## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
### B.Tech I Year I Semester Examinations, December - 2017
### ENGINEERING GRAPHICS
(Common to ME, MCT, MMT, MSNT)

Time: 3 hours

Max Marks: 75

**Answer all five questions**
**All questions carry equal marks**

- - -

1.a) Construct a diagonal scale to read up to 0.1 mm, and mark on it a distance of 6.63 cm. Take the scale as 3:1.

  b) Inscribe an ellipse in a parallelogram of sides $150 \times 100$ mm with an inclined angle of $120^0$. [7+8]

**OR**

2.a) Draw a parabola passing through three vertices of a triangle of sides 30, 45 and 60 mm. The corner of the triangle common to the 45 and 60 mm sides lies on the axis of parabola. Draw a tangent and normal at a point on the curve 20 mm from the axis.

  b) Construct a plain scale of RF = 1:50,000 to show kilometers and hectometers and long enough to measure upto 7 km. Mark a distance of 5.3 km on the scale. [7+8]

3. A divider opened at $40^0$ is placed on HP with its needle ends equidistant from V.P. If the height of hinged end of divider is 60 mm from H.P. and the distance between needle ends is 50 mm, draw the projections of the divider, and determine the a) true lengths of the divider legs, and b) inclinations of the legs with the HP and VP.

[7+8]

**OR**

4. A line AB, 80 mm long, makes an angle of $30^0$ with the VP, and lies in a plane perpendicular to both the HP and VP. Its end A is in the HP, and the end B is in the VP. Draw its projections and show its traces. [15]

5. A pentagonal prism is resting on one of the corners of its base in the HP. The longer edge containing that corner is inclined at 30 degrees to HP and the vertical plane containing that edge is inclined at $45^0$ to the VP. Draw the projections of the solid. [15]

**OR**

6. A tetrahedron of side 45 mm is resting with one of its faces on the HP. Draw its projections when the edge of the face lying on HP is parallel to and 15 mm in front of VP. [15]

7. A hexagonal pyramid of side of base 40 mm and height of axis 110 mm is resting on one of its inclined vertical surface on H.P. such that its axis remains parallel to the V.P. It is cut by a cutting plane which is inclined at an angle $45^0$ with H.P. and bisecting the axis of the pyramid. Draw front view, sectional top view. [15]

**OR**

8. A transition piece connects a square pipe of side 25 mm at the top and a circular pipe of 50 mm diameter at the bottom, the axes of both the pipes being collinear. The height of transition piece is 60 mm. Draw its development. [15]

9. An isometric view of a solid is shown in figure 1 below. Draw the front and top orthographic views of the solid. The dimensions may be assumed in suitable units and in proper proportion to the dimension shown in the figure 1. [15]
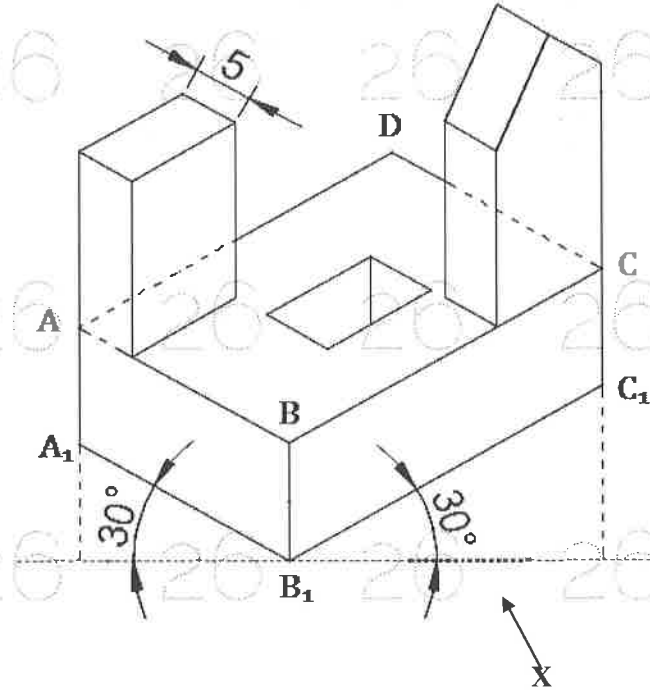


**Figure: 1**

OR

10. Draw the isometric view of the casting whose front and top views are shown in figure 2 below. All dimensions shown in the figure 2 are in mm. [15]
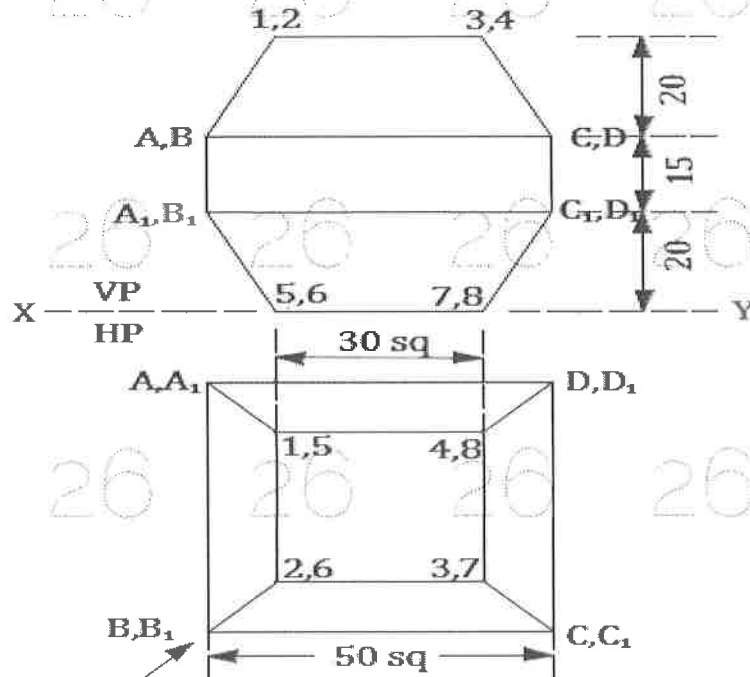


**Figure: 2**

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R16

Time: 3 hours                                                        Max. Marks: 75

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each
question carries 10 marks and may have a, b, c as sub questions.

## PART- A

(25 Marks)

| | | |
|---|---|---|
| 1.a) | Define unilateral and bilateral elements. | [2] |
| b) | Differentiate Independent and Dependent sources. | [3] |
| c) | What is parallel resonance? | [2] |
| d) | State maximum power transfer theorem. | [3] |
| e) | Define ideal and practical resistances. | [2] |
| f) | Define ripple factor. | [3] |
| g) | What is early effect? | [2] |
| h) | Compare CB and CC Configurations. | [3] |
| i) | Differentiate between BJT and JFET. | [2] |
| j) | Give applications of zener diode. | [3] |

## PART-B

(50 Marks)

2.a) Explain in detail the volt-ampere relationship of R, L and C elements with neat diagrams.
  b) Calculate the power absorbed by each component in the circuit shown in below Figure 1.
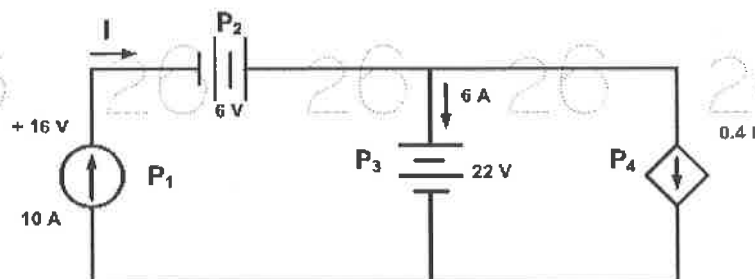
[5+5]



Figure: 1
OR

3.a) Explain in detail about the steady state analysis of a series RL circuit with sinusoidal excitation.
  b) Explain the concept of j-notation.                                              [7+3]

4.a) Show that the resonant frequency $\omega_0$ of an RLC series circuit is the geometric mean of $\omega_1$ and $\omega_2$, the lower and upper half power frequencies respectively.

b) A voltage $V = 50\angle 0^0$ V is applied to a series circuit consisting of fixed inductive reactance $X_L = 5$ ohms and a variable resistance R. Sketch the current locus diagram.

