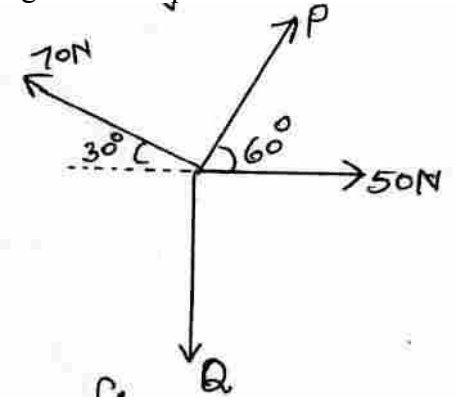
Subject/ Subject Code	Semester/ Branch	Issue Date	Due Date
AM / 3300008	2nd – Mechanical / Civil		

Assignment-1

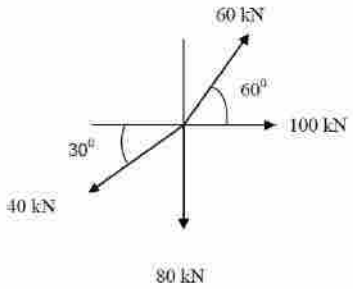
1. Define kinetics and kinematics.
2. Write two fundamental units and two derived unit of SI system.
3. Define scalar and vector quantity with two examples.
4. State two scalar and two vector quantities.
5. Write difference between scalar quantity and vector quantity.
6. Give the units of the following quantities as per S.I. system.
   (1) Force (2) work (3) energy (4) torque.

Assignment - 2

1. Differentiate between weight and mass.
2. Write condition of equilibrium for coplanar parallel force.
3. State the system of forces.
4. State method of finding resultant force.
5. Write the type of equilibrium with neat sketch.
6. Write and explain parallelogram law of forces.
7. Define force and explain its characteristics
8. State and explain Lami's theorem with sketch.
9. State and explain polygon law of forces.
10. Define the terms (1) Space diagram (2) Free body diagram (3) Vector diagram (5) Resultant force
11. Explain principle of superposition of forces.
12. Two forces 15 KN each act an angle θ with each other. So that their resultant is 25 N. Find the angle θ.
13. The system shown in the figure is in equilibrium. Find unknown forces 'P' and 'Q'.



14. Two forces 20 kN and 30 kN both tensile are acting at an angle 60°. Find magnitude and direction of the resultant force.
15. A load of 100 kN is hung by means of a rope attached to a hook in a horizontal ceiling. What horizontal force should be applied so that rope makes 60° with the ceiling? Also calculate tension in rope.
16. If two forces act at an angle 90°, resultant is √10, if they act at an angle 60°, resultant is √13. Find the two forces.
17. Find maximum and minimum resultant of two tensile forces 30 kN and 10 kN acting at one point.
18. Find magnitude and direction of resultant of force system as shown in fig.

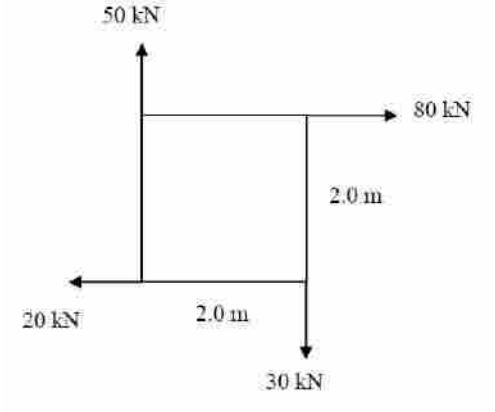


19. Three tensile forces F1,F2&F3 acting at a point are in equilibrium. The angle between F1&F2 is 90^0 and between F2&F3 is 120^0.find the ratio of the forces.
20. A body of 10KN is suspended by two strings of length 50cm and 120cm attached to two hooks in horizontal ceiling at 130cm apart. Find the tension in both strings.
21. The following forces are acting at a point.
    1)450N force towards north-east.
    2)350N force towards east.
    3)250N force at 30° west of north.
    4)300N force at 60° south of west.
    Find magnitude and direction of the resultant.
22. Two tensile forces acting at an angle 120° between them. The bigger force is 35KN.The resultant is perpendicular to the smaller force. Find the smaller force and resultant force.

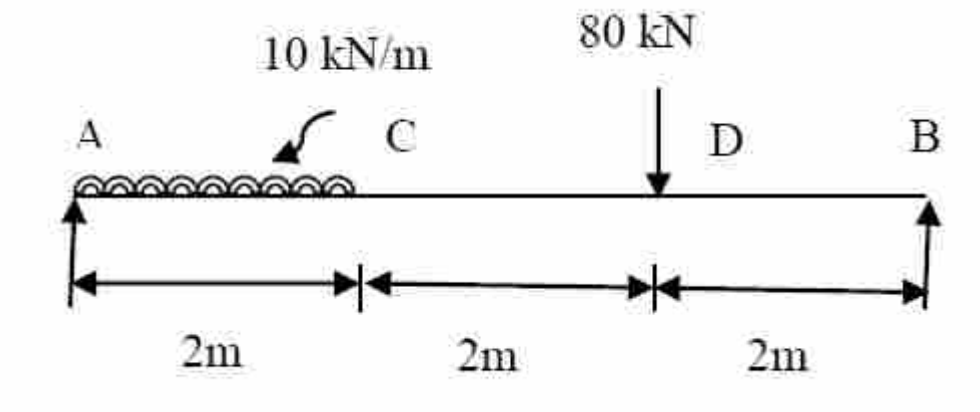
Assignment - 3

1. Write the types of beam.
2. State type of beam support with neat sketch.
3. State analytical conditions of equilibrium for coplanar non concurrent forces.
4. State Varignon's principle of moments.
5. Define a couple and write the properties of couple.
6. Define moment of a force and couple.
7. Explain types of supports and loads.
8. Give characteristics of a couple.
9. Explain different types of supports. Show directions of reactions with neat sketch.
10. Write conditions of equilibrium of Co-Planar Non-Concurrent forces.

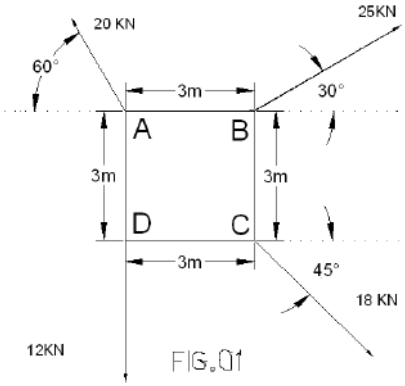
11. Find moment of a force about point 'A' from Figure
12. A simply supported beam has span 5 m. It carries a point load of 200 kN at 2m from left hand support and a point load of 100 kN at 1 m from right hand support. Calculate support reactions.
13. ABCD is a square of 1 m side. Forces 15 N, 25 N, 35 N, 45 N and 50 N are acting respectively along AB, AD, CB, CD and BD. Find the magnitude, direction and position of resultant with respect to a point A.
14. Find magnitude and direction of resultant of force system as shown in fig.



