a+x)(y+b)$ is :

(a) $p^2+px=q$ (b) $pq=1$

(c) $z=pq$ (d) None of these

7. Finite Fourier Sine transform of $f(x)=1-\frac{x}{\pi}$ for $0 < x < \pi$ is :

(a) p (b) $\frac{1}{p}$

(c) $\frac{1}{2p}$ (d) 2p

8. An analytic function with constant modulus is .....

9. The variance of the binomial distribution is .....

10. Variance of the Poission distribution is .....

Section-B

$6\times4=24$

(Short Answer Type Questions)

1. To separate loge (x+iy) into real and imaginary parts.

2. In a two dimensional fluid flow, the stream function is $\psi = \frac{-y}{x^2+y^2}$, find the velocity potential ϕ.

3. Obtain the half range cosine series for $f(x)=x^2$ in $0<x<\pi$.

4. State and prove Baye's theorem.

5. Solve $p+3q = 5z+\tan(y-3x)$.

Section-C

$12 \times 3 = 36$

(Long Answer Type Questions)

1. Explain the function $\frac{1}{(z+1)(z+3)}$ in the regions.

   (i) $|z|<1$ (ii) $1<|z|<3$

   (iii) $|z|>3$ (iv) $1<|z+1|<2$

2. Evaluate : $\int_0^{1+i}(x^2 - iy)dz$ along the paths :

   (i) $y=x$ (ii) $y=x^2$

3. Find a Fourier series to represent $f(x)=x-x^2$ from $x=-\pi$ to $x=\pi$.

4. Find the mean of the Poisson distribution. Also using Poisson distribution, find the probability that the ace of spades will be drawn from a pack of well shuffled cards at least once in 104 consecutive trials. (Given : $e^{-2} = 0.136$)

5. Solve the partial differential equation :

   (i) $(4D^2-4DD'+D'^2)z = 16 \log (x+2y)$

   (ii) $(2D^2-5DD'+2D'^2)z = 5 \sin (2x+y)$

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Roll No. .....

E-855

B.E. IIIrd Semester (M.E.)

Examination, December - 2018

Basic Solid Mechanics

Time : Three Hours]

[Maximum Marks : 75
[Min. Marks : 30

Note : Attempt **all** questions of **Section-A**, **four** questions from **Section-B** and **three** questions from **Section-C.**

Section-A $1.5 \times 10 = 15$

1. In case of biaxial stresses, the maximum value of shear stress is :
   (a) Difference of normal stresses (b) Half of difference of normal stresses
   (c) Sum of normal stresses (d) Half of sum of normal stresses
2. If a body is acted upon by pure shear stresses on two perpendicular planes, the planes inclined at 45^0 are subjected to no _____ stress.
   (a) Tensile (b) Compressive
   (c) Shear (d) None of these
3. A beam is said to be loaded in pure bending if :
   (a) Shear force and bending moment are uniform throughout
   (b) Shear force is zero and bending moment is uniform throughout
   (c) Shear force can very but and bending moment is uniform throughout
   (d) Shear force and bending moment both can vary.
4. The flexural rigidity of a beam is :
   (a) E/I (b) EI
   (c) I/E (d) I^2E

P.T.O.

5. The predominant effect of an axial tensile force on a helical spring is :

(a) Bending (b) Tension

(c) Compression (d) Twisting

6. Leaf spring is subjected to :

(a) Tensile stress (b) Compressive stress

(c) Shear Stress (d) Bending stress

7. In a thin cylinder, the ratio of hoop stress to longitudinal stress is :

(a) 1/4 (b) 1/2

(c) 2 (d) 4

8. The use of compound tubes subjected to internal pressure are to :

(a) Even out the stresses (b) Increse the thickness

(c) Increse the diameter of the tube (d) Increase the strength

9. The variation of bending stress in a curved beam is :

(a) Linear (b) Parabolic

(c) Hyperbolic (d) Cubic

10. For two safts joined in parallel, the _____ in each shaft is the same :

(a) Shear stress (b) Angle of twist

(c) Torque (d) None of these

Section-B

6×4=24

1. Show that a body subjected to a pure shear is also acted upon by tensile and compressive stresses as well.
2. Find the expression for displacement of a fixed beam with a point load at the midspan.
3. What is meant by buckling load? Derive the expression for buckling load for a long column when its one end is fixed and the other end free.
4. Obtain a relation for maximum principal stress and maximum shear stress for a shaft under the action of combined bending and torsion.
5. An 800 mm long closed-end copper tube of 72 mm internal diameter and 2 mm thickness is filled with water under pressure. Find the change in pressure if additional volume of 4000 mm^3 of water is pumped into the tube. Neglect any-

distortion of the end plated. Take E=102 GPa, K=2200 MPa and Poisson's ratio=0.3.