[5+5]

OR

5.a) State and explain Thevenin's theorem.

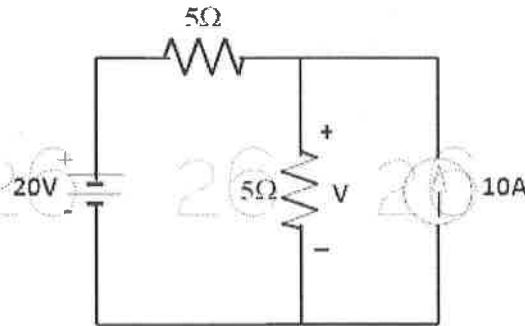b) Using Thevenin's theorem, find the voltage 'V' in the circuit shown in Figure 2. [4+6]



Figure: 2

6.a) Explain about a Fixed Bias Circuit, and derive the necessary DC currents and voltages.

b) Derive the expression for the stability "S" of a fixed bias Circuit. [6+4]

OR

7.a) Explain the operation of a full wave bridge rectifier with relevant waveforms.

b) Explain the necessity of filter circuit after the rectifier circuit. [6+4]

8.a) Explain the operation of a transistor with relevant diagrams.

b) Derive the relationship between $\alpha$ and $\beta$ of a transistor. [4+6]

OR

9.a) Explain compensation techniques with respect to BJT Biasing.

b) Draw the h-parameter model of a CB amplifier and derive the expressions for its voltage gain, current gain, input impedance and output impedance. [4+6]

10.a) Draw and explain the typical transfer characteristics of an n-channel JFET.

b) What is pinch-off voltage? Explain. [6+4]

OR

11.a) Explain the V-I characteristics of Tunnel diode.

b) Discuss the negative resistance property of tunnel diode. [6+4]

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**R13**

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
## B.Tech I Year Examinations, December - 2017
## MATHEMATICS-I
### (Common to CE, EEE, ME, ECE, CSE, CHEM, EIE, BME, IT, MCT, ETM, MMT, AE, AME, MIE, PTM, CEE, AGE)

Time: 3 hours                                                    Max. Marks: 75

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

## PART- A

(25 Marks)

1.a)   Find the rank of $\begin{bmatrix} 1 & -1 & 2 & 1 \\ 1 & 2 & 1 & 1 \\ 2 & 1 & 3 & 2 \\ 1 & -1 & 2 & 1 \end{bmatrix}$.                              [2]

b)   Find the nature of the quadratic form $x^2 + y^2 + 2xy$.                              [3]

c)   If $x = r\cos\theta$, $y = r\sin\theta$ then find the Jacobian $J\left(\dfrac{r,\theta}{x,y}\right)$.                              [2]

d)   State Rolle's mean theorem and explain its geometrical interpretation.                              [3]

e)   Evaluate $\int\limits_{0}^{\frac{\pi}{2}} Sin^3\theta Cos^5\theta d\theta$ using beta and gamma function.                              [2]

f)   Evaluate $\int\limits_{-1}^{1}\int\limits_{0}^{2}\int\limits_{0}^{3} (x+y+z)dxdydz$.                              [3]

g)   Find P.I of $\dfrac{1}{D^2+16} Sin4x$                              [2]

h)   Find the flow of the current in simple closed LR-circuit, initially the current is zero where $L = 2H$, $R = 4\Omega$ and source of the voltage $E(t) = e^t$, $t > 0$.                              [3]

i)   Find $L^{-1}\left(\dfrac{1}{s^2 - 2s + 5}\right)$                              [2]

j)   Let $L\{f(t)\} = \bar{f}(s)$, Prove that $L\{f(at)\} = \dfrac{1}{a}\bar{f}\left(\dfrac{s}{a}\right)$                              [3]

**PART-B**

2.a) If a, b, c are distinct non-zero numbers, show that the homogeneous system with coefficient matrix $\begin{bmatrix} a & b & c \\ a & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{bmatrix}$ has no non-trivial solution.

b) Find the Eigen values and Eigen vectors of $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. [5+5]

**OR**

3.a) Reduce the quadratic form $2x^2 + 2y^2 + 2z^2 + 2yz$ to canonical form and hence find the nature.

b) Find the value of 'k' such that the rank of A is 3, where $A = \begin{bmatrix} 1 & 1 & -1 & 0 \\ 4 & 4 & -3 & 1 \\ k & 2 & 2 & 2 \\ 9 & 9 & k & 3 \end{bmatrix}$. [5+5]

4.a) Examine the maxima and minima of $x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$.

b) Find the approximate value of $\sqrt[5]{245}$ by using Lagrange's mean value theorem. [5+5]

**OR**

5.a) Find the volume of the largest rectangular parallelepiped that can be inscribed in the ellipsoid $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} + \dfrac{z^2}{c^2} = 1$.

b) Verify Rolle's theorem for $\log\left[\dfrac{x^2 + ab}{x(a+b)}\right]$ on [a, b], $b > a > 0$. [5+5]

6.a) Define Beta function, Prove that $B(m,n) = B(n,m), m > 0, n > 0$.

b) Evaluate $\displaystyle\int_0^2 x\sqrt{2-x}\,dx$ using Beta and Gamma function. [5+5]

**OR**

7. Evaluate $\displaystyle\iint_R xy\,dxdy$ where R is the region bounded by x-axis and $x = 2a$ and the curve $x^2 = 4ay$. [10]

8.a) Solve $(1+y^2)dx = (\tan^{-1} y - x)dy$.

b) Find the orthogonal trajectory of the family of cardioids $r = a(1 - \cos\theta), a > 0$. [5+5]

**OR**

9.a)  Solve $(D^2 + 9)y = (x^2 + 1)e^{3x}$.

b)  Solve $(D^2 + a^2)y = Tan\,ax$.                                    [5+5]

10.a)  Find $L\left\{ \sqrt{t} + \dfrac{1}{\sqrt{t}} \right\}$ for $t > 0$.

b)  Solve the integral equation $f(t) = at + \displaystyle\int_0^t f(u)\sin(t-u)du$, $t > 0$.          [5+5]

**OR**

11.a)  Evaluate $\displaystyle\int_0^\infty e^{-t} \dfrac{\sin t}{t} dt$.

b)  Solve $y'' + 4y = 0$, $y(0) = 1$, $y'(0) = 6$  using Laplace transform.          [5+5]

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Code No: 51006

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year Examinations, December - 2017
**COMPUTER PROGRAMMING AND DATA STRUCTURES**
(Common to CE, EEE, ME, ECE, CSE, CHEM, EIE, IT, AE, BT, AME, MIE, PTM)

Time: 3 hours                                                                 Max. Marks: 75

**Answer any five questions**
**All questions carry equal marks**
- - -

1.a)   Explain Software Development Method.
  b)   What is flowchart? What is the use of flowchart?                          [7+8]