15. Find support reactions for a beam as shown in fig.



16. Find magnitude & direction of the resultant for the system of forces shown in figure.



17. Calculate the support reaction for the beam shown in figure.

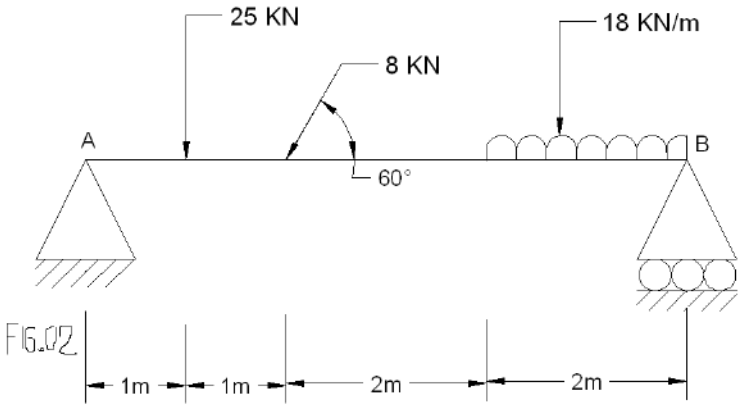
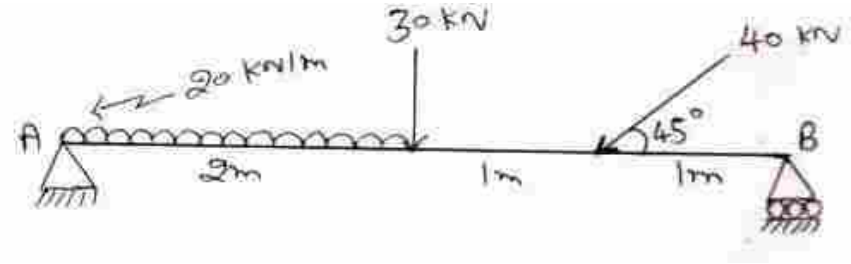
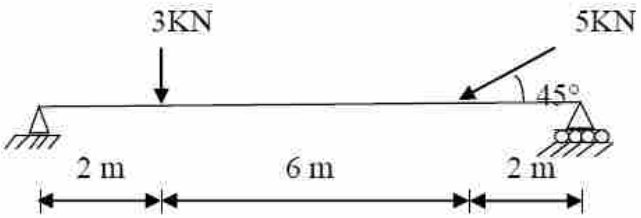


FIG.02

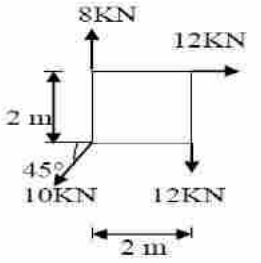
18. Find support reactions for a beam shown in figure.



19. Find Support Reactions for a beam shown in Figure.



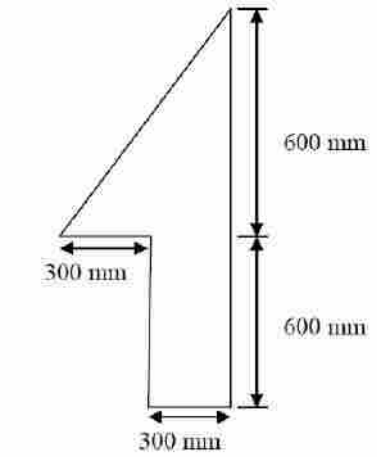
20. Find the magnitude and direction of Resultant for the force system shown in Figure.



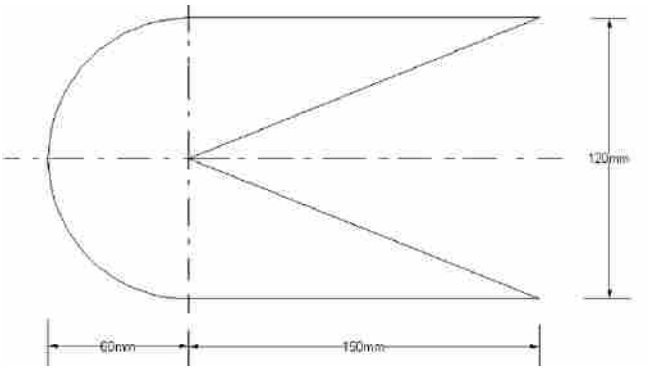
21. A point in equilibrium is pulled by five strings at an equal angle. If tensions in consecutive strings are 5KN, 6KN, 7KN, 8KN and 9KN. Find magnitude and direction of Resultant by Method of Resolution.

Assignment - 4

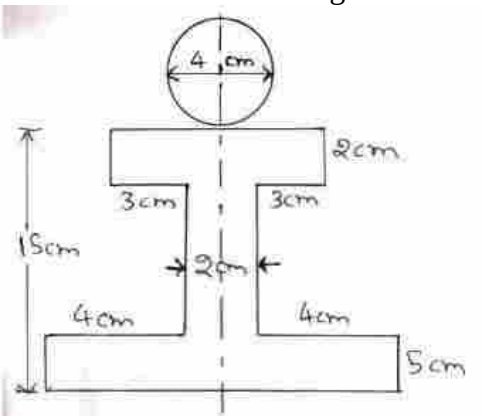
1. Define centroid and centre of gravity.
2. Explain axis of reference and axis of symmetry.
3. Draw neat sketch of (1) Semi Circle (2) Hemi Sphere (3) Triangle
4. Enlist equations for Centre of gravity for different solids.
5. Calculate centre of gravity of 'T' section having flange 20x2cm and web 30x2cm.
6. Calculate centroid of angle section 90x60x6 mm keeping longer leg vertical.
7. A trapezoidal dam section has base width 5 m and top width 2 m. Its height is 16 m with one side vertical. Find centre of gravity of the dam section.
8. Find the centroid of an angle section ISA 60×40×10 mm keeping longer leg vertical.
9. State co-ordinates of centroid of semi circle having radius 'r'.
10. Find centroid of Lamina as shown in fig.



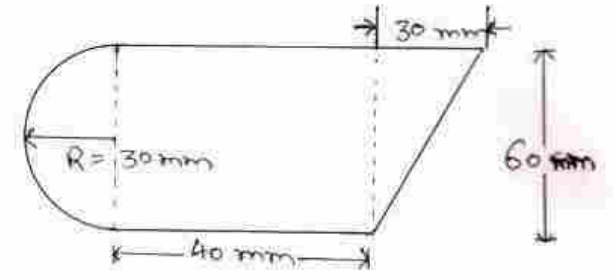
11. An I-section has top flange 18cm X 2cm, web 28cm X 2cm and bottom flange 38 cm X 4cm.find centroid of the section.
12. Find centroid of the given lamina as shown in figure.



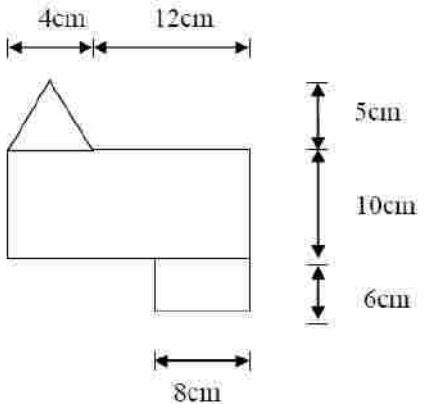
13. Find centre of gravity for the lamina shown in figure – 5.