6. Determine the position of the shear centre for a channel section of 80 cm by 40 cm outside and 5mm thick.

Section-C

$12 \times 3 = 36$

1. The stresses on two perpendicular planes through a point in a body are 30 MPa and 15 MPa both tensile along with shear stress of 25MPa. Find :
   (i) The magnitude and direction of principal stresses
   (ii) The planes of maximum shear stress
   (iii) The normal and shear stresses on the planes of maximum shearing stress.
2. Determine the width and depth of the strongest beam which can be cut out of a cylindrical log of wood of diameter d.
3. The coil diameter of a closed-coiled helical spring having 10 coils is eight times the wire diameter. The spring absorbs 60 N.m of energy when compressed by 40 mm. Find the coil and the wire diameters and the maximum shear stress. G=85GPa.
4. A 1.5 m long solid aluminium shaft with a 60 mm diameter is to be replaced by a steel hollow shaft of the same length and same external diameter s to transmit the same torque. With same angle of twist over the same length. Determine the diameter of the hollow shaft. G(steel)=82 GPa and G (aluminium)=27 GPa.
5. A beam of square section is subjected to uniform bending moment 660 Nm. If the cross-section of the beam is 4cm×4cm. Find for each of the following cases, the maximum tensile and compressive stresses in the section :
   (a) The beam is straight
   (b) The beam is curved to radius of 20 cm along the centroidal axis and bending moment increases the curvature.
   (c) The beam is curved to radius of 4cm along the centroidal axis and bending moment increases the curvature.

   What do you conclude from the results of this problem regarding the effect of curvature on stresses?

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E-856

B.E. III Semester Examination, December-2018

Mechanical Design & Drawing

Branch : Mechanical Engg.

(Main & Re Exam)

Time : Three Hours] *[Maximum Marks : 75*

Note : Attempt **all** questions from **Section-A**, **Four** questions from **Section-B** and **Three** questions from **Section-C.**

Section - A

1. In shaft-basis system, the basis shaft is **one**: $1.5 \times 10 = 15$

   (a) whose upper deviation is zero

   (b) whose upper & lower deviations are zero

   (c) whose lower deviation is zero

   (d) none of the above

2. The designation M20 means:

   (a) metric coarse threads of 20 mm outside diameter

   (b) metric fine threads of 20 mm outside diameter

   (c) metric threads of 20 mm core diameter

   (d) metric threads of 20 mm pitch diameter

3. In fillet weld, the ratio of throat to leg is :

   (a) 0.5 (b) 0.707 (c) 1.0 (d) $\sqrt{2}$

4. The shear resistance of one rivet in double shear is:

   (a) 2.5 times its resistance in single shear

   (b) two times its resistance in single shear

   (c) 1.875 times its resistance in single shear

   (d) 1.5 times its resistance in single shear

P.T.O.