2.a)   Explain type identifiers in C.
  b)   Write a short note operator precedence and order of evaluation.           [7+8]

3.a)   Write a note on scope of a variable.
  b)   Explain various parameter passing mechanisms.                             [7+8]

4.a)   Explain pointer to function in detail.
  b)   Explain dynamic memory allocation.                                        [7+8]

5.a)   Distinguish between Structure and Union.
  b)   Explain Nested structure with example.                                    [7+8]

6.     Explain the following:
       a) getchar()          b) putchar()          c) EOF                        [15]

7.     Write a C program for sorting integers in ascending order using selection sort and explain
       with an example.                                                          [15]

8.     Write a 'C' program to implement stack using linked list.                 [15]

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Code No: 111AG

**R13**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year Examinations, December - 2017
**ENGINEERING DRAWING**
(Common to ECE, EIE, ETM)

Time: 3 hours                                                                                               Max Marks: 75

Answer all five questions
All questions carry equal marks

- - -

1.  A fixed point is at 50 mm from a fixed straight line. Draw the curve when eccentricity is 3/2. Name the curve. Draw tangent and normal to the curve through a point P, 60 mm from directrix. [15]

**OR**

2.  Construct a vernier scale to read distances correct to a decameter on a map in which the actual distances are reduced in the ratio of 1 :40000. The scale should be long enough to measure 6 kilometers. Mark on the scale the lengths of 3.34 km and 0.57 km. [15]

3.a) Draw the projections of a point P lying 30 mm above HP and situated in the first quadrant, if its shortest distance from the line of intersection of VP and HP is 40 mm. Determine the distance of the point from the VP.

   b) A line AB of length 70 mm is inclined at $30^0$ with HP and $45^0$ with VP. The end A is 20 mm above HP and 30 mm in front of VP. Draw the projections of the line and find its apparent inclination with the principal planes. [5+10]

**OR**

4.  A thin $30^0$-$60^0$ set-square has its longest edge (diagonal) on H.P and inclined at $30^0$ to V.P. Its surface makes an angle of $45^0$ with H.P. Draw the projections, choosing suitable size for the set-square. [15]

5.a) A hexagonal pyramid is lying on one of its triangular faces on HP with axis parallel to VP. Side of the base 30 mm, length of axis 70 mm. Draw its projections.

   b) Draw the projections of A square prism, axis perpendicular to VP with one of the rectangular faces making $60^0$ with HP and axis 50 mm above HP taking a side of the base 40 mm long and the axis 75 mm long. [7+8]
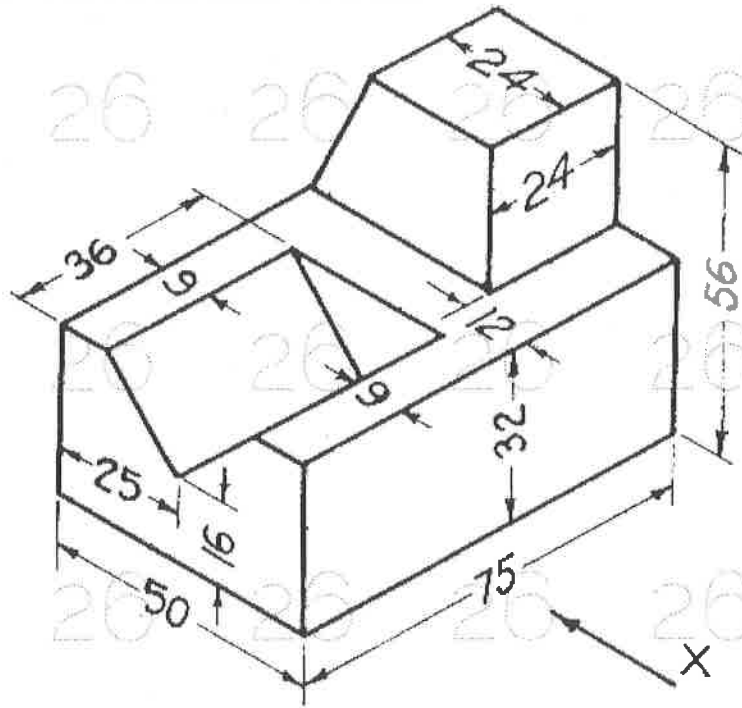
**OR**

6.  A square prism, base 40 mm side, axis 80 mm long, has its base on the H.P. and its faces equally inclined to the V.P. It is cut by a plane, perpendicular to the V.P., inclined at $60^0$ to the H.P. and passing through a point to the axis, 55 mm above the H.P. Draw its front view, sectional top view and another top view on an A.I.P. parallel to the section plane. [15]

7.  A hexagonal prism of side of base 30 mm and axis 75 mm long, is resting on base on H.P., such that, a rectangular face is parallel to V.P. It is cut by a section plane, perpendicular to V.P., and inclined at $30^0$ to H.P. The section plane is passing through the top end of extreme lateral edge of the prism. Draw the development of the lateral surface of the cut prism. [15]

**OR**

8.  A cylinder having base with a 70 mm diameter is resting on its base in the H.P. It is penetrated by a square prism of base with a 30 mm side, the axis of which is parallel to both the principal planes and faces equally inclined to the H.P. The axes of the cylinder and prism are 10 mm apart. Draw the projections of the combination and show the curves of intersection. [15]

9. Convert the isometric view of the picture shown in the figure into orthogonal projection of all three views. All dimensions are in mm. [15]



**OR**

10. A straight line AB, 4 cm long, is parallel to and 1.5 cm above the ground plane, and inclined at $30^0$ to the picture plane. The end A is 2 cm behind the picture plane. The station point is 4 cm above the ground plane, 5 cm in front of the picture plane and lies in a central plane which passes through the mid-point of AB. Draw its perspective view. [15]
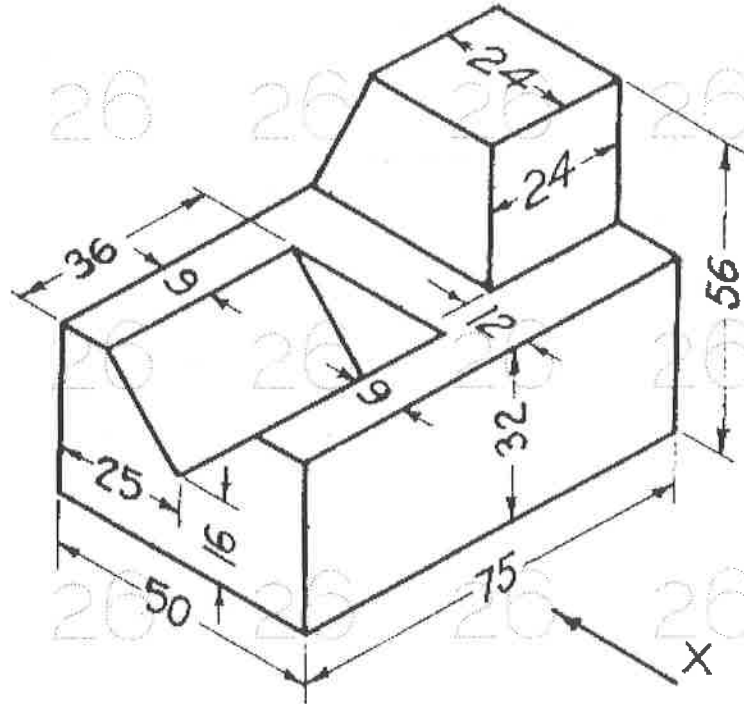
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Code No: 111AJ