14. Find the centroid of the lamina shown in figure.



15. Find Centroid of the lamina as shown in Figure.



Assignment - 5

1. State the law of dynamic friction.
2. Define angle of repose and angle of friction.
3. Write advantages and disadvantages of friction.
4. Write laws of static friction and Dynamic friction.
5. Define angle of friction and state its relation with coefficient of friction.
6. Define friction force and state laws of static friction.
7. Define : (1) Coefficient of friction
8. Explain Friction and Limiting friction.
9. A block weighing 150 N is resting on the inclined plane which makes 20º with horizontal. Calculate the pull required parallel to the plane when the block is just at point of sliding upward. Take μ=0.28.
10. A body of weight 400 N resting on a plane inclined at 15º to the horizontal. A horizontal force of 247.5 N is just sufficient to cause the body to start move up the plane. Find co-efficient of friction (μ).
11. A body of weight 30 N is resting on a plane inclined at 20º to the horizontal. A horizontal force of 15 KN is sufficient to move body upward the plane. Find co-efficient of friction (μ) and angle of friction.
12. A pull of 50 N inclined at 30° to the horizontal is necessary to move a wooden block on a horizontal table. If coefficient of friction is 0.20, find the weight of wooden block.
13. A block weighing 100 N is resting on inclined plane which makes 20° with horizontal. Calculate the pull required parallel to plane when the block is just on point of sliding upward. Take co-efficient of friction = 0.288.
14. Find the magnitude of a push inclined at 30° to the horizontal required to move a block of weight of 500 N resting on a horizontal surface having co-efficient of friction is 0.4.
15. A box weighing 10 kN is pulled along inclined plane by 6.30 kN force parallel to plane. The inclination of plane is 300with horizontal .find coefficient of friction.
16. A pull of 50 N inclined at 300 to the horizontal is necessary to move a wooden block of 215 N weight placed on horizontal table. Find coefficient of friction.
17. Find out magnitude of a push inclined at 30º to the horizontal required to the horizontal required to move a block of weight of 450N resting on a horizontal surface having coefficient of friction is 0.36.

Assignment – 6

1. Draw displacement diagram for work done by constant force.
2. Define work and power. Write their unit as per SI and MKS system.
3. Define kinetic energy and potential energy.
4. What are the different forms of energy?
5. State law of conservation of energy.
6. Define ‘work’ ‘power’ and ‘energy’. Give theire units as per S.I. System

7. Define Torque with its unit.
8. Explain Force-displacement diagram.
9. Calculate horsepower required to lift a block weighing 170 KN by 16 meter in 7 minutes.
10. A locomotive pull a train with a uniform velocity of 70 Kmph and exert attractive pull of 30 KN. Calculate work done by locomotive in 20 minutes and power of locomotive.
11. A water tank of 5000 litres capacity is at 20 m above the ground. It is to be filled within 15 minutes from a tank at ground level by a pump. Calculate power of the pump required.
12. A woman pulls water by bucket from a well of 30 m depth. The bucket is having a small hole and is leaking uniformly. When bucket is full of water its weight is 180 N and at the top of well its weight is 100 N. Calculate the work done by a woman in pulling one bucket of water. Neglect the weight of rope.
13. A water tank of 50000 litre capacity is at 20 m height from ground.It is to be filled in 25 minutes by a pump. calculate required power of the pump in kW.
14. An engine pulls a train with uniform velocity of 90 kmph and exerts a pull of 20 kN. calculate work done by engine in 30 minutes.
15. A water tank of 5m X 5m X 1m in size is at 20m height from ground level. Find out the power required to fill the tank in 30 minutes if the efficiency of pump is 80%.
16. Find out the power required to lift a load of 15000 kg at a height of 20 mm within 10 minute time.
17. A train weighing 600 KN runs at a speed of 36 KMPH. Calculate Kinetic Energy of the train.
18. An engine weighing 150 KN is capable of generating average of 72KMPH in 4 minutes on level track. If resistance due to friction and others be 80 N/KN, calculate horse power of an engine.
19. Calculate power required to life up a block weighing 150 KN by 20 m in 10 minutes.

Assignment – 7

1. Explain self locking, output of a machine and reversible machine.
2. Explain Law of simple machine with diagram.
3. Define (1) velocity ratio (2) mechanical advantage (3) Ideal machine. (4) efficiency.
4. Draw a neat sketch of simple wheel and differential axle and label its parts. Write formula for VR.
5. Draw neat sketch of different system of pulley.
6. In a simple lifting machine an effort of 2 KN raised a load of 60 KN and effort of 3 KN raised a load of 100 KN. The velocity ratio of machine is 50.
   Determine:
   (1) Effort required lifting a load of 160 KN.
   (2) Maximum efficiency of machine.
   (3) State machine is reversible or self locking.
7. The velocity ratio of a machine is 10 and efficiency is 75%. Find load when effort is applied is 180 N.
8. In a lifting machine an effort of 90 N raised a load of 950 N and an effort of 450 N raised a load of 5700 N. Find the law of machine.

9. For a simple machine the law of machine is P=0.1W+3.0, calculate maximum mechanical advantage.
10. For a simple wheel and axle, the diameter of axle is 20 cm and diameter of wheel is 50 cm. Find an effort required to lift a load of 1000N when efficiency of machine is 80%
11. In a machine an effort of 75N was able to raise a load of 2.25 KN. The effort was found to move through a distance of 18m, when the load moved through a distance of 47cm. Find (1) mechanical advantage (2) velocity ratio.
12. A law of machine for simple machine is p= (0.1w+3.0).find out effort required to lift of 70KN.Also calculate maximum mechanical advantage.
13. A simple machine lifts a load of 50 KN by an effort of 10 KN. If the maximum mechanical advantage is 10. Calculate an effort required to lift a load of 120 KN.
14. Calculate maximum mechanical advantage and maximum efficiency of a machine having law of machine P = 1/20 * W + 135 and V.R. = 25.
15. Prove that the maximum efficiency for a simple lifting machine to be self locking is 50%.
16. The velocity ratio of a machine is 10 and efficiency is 30%. Determine the effort required to lift a load of 180KN.

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NOBLE GROUP OF INSTITUTIONS

QUESTION BANK

Subject code: - 3320003
Subject Name: - Advance Mathematics

Branch: - Civil and Mechanical

Section : 1 Questions for mark 1

1. $\frac{d}{dx}x^n$ =.....
2. $\frac{d}{dx}(e^x + x^6 + e^e)$ =.....
3. $\frac{d}{dx}a^a$ =.....
4. $\frac{d}{dx}e^{5x}$ =.....
5. $\frac{d}{dx}x^x$ =.....
6. $\frac{d}{dx}\sqrt{x\sin x}$ =.....
7. $\frac{d}{dx}cotx$ =.....
8. $\left(\frac{d}{dx}sec^{-1}x\right)_{x=-3}$ =.....
9. $\frac{d}{dx}\tan^n x$ =.....
10. $\frac{d}{dx}(sin^2x + cos^2x)$ =.....
11. $\frac{d}{dx}(3sinx - 4sin^3x)$ =.....

12. $\frac{d}{dx}(sin^{-1}x + cos^{-1}x) =$.....

13. $\frac{d}{dx}\log(\cot x) =$.....

14. $\frac{d}{dx}x^x =$.....

15. $\frac{d}{dx}e^{-\log x} =$.....

16. $\frac{d}{dx}(x\log x) =$.....

17. $\frac{d^2}{dx^2}(x\log x) =$.....

18. $\frac{d}{dx}\log\sqrt{x^2+1} =$.....

19. $f(x) = \log\sqrt{x^2+1}$, then $f'(0) =$.....

20. If $x = at$ and $y = \frac{a}{t}$, then $\frac{dy}{dx} =$.....

21. If $f(x) = e^{2x}$, then $f'(0) =$.....

22. If $x^2 + y^2 = 29$, then $\frac{dy}{dx}$ at point $(2, 5)$=.....

Section : 2 Questions for mark 3

1. Find $f'(x)$ for followings using first principal(By definition):
   (a) $f(x) = \cos x$.
   (b) $f(x) = \tan x$.
   (c) $f(x) = a^x$.
   (d) $f(x) = e^x$.
   (e) $f(x) = \log x$.
   (f) $f(x) = c$.

(g) $f(x) = x^3 + 5x$.

(h) $f(x) = x^2 + 2x - 1$.

(i) $f(x) = \sin^2 x$.

(j) $f(x) = \cos^4 x$.

(k) $f(x) = \tan^3 x$.

(l) $f(x) = f(x) = \dfrac{1 - \cos x}{\sin x}$.