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

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{8}$ (d) $\frac{1}{16}$

6. The type of key used when the gear is required to slide on the shaft is:

(a) Sunk key (b) Feather key

(c) Woodruff key (d) Kennedy key

7. The bolts in a rigid flanged coupling connecting two shafts transmitting power are subjected to:

(a) shear force and bending moment

(b) axial force

(c) torsion

(d) torsion and bending moment

8. Locking washer is used to prevent the _____ movement of the bearing.

(a) radial (b) axial

(c) both radial and axial (d) none of these

9. The side view of an object is drawn in :

(a) Vertical plane (b) Horizontal plane

(c) Profile plane (d) Any of the plane

10. In the following geometric modelling techniques which are not three dimensional medelling?

(a) Wireframe modelling (b) Drafting

(c) Surace modelling (d) Soild modelling

Section - B

1. Sketch the following types of key in two views. 6×4=24

(a) hollow saddle key

(b) single headed feather key

(c) woodruff key

2. Explain in brief the various steps involved in designing a welded joint?

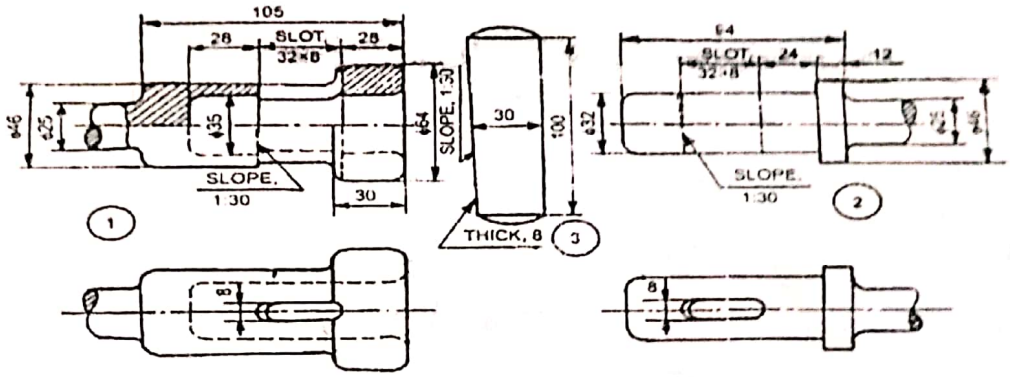
3. Draw the sectional front view and top view of a Chain Type doubled riveted lap joint. Take the diameter of rivet = 24 mm.

4. what is an assembly drawing? Explain the various types of assembly drawings giving suitable example.
5. Give the schematic representations of the three classes of Fits.
6. What are the advantages of computer aided drafting?

Section - C

$12 \times 3 = 36$

1. Draw the front view, top view and side view of a hexagonal bolt 24 mm diameter and 96 mm long with a hexagonal nut and a washer by following approximate proportions.
2. Draw (a) half sectional view from the front, top half in section and (b) view from the side of a bushed pin type flange coupling, indicating proportions to connect two shafts, each of diameter 30 mm.
3. Assemble the parts of a socket and spigot cotter joint, show below and draw the following views:
   (i) Half sectional view from the front, with top half in section, and
   (ii) View from the right.



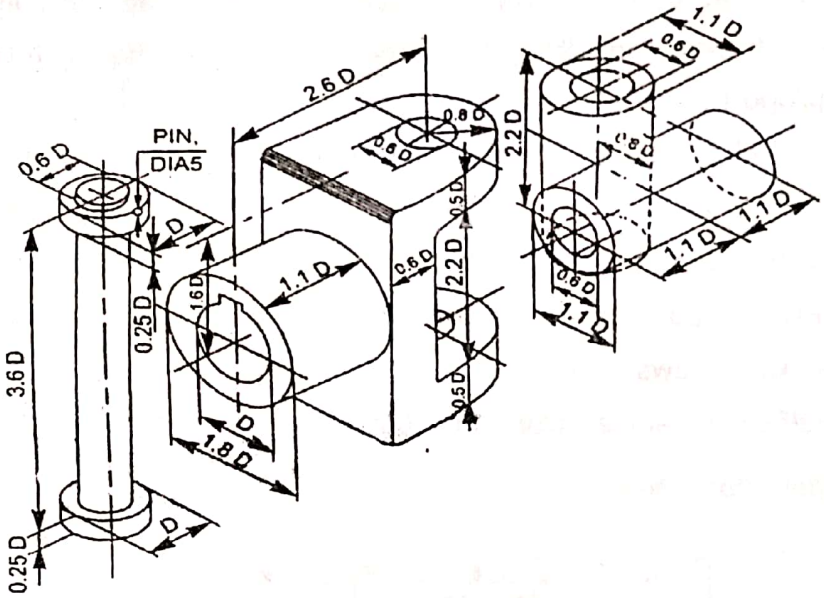
Parts list :

Sl.No.	Name	Matl.	Qty.
1	Socket end	MS	1
2	Spigot end	MS	1
3	Cotter	HCS	1

4. Assemble the parts of a Universal coupling, show below and draw the following views:

(i) Half sectional view from the front, with top half in section, and

(ii) View from the right.



5. Explain the following:

(a) Reverse engineering

(b) Computer aided drafting of machine

(c) Locking arrangements.