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, December - 2017
### ENGINEERING DRAWING
(Common to ME, IT, MCT, MMT, AME)

Time: 3 hours            Max Marks: 75

Answer all five questions
**All questions carry equal marks**

- - -

1. A fixed point is at 50 mm from a fixed straight line. Draw the curve when eccentricity is 3/2. Name the curve. Draw tangent and normal to the curve through a point P, 60 mm from directrix. [15]

**OR**

2. Construct a vernier scale to read distances correct to a decameter on a map in which the actual distances are reduced in the ratio of 1 :40000. The scale should be long enough to measure 6 kilometers. Mark on the scale the lengths of 3.34 km and 0.57 km. [15]

3.a) Draw the projections of a point P lying 30 mm above HP and situated in the first quadrant, if its shortest distance from the line of intersection of VP and HP is 40 mm. Determine the distance of the point from the VP.

  b) A line AB of length 70 mm is inclined at $30^0$ with HP and $45^0$ with VP. The end A is 20 mm above HP and 30 mm in front of VP. Draw the projections of the line and find its apparent inclination with the principal planes. [5+10]

**OR**

4. A thin $30^0$-$60^0$ set-square has its longest edge (diagonal) on H.P and inclined at $30^0$ to V.P. Its surface makes an angle of $45^0$ with H.P. Draw the projections, choosing suitable size for the set-square. [15]

5.a) A hexagonal pyramid is lying on one of its triangular faces on HP with axis parallel to VP. Side of the base 30 mm, length of axis 70 mm. Draw its projections.

  b) Draw the projections of A square prism, axis perpendicular to VP with one of the rectangular faces making $60^0$ with HP and axis 50 mm above HP taking a side of the base 40 mm long and the axis 75 mm long. [7+8]

**OR**

6. A square prism, base 40 mm side, axis 80 mm long, has its base on the H.P. and its faces equally inclined to the V.P. It is cut by a plane, perpendicular to the V.P., inclined at $60^0$ to the H.P. and passing through a point to the axis, 55 mm above the H.P. Draw its front view, sectional top view and another top view on an A.I.P. parallel to the section plane. [15]

7. A hexagonal prism of side of base 30 mm and axis 75 mm long, is resting on base on H.P., such that, a rectangular face is parallel to V.P. It is cut by a section plane, perpendicular to V.P., and inclined at $30^0$ to H.P. The section plane is passing through the top end of extreme lateral edge of the prism. Draw the development of the lateral surface of the cut prism. [15]

**OR**

8. A cylinder having base with a 70 mm diameter is resting on its base in the H.P. It is penetrated by a square prism of base with a 30 mm side, the axis of which is parallel to both the principal planes and faces equally inclined to the H.P. The axes of the cylinder and prism are 10 mm apart. Draw the projections of the combination and show the curves of intersection. [15]

9. Convert the isometric view of the picture shown in the figure into orthogonal projection of all three views. All dimensions are in mm. [15]



**OR**

10. A straight line AB, 4 cm long, is parallel to and 1.5 cm above the ground plane, and inclined at $30^0$ to the picture plane. The end A is 2 cm behind the picture plane. The station point is 4 cm above the ground plane, 5 cm in front of the picture plane and lies in a central plane which passes through the mid-point of AB. Draw its perspective view. [15]

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**R09**

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
### B.Tech I Year Examinations, December - 2017
### ENGINEERING DRAWING
(Common to CE, BME)

Time: 3 hours
Max. Marks: 75

**Answer any five questions**
**All questions carry equal marks**
- - -

1.a) The foci of an ellipse are 90 mm apart and the minor axis is 65 mm long. Determine the length of the major axis and draw half the ellipse by concentric-circles method and the other half by oblong method. Draw a curve parallel to the ellipse and 25 mm away from it.

b) Draw a rectangle having its sides 125 mm and 75 mm long. Inscribe two parabolas in it with their axis bisecting each other. [7+8]

2. The end A of line AB is 10 mm above the HP and 30 mm in front of the VP. The end B is 50 mm below the HP and 15 mm behind the VP. The length of the line is 80 mm. Draw the projection and locate the traces. What are the inclinations of the line with the RPs? [15]

3. A thin regular hexagonal plate of 30 side is resting on a corner on H.P. the end of the longest diagonal through the corner is 40 above H.P. Draw the projections of the plate. Also draw auxiliary front view on an A.V.P, inclined at $45^0$ with V.P. [15]

4. Draw the development of a cylinder of 50 mm diameter and 75mm height, containing a square hole of 25 mm side. The sides of the hole are equally inclined to the base and the axis of the hole bisects the axis of the cylinder. [15]

5. A triangular prism of edge of base 30, has its axis parallel to the H.P and inclined at $30^0$ to the V.P. This prism interpenetrates a vertical cylinder of base diameter 60. The axes of the objects intersect each other and one of the faces on the prism is perpendicular to the H.P. Draw the curves of intersection. [15]

6. A circular plate of 60 mm diameter is lying on the GP with its centre 42 mm behind the PPP. The station point is 85 mm in front of the PPP and 60 mm above the GP. Draw the perspective projection of the plate if the CP is 35 mm to the left of the centre of the plate. [15]

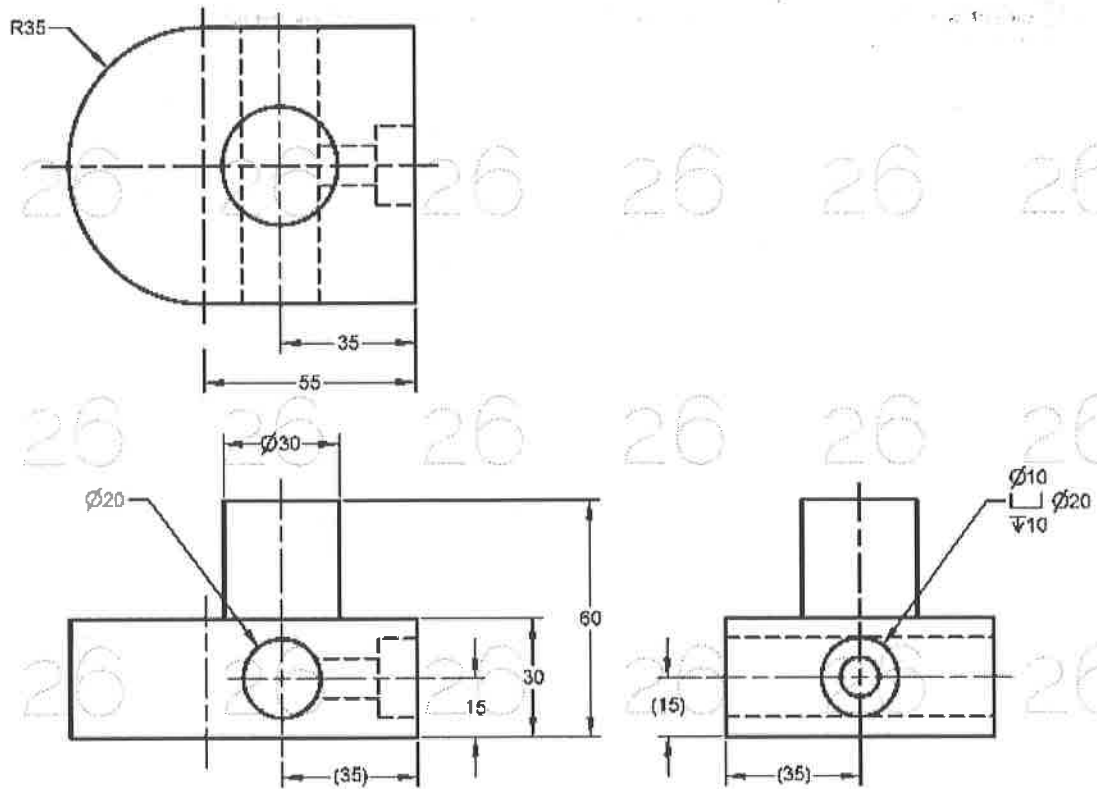7    Draw the isometric view of the given figure 1. All the dimensions are in mm.    [15]