(m) $f(x) = x \cos x$.

2. Find $\dfrac{dy}{dx}$ for followings:

(a) $y = \dfrac{4x^2 - 5x + 1}{x^5 - x^4}$.

(b) $y = \dfrac{x^2 - 1}{x^2 + 1}$.

(c) $y = e^x \sec x$.

(d) $y = e^3 x \cos 2x$.

(e) $y = \dfrac{\log x}{x}$.

(f) $y = \log\left(x + \sqrt{1 + x^2}\right)$.

(g) $\log y = x^x \log x$.

3. The equation of motion of particle is $s = t^3 - 6t^2 + 8t - 4$. Then find the velocity and acceleration when $t = 3sec$.

4. If $f(x) = \dfrac{\sin x}{\sin x - \cos x}$ and $g(x) = \dfrac{\cos x}{\sin x - \cos x}$, then show that its derivatives are equal.

5. If $x^3 + y^3 = x^3 y^3$, then prove that $\dfrac{dy}{dx} + \dfrac{y^4}{x^4} = 0$. Also prove that $\dfrac{dy}{dx} - \dfrac{x^2(1 - y^3)}{y^2(x^3) - 1} = 0$.

6. If $x^2 + xy + y^2 = 0$, then find $\dfrac{dy}{dx}$.

7. If $y = A\cos pt + B\sin pt$, then prove that $\dfrac{d^2y}{dt^2} + p^2y = 0$.

8. If $x = a\cos^4\theta$ and $y = n\sin^4\theta$, then prove that $\dfrac{dy}{dx} + \sqrt{\dfrac{by}{ax}} = 0$.

9. If $y = \log\left(\dfrac{\sqrt{x^2+a^2}+x}{\sqrt{x^2+a^2}-x}\right)$, then prove that $\sqrt{x^2+a^2}\dfrac{dy}{dx} = 2$.

Section : **3 Questions for mark 4**

1. Find $\dfrac{dy}{dx}$ for followings:

   (a) $x + y = \sin(xy)$.

   (b) If $x = \dfrac{1}{2}\left(t + \dfrac{1}{t}\right)$ and $y = \dfrac{1}{2}\left(t - \dfrac{1}{t}\right)$.

   (c) $x - y = \sin(x + y)$.

   (d) $y = (\sin x)^x$.

   (e) $y = x^x \log x$.

   (f) $y = \cos x^x + \sin x^x$.

   (g) $y = (\log x)^{\cos x}$.

   (h) $x = a(\theta + \sin\theta)$ and $y = b(1 - \cos\theta)$.

   (i) $x = a\left(\cos t + \log\tan\dfrac{t}{2}\right)$ and $y = a\sin t$.

   (j) $x = a(\cos\theta + \theta\sin\theta)$ and $y = a(\sin\theta - \theta\cos\theta)$.

   (k) $y = \sin^{-1}\left(3x - 4x^2\right)$, $0 < x < \dfrac{1}{2}$.

   (l) $y = \tan^{-1}\dfrac{2x}{1-x^2}$, $x \neq \pm 1$.

   (m) $y = \cos^{-1}\dfrac{1-x^2}{1+x^2}$.

   (n) $y = \sin^{-1}\dfrac{2x}{1+x^2}$.

   (o) $y = \tan^{-1}\dfrac{3x - x^3}{1-3x^2}$, $|x| > \dfrac{1}{\sqrt{3}}$.

(p) $y = \sin^{-1}\left(2x\sqrt{1-x^2}\right)$, $\dfrac{1}{\sqrt{2}} < x < 1$.

2. $x = \sqrt{a^{\sin^{-1}t}}$ and $y = \sqrt{a^{\cos^{-1}t}}$, then prove that $\dfrac{dy}{dx} = \dfrac{-y}{x}$, when $|t| < 1$.

3. If $x = at^2$ and $y = 2at$, then prove that $y\dfrac{d^2y}{dx^2} + \left(\dfrac{dy}{dx}\right)^2$.

4. If $x^y y^x = 1$, then find $\dfrac{dy}{dx}$.

5. If $y = \dfrac{1}{x^2 - 5x + 6}$, then prove that $\dfrac{d^y}{dx^2} = \dfrac{2}{(x-3)^3} - \dfrac{2}{(x-2)^3}$.

6. If $y = e^{\tan^{-1}x}$, then prove that $(1+x^2)y_2 + (2x-1)y_1 = 0$.

7. If $\log\left(x + \sqrt{1+x^2}\right)$, then prove that $(1+x^2)y_2 + xy_1 = 0$.

8. If $y = 2e^{3x} + 3e^{-2x}$, then prove that $y_2 - y_1 - 6y = 0$.

9. If $y = ae^{kx} + be^{-kx}$, then prove that $y_2 = k^2 y$.

10. If $y = a\cos(\log x) + b\sin(\log x)$, then prove that $x^2y_2 + xy_1 + y = 01$.

11. If $y = \sin(\sin x)$, then prove that $y_2 + y_1 \tan x + y\cos^2 x = 0$.

12. If $y = e^x \sin x$, then prove that $y_2 - 2y_1 + 2y = 0$.

13. If $y = \log\sin x$, then prove that $y_2 + y_1^2 + 1 = 0$.

14. If $y = e^{m\tan^{-1}x}$, then prove that $(1+x^2)y_2 + (2x-m)y_1 = 0$.

15. The distance of moving particle is given by $s = t^3 - 3t^2 + 4t + 3$. Find the velocity and acceleration at $t = 2$.

16. The distance of a moving particle is given by $s = t^3 - 3t^2 + 4t + 3$. Find the velocity at $t = 0$. And find acceleration at velocity, $v = 0$.

17. Equation of motion of a particle is $t^3 - 5t^2 + 3t$. When particle comes to rest? Find acceleration at that time.

18. Find Minimum and Maximum Value of the function $f(x) = x^3 - 4x^2 + 5x + 7$.

Section : 1 Questions for mark 1

1. If $f(x) = log(e^x)$ then $f(-1) =$.....
2. If $f(x) = log(e^x)$ then $f(0) =$.....
3. $(f^{-1} \circ f)(x) =$ ..... $= (f \circ f^{-1})(x)$
4. If $f(x) = \dfrac{1-x}{1+x}$, then $f(x) \cdot f(-x) =$.....
5. If $f(x) = \dfrac{6x+5}{7}$, then $f^{-1}(x) =$.....
6. If $f(x) = \cos x$ then $f\left(\dfrac{3\Pi}{2} - x\right) =$.....
7. If $f(x) = x^2$, then $f(x+1) - f(x-1) =$.....
8. If $f(x) = ax + \dfrac{1}{x}$ and $f\left(\dfrac{1}{5}\right) = \dfrac{28}{5}$, then $a =$.....
9. If $f(x) = \dfrac{x}{x-1}, (x \neq 1)$, then $\dfrac{f(a)}{f(a+1)} =$.....
10. If $f(x) = \dfrac{x}{x+1}, (x \neq -1)$, then $\dfrac{f\left(\dfrac{a}{b}\right)}{f\left(\dfrac{b}{a}\right)} =$.....
11. Find $f^{-1}(x)$ of following functions:
    (a) $f(x) = 2x + 5$
    (b) $f(x) = 7x + 2$
    (c) $f(x) = \dfrac{6x+5}{7}$
    (d) $f(x) = x^3$
    (e) $f(x) = \sqrt{x^3}$
    (f) $f(x) = \dfrac{1-x}{1+x}$
12. $\lim\limits_{x \to 1} [x]^{\frac{1}{x-1}} =$.....
13. Find $\lim\limits_{n \to \infty} \dfrac{\sin n\theta}{n} =$.....

14. $\lim_{x\to 0} \frac{\sin x}{x}$ =.....

15. $\lim_{x\to 0} \frac{\sin 2x}{x}$ =.....

16. $\lim_{x\to 0} \frac{e^x - 1}{x}$ =.....

17. $\lim_{x\to 0} \frac{6^x - 2^x}{x}$ =.....

18. $\lim_{x\to \infty} x\left(\sqrt[x]{2} - 1\right)$ =.....

19. $\lim_{x\to \Pi} \frac{tanx}{\Pi - x}$ =.....

20. $\lim_{x\to a} \frac{sinx - sina}{x - a}$ =.....

21. $\lim_{x\to a} \frac{sinx - sina}{\sqrt{x} - \sqrt{a}}$ =....., $(a > 0)$.

Section : 2 Questions for mark 3

1. If $f(x) = 2x+1$ and $g(x) = x^2-2$ then find $(f+g)(x)$, $(f-g)(x)$, $(fg)(x)$, $(\frac{f}{g})(x)$, $(\frac{g}{f})(x)$, $f^{-1}(x)$, $g^{-1}(x)$, $(f \circ g)(x)$, $(g \circ f)(x)$, $(f \circ f^{-1})(x)$, $(g \circ f^{-1})(x)$.

2. If $f(x) = log\left(\frac{x}{x-1}\right)$, then show that $f(a+1) + f(a) = log\left(\frac{a+1}{a-1}\right)$.

3. If $f(x) = \frac{a+bx}{b+ax}$, then prove that $f(x) \cdot f\left(\frac{1}{x}\right) = 1$.

4. If $f(x) = log_2 x$ and $g(x) = x^8$ then prove that $(f \circ g)(x) = 8f(x)$.

5. If $f(x) = log\left(\frac{1-x}{1+x}\right)$, then prove that $f\left(\frac{2x}{1+x^2}\right) = 2f(x)$.

6. Evaluate: $\lim_{x\to 0} \frac{1 - cosx}{x^2}$.

7. Evaluate: $\lim_{x\to 2} \frac{x^4 - 8x^2 + 16}{x^3 - 3x^2 + 4}$.

8. Find $\lim_{x\to 1} \frac{x^3 - x^2 + x - 1}{x^2 - 1}$.

9. $\lim_{x\to 0} \frac{3sinx - sin3x}{x^3}$.

10. $\lim_{x\to 0} \frac{4^x - 3^x}{x}$.

11. $\lim_{x\to \infty} \left(\frac{x+1}{x+2}\right)^x$.

Section : 3 Questions for mark 4

1. If $f(x) = log\left(\frac{1-x}{1+x}\right)$, then prove that
   (a) $f(x) = f^{-1}(x)$
   (b) $f(x) \cdot f(-x) = 1$
   (c) $f(x) + f(\frac{1}{x}) = 0$
   (d) $f(x) - f(\frac{1}{x}) = 2f(x)$
   (e) $f\left(\frac{2x}{1+x^2}\right) = 2f(x)$.

2. If $f(x) = \frac{x+3}{4x-5}$ and $t = \frac{3+5x}{4x-1}$ then show that $x = f(t)$.

3. If $f(x) = \frac{1+x}{1-x}$ then prove that $x(f(x)) + 1 = 0$.

4. Evaluate: $\lim_{x\to 2} \frac{x\sqrt{x} - 2\sqrt{2}}{x-2}$.

5. Evaluate: $\lim_{\theta\to\frac{\Pi}{4}} \frac{sin\theta - cos\theta}{\theta - \frac{\Pi}{4}}$.

6. Evaluate: $\lim_{x\to} \frac{x\, log(1+x)}{1-cosx}$.

7. Evaluate: $\lim_{n\to\infty} \frac{5^{n+1} - 7^{n+1}}{5^n + 7^n}$.

8. Prove that $\lim_{h\to 0} \frac{(5+2h)^{-1} - 5^{-1}}{h} = \frac{-2}{25}$.

9. Find $\lim_{x\to 0} \frac{x(1-\sqrt{1-x^2})}{\sqrt{1-x^2}(sin^{-1}x)^3}$.

10. Give the example of $\lim_{x\to a}(f(x) + g(x))$ is exists but $\lim_{x\to a} f(x)$ and $\lim_{x\to a} f(x)$ are not exists.

11. $\lim_{x\to\frac{\Pi}{3}} \frac{sin\left(x - \frac{\Pi}{3}\right)}{2cosx - 1}$.

12. $\lim_{x\to 0} \frac{2x - 3sin^{-1}x}{3x - 5tan^{-1}x}$.

Section : 1 Questions for mark 1

1. $\int e^{x \log a} dx =$.....
2. $\int e^x \left(\frac{1}{x} - \frac{1}{x^2}\right) =$.....
3. $\int_{-1}^{1} \sin^3 x \cos^4 x dx =$.....
4. $\int \sqrt{1 + \sin 2x} dx =$.....
5. $\int \frac{1}{1+x^2} dx =$.....
6. $\int (\sin^2 x + \cos^2 x) dx =$.....
7. $\int \frac{1}{\sqrt{a^2 - x^2}} dx =$.....
8. $\int \frac{1}{x^2 + 25} dx =$.....
9. $\int \cos(ax + b) dx =$.....
10. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos x dx =$

Section : 2 Questions for mark 3

Integrate the followings:

1. $\int x^3 \tan^5(x^4) \sec^2(x^4) dx.$
2. $\int \frac{e^x(1+x)}{\sin^2(xe^x)} x$
3. $\int \sin 5x \sin 6x dx.$
4. $\int \frac{3x^2 - 2x}{x+4} dx.$
5. $\int \cos(\log x) dx.$
6. $\int e^x \left(\frac{1 + \sin x}{1 - \cos x}\right) dx.$

7. $\int \frac{x^4+x^2+1}{x^2+1}dx.$

8. $\int \frac{2+3\sin x}{\cos^2 x}dx.$

9. $\int e^{\tan x}\sec^2 x dx.$

10. $\int xe^x dx.$

11. $\int_1^e \frac{(\log x)^n}{x}dx.$

Section : 3 Questions for mark 4
Do as direct:

1. $\int_0^{\frac{\pi}{2}} \frac{\cos x-\sin x}{1+\sin x\cos x}dx.$

2. $\int_0^1 \frac{1}{1+\sqrt{1-x^2}}dx.$

3. $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\cos x}+\sqrt{\sin x}}dx.$

4. $\int_0^{\frac{\pi}{2}} \log(\tan x)dx.$

5. Find the area of a region bounded by $y = 3x^2$, $x = 2$, $x = 3$ and x-axis.

6. Find the area of a region bounded by the curve $y^2 = 4x$ and $x = 2$.

7. Find the volume of a sphere of radius r by method of integration.

8. Using integration find the area of circle $x^2 + y^2 = a^2$.

Subject/ Subject Code	Semester/ Branch	Question Bank
MSM / 3321902	2nd – Mech	GTU EXAM

Chapter-1

Q-1 Explain the construction properties of Ionic or Electrovalent bond.
Q-2 Explain secondary bond and state its characteristics.
Q-3 Write properties of metallic bonds.
Q-4 Write properties of covalent bonds.
Q-5 List factors to be considered during selection of materials
Q-6 Write short note on physical properties of materials.
Q-7 Explain B.C.C, F.C.C, H.C.P structure with its neat figures.
Q-8 Explain effects of grain boundary and grain size on the properties of metal.
Q-9 Write short note on super conductivity.
Q-10 Define following terms
(a).Space lattice (b).Crystal lattice (c). Unit cell (d). Melting point (e).Porosity
(f). Temp coefficient of Resistance (g). Dielectric strength (h).Permeability
(i). Thermal conductivity (j).Thermal diffusivity (k). Spelling