**Figure: 1**

8.    Draw the front view, top view and side view for the given figure 2. All the dimensions are in mm.    [15]
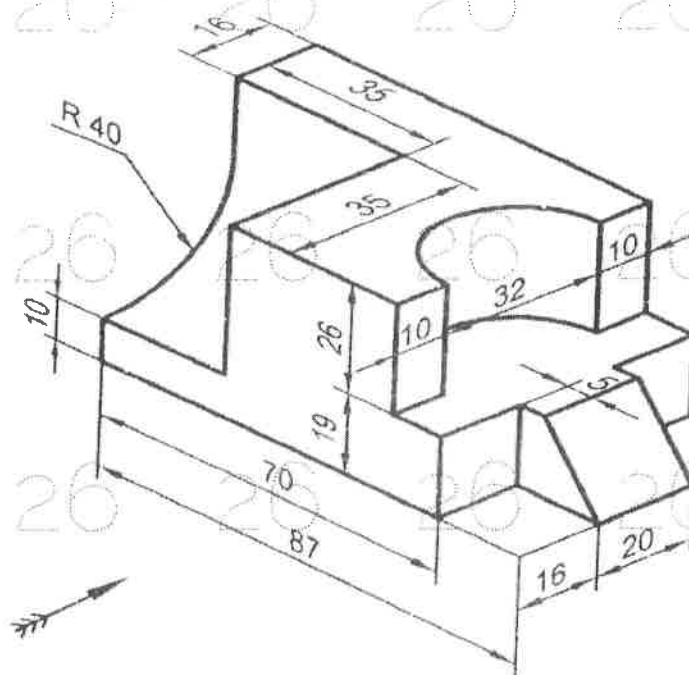


**Figure: 2**

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B.Tech I Year Examinations, December - 2017**
**ENGINEERING DRAWING**
(Electrical and Electronics Engineering)

Time: 3 hours                                                         Max. Marks: 75

**Answer any five questions**
**All questions carry equal marks**

- - -

1.a)  The foci of an ellipse are 90 mm apart and the minor axis is 65 mm long. Determine the length of the major axis and draw half the ellipse by concentric-circles method and the other half by oblong method. Draw a curve parallel to the ellipse and 25 mm away from it.

b)  Draw a rectangle having its sides 125 mm and 75 mm long. Inscribe two parabolas in it with their axis bisecting each other.                                    [7+8]

2.  The end A of line AB is 10 mm above the HP and 30 mm in front of the VP. The end B is 50 mm below the HP and 15 mm behind the VP. The length of the line is 80 mm. Draw the projection and locate the traces. What are the inclinations of the line with the RPs?
                                                                            [15]

3.  A thin regular hexagonal plate of 30 side is resting on a corner on H.P. the end of the longest diagonal through the corner is 40 above H.P. Draw the projections of the plate. Also draw auxiliary front view on an A.V.P, inclined at $45^0$ with V.P.          [15]

4.  Draw the development of a cylinder of 50 mm diameter and 75mm height, containing a square hole of 25 mm side. The sides of the hole are equally inclined to the base and the axis of the hole bisects the axis of the cylinder.                              [15]

5.  A triangular prism of edge of base 30, has its axis parallel to the H.P and inclined at $30^0$ to the V.P. This prism interpenetrates a vertical cylinder of base diameter 60. The axes of the objects intersect each other and one of the faces on the prism is perpendicular to the H.P. Draw the curves of intersection.                              [15]

6.  A circular plate of 60 mm diameter is lying on the GP with its centre 42 mm behind the PPP. The station point is 85 mm in front of the PPP and 60 mm above the GP. Draw the perspective projection of the plate if the CP is 35 mm to the left of the centre of the plate.
                                                                            [15]

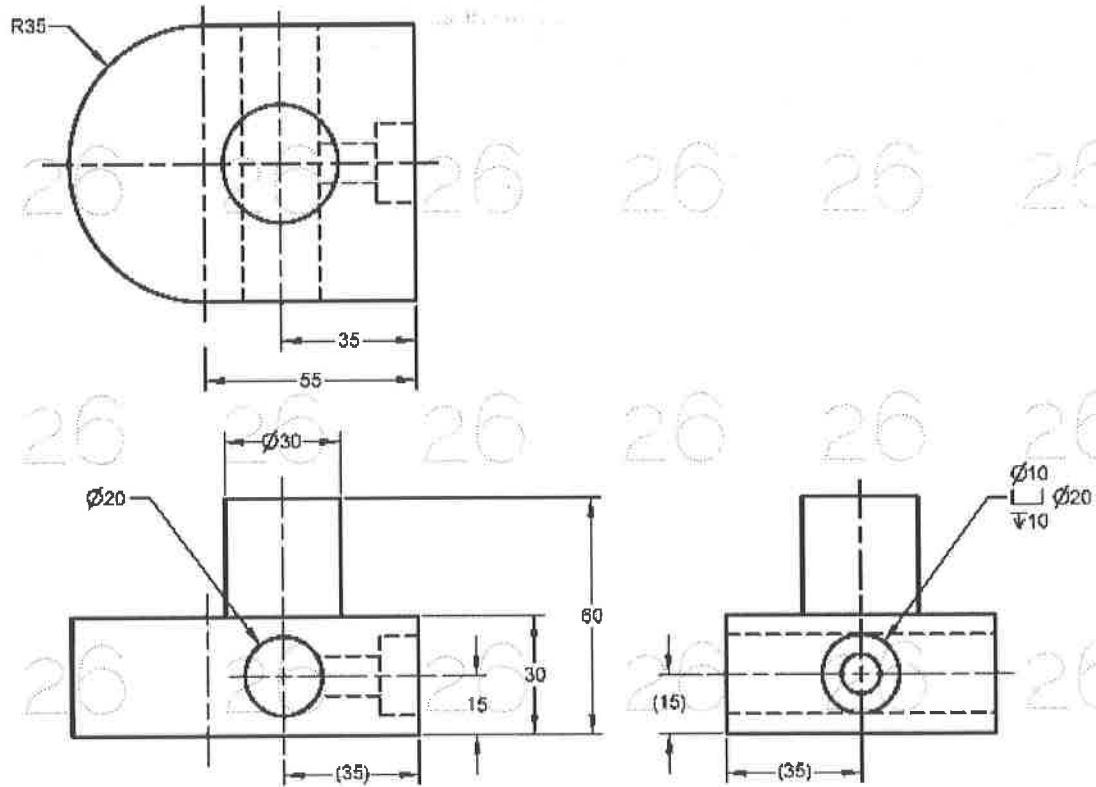7    Draw the isometric view of the given figure 1. All the dimensions are in mm.    [15]