Chapter-2

Q-1 What is phase diagram?
Q-2 Classify equilibrium diagrams
Q-3 Explain time temperature transformation (TTT) curve.
Q-4 List alloying elements added to steel
Q-5Explain pit furnace with neat figure.
Q-6Describe normalizing process.
Q-7Write definition of Equilibrium diagram.
Q-8Write short note on solid solution.
Q-9 List purpose of annealing &Differentiate between annealing heat treatment and normalizing heat treatment process.
Q-10Draw and explain in brief Iron carbon diagram.
Q-11 Write short note on equilibrium diagram of lead- tin
Q-12 Draw neat diagram of any six heat treatment furnaces and labels parts in it
Q-13 Draw part of iron carbon equilibrium diagram showing heat treating temperature for carbon steel
Q-14 Write the various types of quenching mediums and its applications.
Q-15 Define following terms
(a). Austenite (b). Critical points (c). Carburising (d). Nitriding

Chapter-3

Q-1 Explain optical principal of microscope with neat figure.
Q-2 Explain Optical Principle of metallurgical Microscope with line diagram.
Q-3State the sequential steps of preparing a micro-specimen.
Q-4Differentiate between microstructure and macrostructure.
Q-5Draw the neat sketch of metallurgical microscope with component's nomenclature
Q-6Write the procedure to prepare the metal specimen.
Q-7 Write short note on preparation of micro specimen of cast iron
Q-8What are the precautions to be taken while using metallurgical microscope?

Chapter-4

Q-1 Classify cast iron .give difference between white cast iron and grey cast iron.
Q-2 Classify ferrous metals
Q-3 State the effect of phosphorus, sulphur, silicon, manganese as impurities on C.I.
Q-4Write the properties of copper and give four use of copper, with reasons for its selection.
Q-5Compare high carbon steel and tool steel.
Q-6Explain cooling method of alloy steel as per BIS.
Q-7Differentiate brass and bronze.
Q-8Write the types of cast iron with properties and applications.
Q-9Write short note on designation of plain carbon steel as per BIS with example.
Q-10Give the name of alloying elements used in alloy steel manufacturing. Give carbon content range presents in low carbon steel and stainless steel.
Q-11 State the composition and application of following
(a) Grey cast iron (b) White cast iron (c) Mild steel
(d) Tool steel (e) Alloy steel (f) plain carbon steel

Chapter-5

Q-1 State merits and demerits of adhesive materials.
Q-2 What are the ceramic materials? Give the classification of ceramic materials.
Q-3 Write the difference between thermoplastic and thermosetting plastics.
Q-4 Give the classification of non-metallic materials.
Q-5 State the use of
1. Refractory materials 2. Insulators materials
3. Rubber materials 4. Adhesives materials
Q-6 List characteristics of any four plastics with their use
Q-7 Give the names of insulating materials used and state its use.

Chapter-6

Q-1 Explain uniform corrosion and pitting corrosion.
Q-2 Explain galvanic and crevice corrosion
Q-3 State industrial application of electrolysis.
Q-4Write the various types of corrosion occur in metal with reasons.
Q-5 Write short note on galvanic series.

Chapter-7

Q-1 Define powder metallurgy and explain basic concept and application of powder metallurgy
Q-2 Write short note on powder metallurgy and also state its merits and demerits
Q-3 List method of powder manufacturing and explain any two
Q-4 Explain Cloud Point and Pour Point For Lubricating Oils.
Q-5 Write short note on paints and varnish.
Q-6 List properties of oil and explain any three
Q-7 Explain sintering process.
Q-8 Define following terms.
(a). Viscosity (b). Cloud point and pour point (c). Flash point

SUBJECT/ SUBJECT CODE	SEMESTER/ BRANCH	FACULTY NAME
MD/ 3321901	2ND / MECHANICAL	PRANAV PANDYA

Chapter - 1
[MULTIVIEW REPRESENTATION/ SECTIONAL ORTHOGRAPHIC]

Q – 1: Draw symbols for first angle projection method and third angle projection method

Q – 2: Draw following views of fig 1 using "First Angle Projection Method."

(1) Sectional Front View

(2) Top View

Q – 3: Explain the types of sections.

Q – 4: Draw following views of fig. - 2 using "First Angle Projection Method."

(1) Front View

(2) Sectional side view.

Q – 5 Draw following views of fig.-3 using "First Angle Projection Method."

(1) Left Hand Side View

(2) Bottom View

Q – 6: Explain rules for section lines.

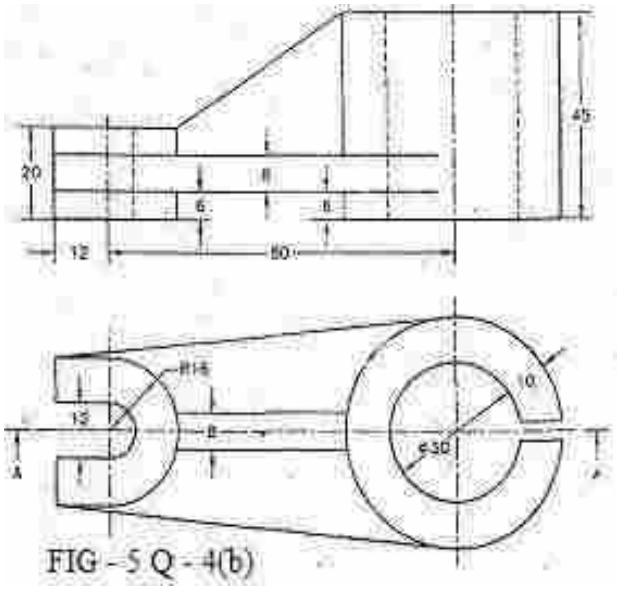
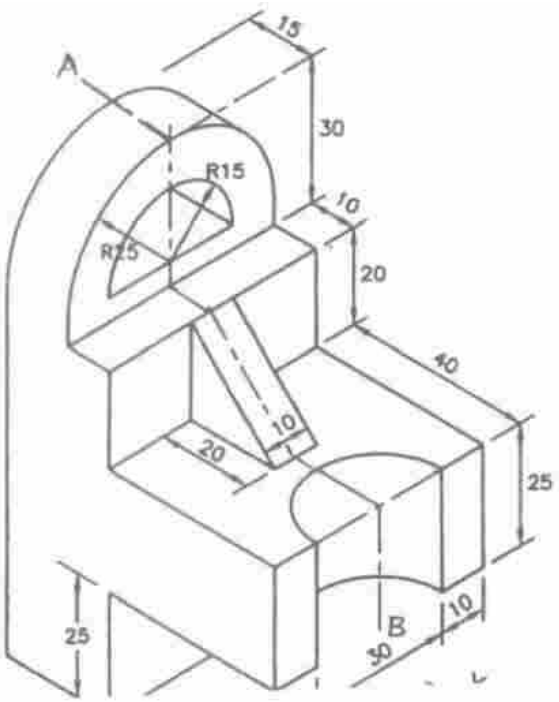
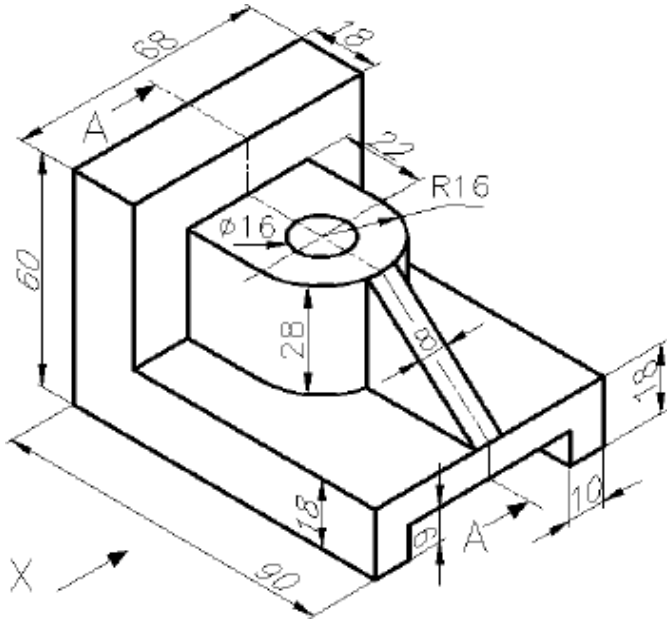