**Figure: 1**

8.    Draw the front view, top view and side view for the given figure 2. All the dimensions are in mm.    [15]
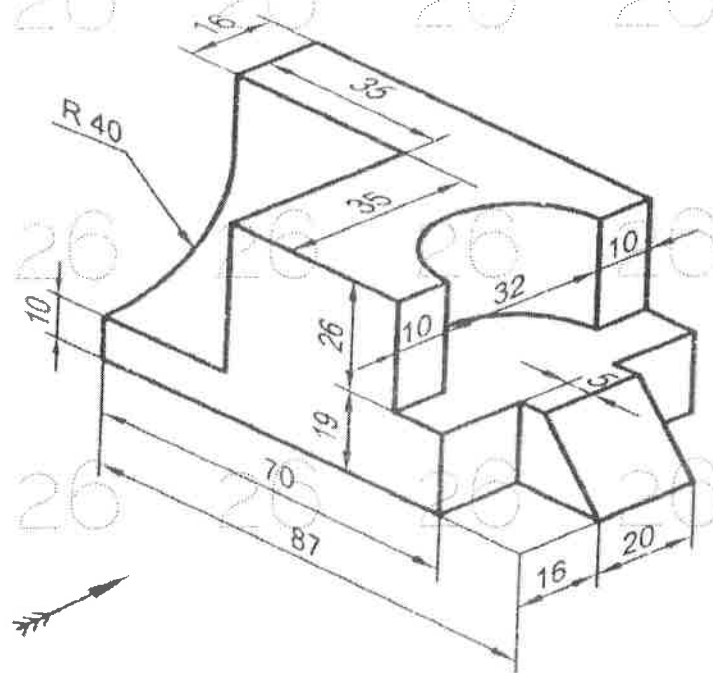


**Figure: 2**

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year Examinations, December - 2017
**ENGINEERING DRAWING**
(Computer Science and Engineering)

Time: 3 hours                                                        Max. Marks: 75

**Answer any five questions**
**All questions carry equal marks**
- - -

1.a) The foci of an ellipse are 90 mm apart and the minor axis is 65 mm long. Determine the length of the major axis and draw half the ellipse by concentric-circles method and the other half by oblong method. Draw a curve parallel to the ellipse and 25 mm away from it.

b) Draw a rectangle having its sides 125 mm and 75 mm long. Inscribe two parabolas in it with their axis bisecting each other.                                    [7+8]

2. The end A of line AB is 10 mm above the HP and 30 mm in front of the VP. The end B is 50 mm below the HP and 15 mm behind the VP. The length of the line is 80 mm. Draw the projection and locate the traces. What are the inclinations of the line with the RPs?
[15]

3. A thin regular hexagonal plate of 30 side is resting on a corner on H.P. the end of the longest diagonal through the corner is 40 above H.P. Draw the projections of the plate. Also draw auxiliary front view on an A.V.P, inclined at $45^0$ with V.P.                [15]

4. Draw the development of a cylinder of 50 mm diameter and 75mm height, containing a square hole of 25 mm side. The sides of the hole are equally inclined to the base and the axis of the hole bisects the axis of the cylinder.                              [15]

5. A triangular prism of edge of base 30, has its axis parallel to the H.P and inclined at $30^0$ to the V.P. This prism interpenetrates a vertical cylinder of base diameter 60. The axes of the objects intersect each other and one of the faces on the prism is perpendicular to the H.P. Draw the curves of intersection.                                          [15]

6. A circular plate of 60 mm diameter is lying on the GP with its centre 42 mm behind the PPP. The station point is 85 mm in front of the PPP and 60 mm above the GP. Draw the perspective projection of the plate if the CP is 35 mm to the left of the centre of the plate.
[15]

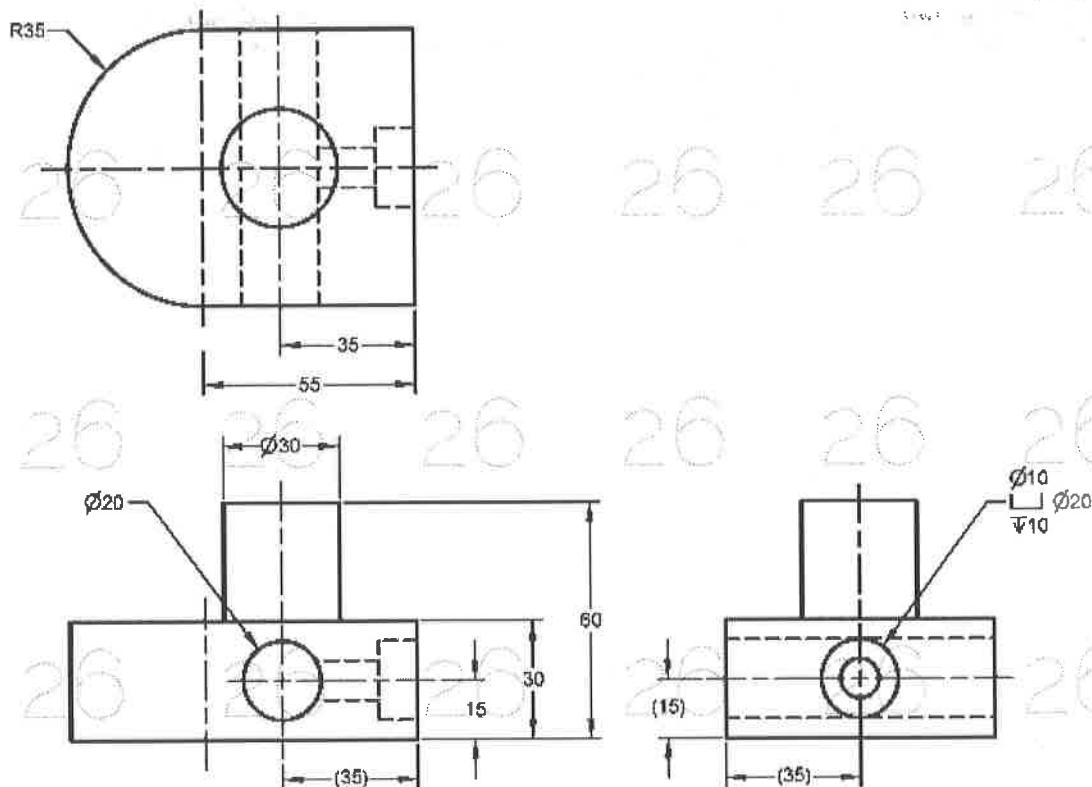7 Draw the isometric view of the given figure 1. All the dimensions are in mm. [15]



R35

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**Figure: 1**

8. Draw the front view, top view and side view for the given figure 2. All the dimensions are in mm. [15]



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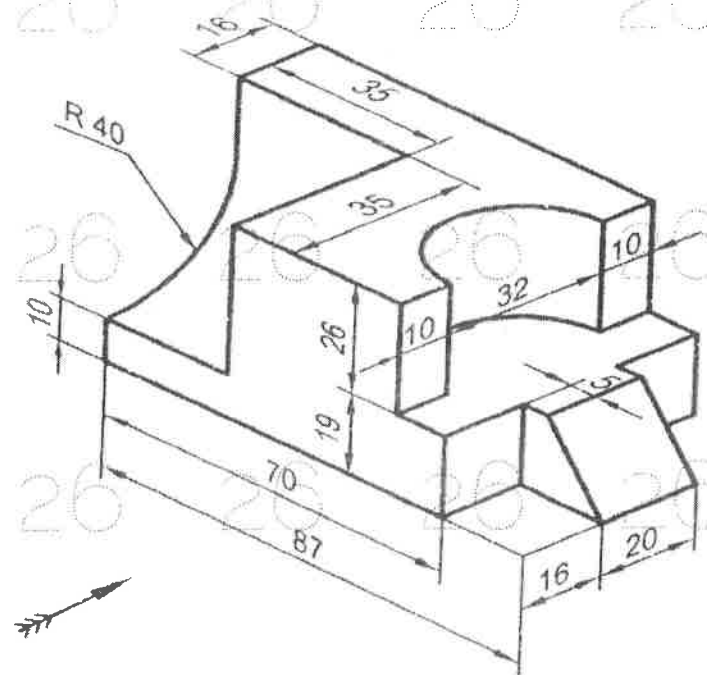10
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**Figure: 2**

---ooOoo---

**R09**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B.Tech I Year Examinations, December - 2017**
**ENGINEERING DRAWING**
**(Common to BT, MIE, PTM)**

Time: 3 hours                                        Max. Marks: 75

**Answer any five questions**
**All questions carry equal marks**

- - -

1.a) The foci of an ellipse are 90 mm apart and the minor axis is 65 mm long. Determine the length of the major axis and draw half the ellipse by concentric-circles method and the other half by oblong method. Draw a curve parallel to the ellipse and 25 mm away from it.

  b) Draw a rectangle having its sides 125 mm and 75 mm long. Inscribe two parabolas in it with their axis bisecting each other. [7+8]

2. The end A of line AB is 10 mm above the HP and 30 mm in front of the VP. The end B is 50 mm below the HP and 15 mm behind the VP. The length of the line is 80 mm. Draw the projection and locate the traces. What are the inclinations of the line with the RPs? [15]

3. A thin regular hexagonal plate of 30 side is resting on a corner on H.P. the end of the longest diagonal through the corner is 40 above H.P. Draw the projections of the plate. Also draw auxiliary front view on an A.V.P, inclined at $45^0$ with V.P. [15]

4. Draw the development of a cylinder of 50 mm diameter and 75mm height, containing a square hole of 25 mm side. The sides of the hole are equally inclined to the base and the axis of the hole bisects the axis of the cylinder. [15]

5. A triangular prism of edge of base 30, has its axis parallel to the H.P and inclined at $30^0$ to the V.P. This prism interpenetrates a vertical cylinder of base diameter 60. The axes of the objects intersect each other and one of the faces on the prism is perpendicular to the H.P. Draw the curves of intersection. [15]

6. A circular plate of 60 mm diameter is lying on the GP with its centre 42 mm behind the PPP. The station point is 85 mm in front of the PPP and 60 mm above the GP. Draw the perspective projection of the plate if the CP is 35 mm to the left of the centre of the plate. [15]

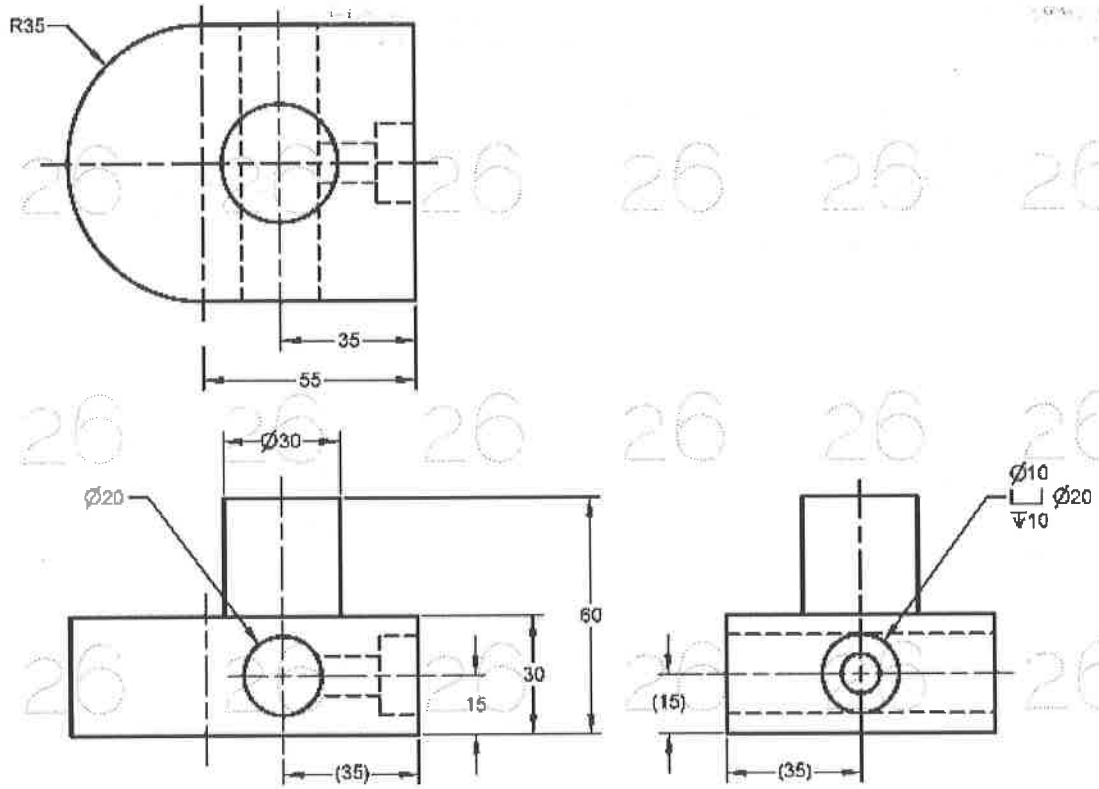7    Draw the isometric view of the given figure 1. All the dimensions are in mm.    [15]



**Figure: 1**

8.    Draw the front view, top view and side view for the given figure 2. All the dimensions are in mm.    [15]
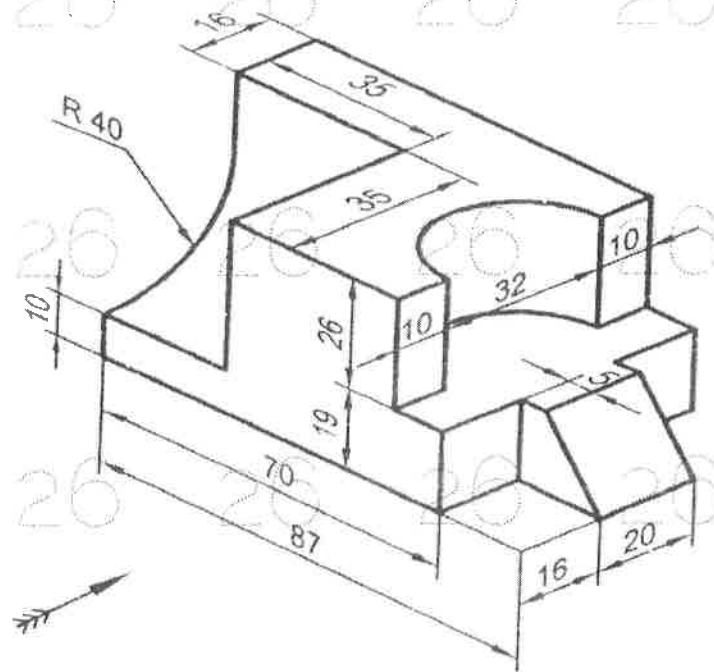


**Figure: 2**

---ooOoo---

Code No: 131AA

**R16**

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
### B.Tech I Year I Semester Examinations, December - 2017
### MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, ETM, MMT, AE, MIE, PTM, CEE, MSNT)