20
6
8
12
80
45
R16
13
8
ϕ30
10

FIG - 5 Q - 4(b)


A
15
30
R15
R15
10
20
40
10
20
25
25
B
10
30


68
18
A
20
R16
ϕ16
60
28
10
18
18
10
C
A
X
90

Chapter - 2
[PROJECTIONS AND SECTION OF SOLIDS]

Q – 1: A hexagonal prism of base side 30 mm and axis length 60 mm is resting on HP on one of its bases with two of the vertical faces perpendicular to VP. It is cut by a plane inclined at 600 to HP and perpendicular to VP and passing through a point at a distance 12 mm from the top base. Draw its front view, sectional top view and true shape of section.

Q – 2: A cylinder of 60 mm diameter and axis 80 mm long is resting on its base on H.P. It is cut by a sectional plane which makes an angle of 450 with H.P. and passing through a point on the axis 25 mm below the top base. Draw front view, sectional top view, and true shape of section

Q – 3: A square prism having side of base 30 mm and height 45 mm is resting on HP on one of its edge of base .The edge on which it rests on HP makes 45 º with VP. The base of the prism makes 30 º with HP or the axis makes 60 º with HP

Q – 4: A Pentagonal pyramid, base 30mm side and axis 75 mm long, is resting on its base on the H.P. with one edge perpendicular to the V.P. It is cut by a section plane perpendicular to the V.P., inclined at 45° to the H.P. and intersecting the axis at a point 35mm above the base. Draw elevation, sectional plan & true shape of section.

Q – 5 A transparent cylindrical container, diameter of base 60mm and height 75mm is full of water. It is tilted by 60° from vertical so that some water from it is drained out. Draw the surface of water in plan and elevation.

Q – 6: A hexagonal pyramid having side of base 35 mm and height 55 mm is resting on H.P. with two sides of base perpendicular to V.P. is cut by an A.I.P, inclined to H.P by 45º, passing through a point 25mm away from apex on the axis. Draw three projections with sections and the true shape of the section.

Q – 7: What is true shape of section in section of solids?

Chapter - 3
[INTERSECTION OF SOLIDS]

Q – 1: A square prism of base side 60 mm rests on one of its ends on the HP with the base sides equally inclined to the VP. It is penetrated fully by another square prism of base side 45 mm with the base side equally inclined to the HP. The axes intersect at right angles. The axis of the penetrating prism is parallel to both the HP and the VP. Draw the projections with their line of intersection.

Q – 2: A horizontal cylinder of diameter 40 mm penetrates into a vertical cylinder of diameter 60 mm. The axes of the cylinders intersect at right angles. Draw the curves of intersection when the axis of the horizontal cylinder is parallel to the VP.

Q – 3: A vertical square prism, base 50mm having its faces equally inclined to V.P. is completely penetrated by a horizontal cylinder of 40mm diameter, the axis of which

parallel to V.P. and 6mm away from that of the prism. Draw its projections showing curves of intersection.

Q – 4: A square pipe of 50mm side has a similar branch of 30mm side. The axis of the main pipe is vertical and is intersected by the axis of the branch at an angle of 30° to the H.P. All the faces of pipes are equally inclined to V.P. Draw its projections showing Line of intersection.

Q – 5 A vertical square prism, base of 80 mm side is completely penetrated by a horizontal square prism base 35 mm side so that their axis are 6 mm apart .The axis of horizontal prism is parallel to VP ,while the faces of both prisms are equally inclined to the VP. Draw the projections of the prisms showing

Q – 6: A vertical cone, diameter of base 60 mm and axis 100 mm long is standing on H.P. on it's base. A cylinder of 35mm diameter completely penetrated in the cone. The axes of the cylinder is parallel to H.P. and V.P. and intersect the axis of cone at a point 30 mm above the base and on the axis of cone. Draw projections of the solids showing curves of intersection.

Chapter - 4
[DEVLOPMENT OF SURFACE]

Q – 1: A pentagonal pyramid, side of base 50 mm and height 80 mm rests on its base on the ground with one of its base sides parallel to V.P. A section plane perpendicular to VP and inclined at 30° to H.P cuts the pyramid, bisecting its axis. Draw the development of the truncated pyramid.

Q – 2: A cylinder of diameter of base 40 mm and height 50 mm is standing on its base on HP. A cutting plane inclined at 45° to the axis of the cylinder passes through the left extreme point of the top base. Develop the lateral surface of the truncated cylinder.

Q – 3: Draw the development of given pyramid in fig. - 1.

Q – 4: Draw the development of given cylinder in fig. - 2.

Q – 5: Draw the development of given solid in fig. - 3.

Q – 6: Draw the development of given solid in fig - 4. Consider angel as 45°.

Q – 7: Draw the development of given pyramid in fig. - 5.

Q – 8: Draw the development of given cylinder in fig - 6.

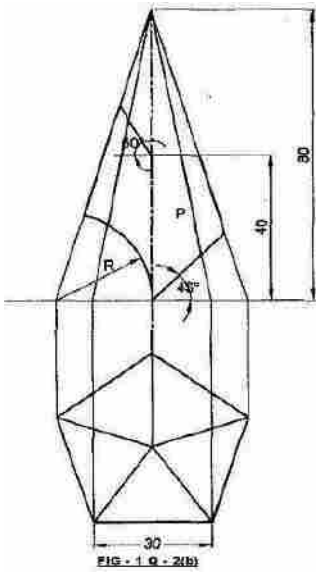


FIG - 1 Q - 2(b)

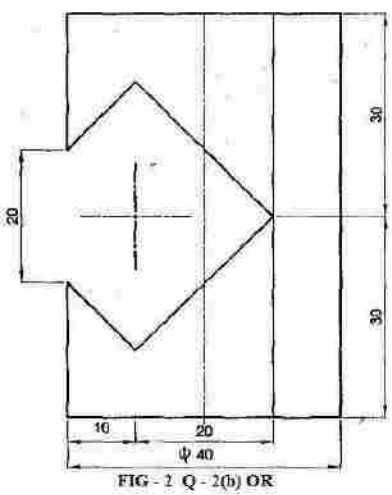
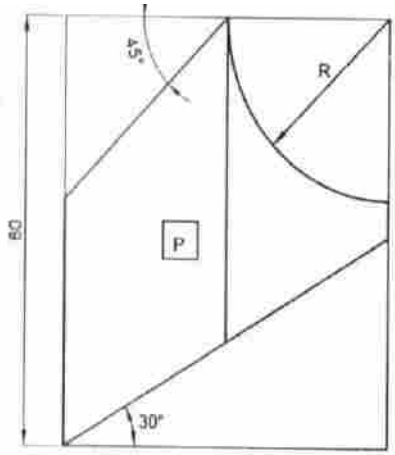


FIG - 2 Q - 2(b) OR



SQUARE PRISM
BASE SIDE 30 mm

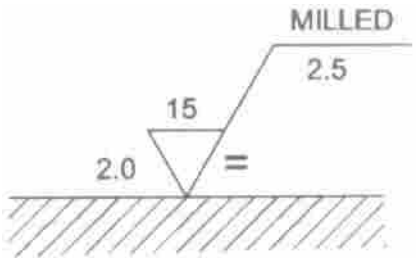
Chapter - 5
[DRAFTING SYMBOLS/ WELDED JOINTS, PIPING LAYOUTS]

Q – 1: draw symbols for the following
(1) Reducer & safety valve
(2) Flanged pipe fittings
(3) Pipeline for air & GAS
(4) Pipeline for refrigerant and hot water
(5) Single j joint and double v joint
(6) Elbow 45 & T joint
(7) Vacuum & oil
(8) Globe valve & safety Valve.
(9) Plug Weld & Seam Weld.
(10) Lateral & Check Valve.

Q – 2: draw sketch for the following.
(1) Knuckle thread
(2) Square thread and Acme thread.
(3) Countersunk head rivet
(4) Pan head rivet and Snap head rivet
(5) UNION, Reducer. AND coupling
(6) 90^0 elbow and Nipple
(7) Hex. head bolt and nut.
(8) Ring & Wing Nut.
(9) Sellers & B.A. Thread.

Q – 3: What is bill of material?

Q – 4: Draw surface roughness symbol for following details.
(1) Roughness Value = 6.3 microns
(2) Production Methods = Grinding
(3) Sampling Length = 60 mm
(4) Machining Allowance = 2 mm
(5) Type of Lay = Circular



Q – 5 Write details of given surface roughness symbol for fig: 1.

Chapter - 6
[DETAIL AND ASSEMBLY DRAWING]

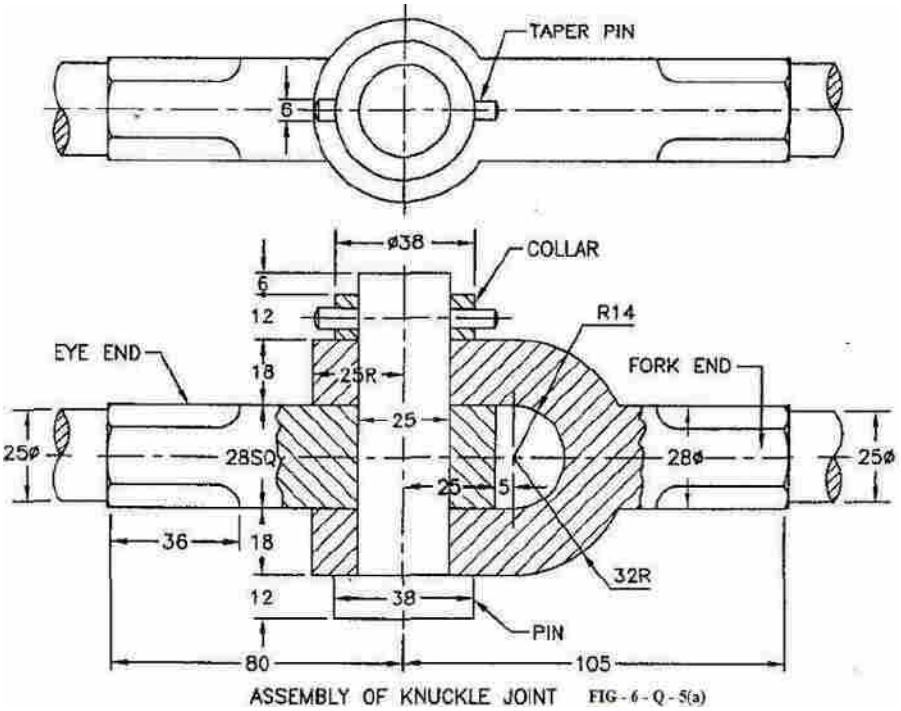
Q – 1: What type of fastener is used for making joint of boiler shell?

Q – 2: Draw free hand neat sketch of hex. head bolt and nut assembly with washer

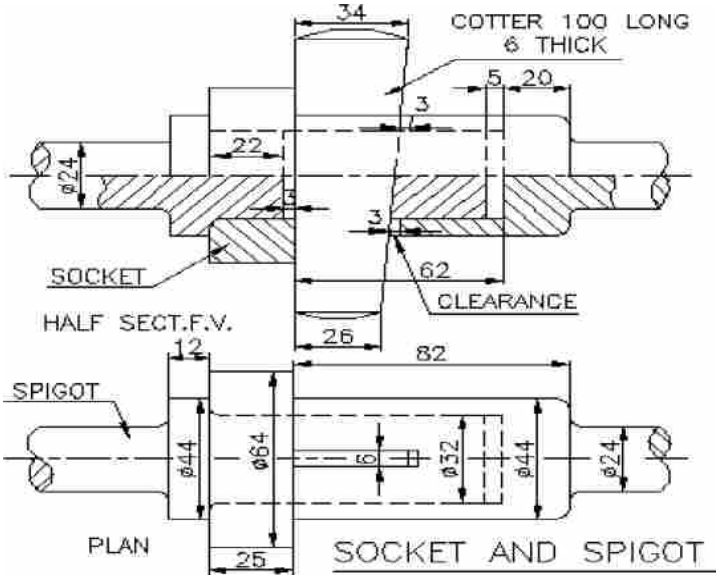
Q – 3: An assembly drawing of "Knuckle Joint" is shown in fig – 1. Draw detailed drawing of each part in two views using "First Angle Projection Method." Prepare part list.

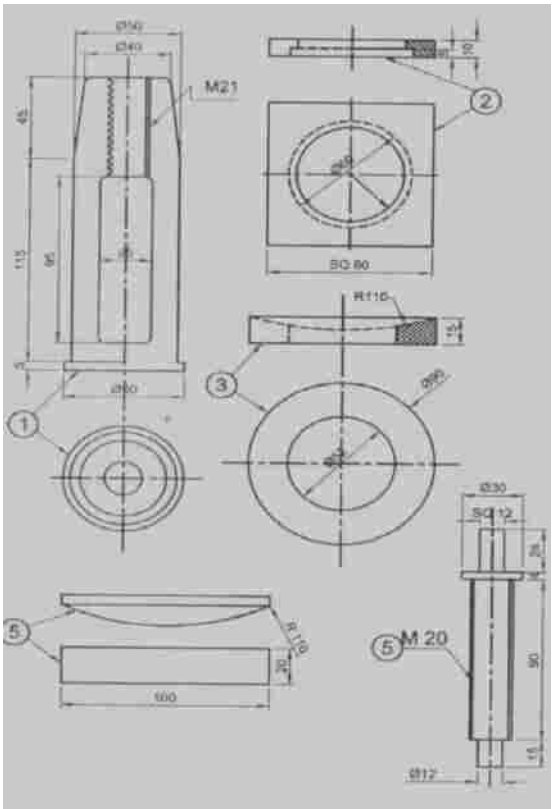
Q – 4: An assembly of drawing of "Socket & Spigot Joint" is shown in fig – 2. Draw detailed drawing of each part in two views using "First Angle Projection Method." Prepare part list.

Q – 5 A Detail of drawing of tool post is shown in fig – 3. Draw top view & sectional front view of assembly and bill of material. (Use First Angle Projection Method.)



ASSEMBLY OF KNUCKLE JOINT FIG - 6 - Q - 5(a)


34
COTTER 100 LONG
6 THICK
5
20
3
22
ø24
3
SOCKET
62
CLEARANCE
HALF SECT.F.V.
26
12
82
SPIGOT
ø44
ø64
6
ø32
ø44
ø24
PLAN
25
SOCKET AND SPIGOT


M21
SQ 80
R110
M 20
SQ 12
Ø30
Ø12