Time: 3 hours

Max. Marks: 75

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

## PART- A

(25 Marks)

1.a) Define exact differential equation. Give an example. [2]

b) Find a particular integral of $y'' - 2y' + y = \dfrac{e^x}{x}$. [3]

c) Show that the matrix $A = \begin{pmatrix} 3i & 2+i \\ -2+i & -i \end{pmatrix}$ is Skew-Hermitian. [2]

d) Find the values of $a$ and $b$ such that the system
$2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$, $2x + 3y + az = b$ has no solution. [3]

e) Find the sum and product of the Eigen values of the matrix $A = \begin{pmatrix} 2 & 5 & 7 \\ 1 & 4 & 6 \\ 2 & -2 & 3 \end{pmatrix}$. [2]

f) Write the quadratic form corresponding to the matrix $A = \begin{pmatrix} 1 & 5 & 7 \\ 5 & 4 & 6 \\ 7 & 6 & 3 \end{pmatrix}$. [3]

g) If $u = f(x-y, \ y-z, \ z-x)$, find $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z}$. [2]

h) Expand $f(x,y) = e^{xy}$ about origin up to $2^{nd}$ degree terms. [3]

i) Form a partial differential equation by eliminating the arbitrary function $f$ from $z = f(x^2 + y^2)$. [2]

j) Solve $\sqrt{p} + \sqrt{q} = 1$. [3]

## PART-B

(50 Marks)

2.a) Solve $(3xy^2 - y^3)dx - (2x^2y - xy^2)dy = 0$.

b) Solve $y'' + y = x \sin x$. [5+5]

**OR**

3.a) Apply the method of variation of parameters to solve $y'' - y = x^2$.

b) If the temperature of the air is $30^0$ C and the substance cools from $100^0$ C to $70^0$ C in 15 minutes, find when the temperature will be $40^0$ C. [5+5]

4.a) Find the rank of the matrix $A = \begin{pmatrix} 0 & 1 & -3 & -1 \\ 0 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$ by reducing to echelon form.

b) Show that the system of equations $5x + 3y + 7z = 4$, $3x + 26y + 2z = 9$, $7x + 2y + 10z = 5$ is consistent and hence solve it. [5+5]

**OR**

5. Solve the system of equations $2x - 2y - 2z = -4$, $-y + z = -1$, $-x + 5y + 2z = 6$ by LU – decomposition method. [10]

6.a) Find the Eigen values of $5A^5 - 2A^2 + 7A - 3A^{-1} + I$, if $A = \begin{pmatrix} -3 & -7 & -5 \\ 2 & 4 & 3 \\ 1 & 2 & 2 \end{pmatrix}$.

b) Using Cayley-Hamilton theorem, find $A^{-1}$ and $A^{-2}$ if $A = \begin{pmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{pmatrix}$. [5+5]

**OR**

7. Reduce the quadratic form $Q = 8x^2 + 7y^2 + 3z^2 + 12xy + 4xz - 8yz$ to canonical form and hence find its rank, nature, index and signature. [10]

8.a) If $f(x, y) = \ln\left(\dfrac{x^4 + y^4}{x + y}\right)$, show that $x f_x + y f_y = 3$.

b) Determine whether the functions $u = \dfrac{x + y}{x - y}$, $v = \dfrac{xy}{(x - y)^2}$ are dependent. If so, find the relation between them. [5+5]

**OR**

9.a) Find the Taylor series expansion of $f(x, y) = e^x \cos y$ in powers of $(x - 1)$ and $\left(y - \dfrac{\pi}{4}\right)$.

b) Find the maximum and minimum values of the function $f(x, y) = x^4 + y^4 - x^2 - y^2 + 1$. [5+5]

10.a) Find all possible second order partial differential equations by eliminating the arbitrary constants $a$, $b$, $c$ from $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} + \dfrac{z^2}{c^2} = 1$.

b) Solve $(p - q)z = z^2 + (x + y)^2$. [5+5]

**OR**

11.a) Reduce the equation $p^2 x^2 = z(z - qy)$ to $F(p, q, z) = 0$ form and hence solve it.

b) Solve $p^2 y(1 + x^2) = qx^2$. [5+5]

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year Examinations, December - 2017
**ENGINEERING MECHANICS**
(Common to CE, ME, MCT, MMT, AE, AME, MIE, PTM, AGE)

Time: 3 hours                                                                 Max. Marks: 75

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each
question carries 10 marks and may have a, b, c as sub questions.

## PART- A

(25 Marks)

1.a) Define free body diagram with an example. [2]
  b) Differentiate between moment of a force and a couple. [3]
  c) Give some examples indicating useful and harmful effects of friction. [2]
  d) Explain the principle of differential screw jack. In what way it is different from simple screw jack. [3]
  e) State the parallel axis theorem for area moment of inertia. [2]
  f) What is the meaning of symmetry? How can you use the symmetry for determining the centre of gravity of bodies? Give example. [3]
  g) What is the value of normal acceleration, if the path of a particle is straight line? [2]
  h) Explain the terms kinetics and kinematics. [3]
  i) Distinguish between impulse and momentum. [2]
  j) A particle is moving with SHM. The frequency is 3 oscillation per sec and the amplitude is 375 mm. calculate the maximum acceleration and the maximum velocity of the particle during the motion. [3]

## PART-B

(50 Marks)

2.a) Explain various types of *coplanar* and *non-coplanar* system of forces with a neat sketch.
  b) Determine the tension in the string AD and the reaction at point B as shown in figure 1, if the weight of the sphere is 35.6 N, radius r=75 mm and AB = 100 mm by using Lami's equation. [5+5]
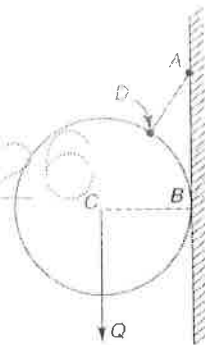


Figure: 1

OR

3.a) An eye bolt is being pulled from ground by three forces as shown in the figure 2. Determine the resultant of three forces.
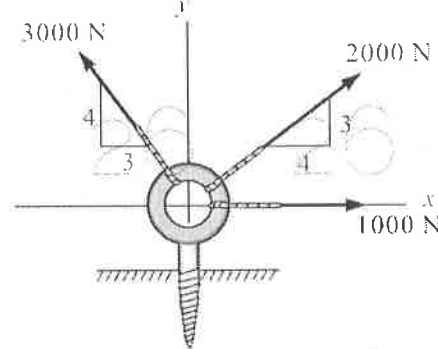


**Figure: 2**

b) Determine the magnitude of the resultant for the forces acting on the beam as shown in the following figure 3. Also determine the distance $x$ from D at which the resultant of the three forces acts. [4+6]
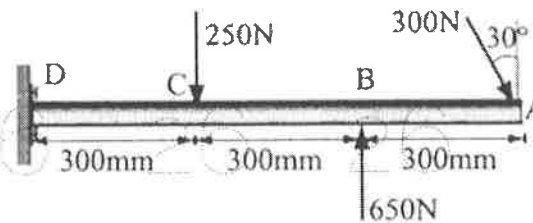


**Figure: 3**

4.a) How will you distinguish between static friction and dynamic friction?

b) Block A weighing 1000 N rest over block B which weighs 2000 N as shown in figure 4. Block A is tied to wall with a horizontal string. If the coefficient of friction between blocks A and B is 0.25 and between B and Floor is 1/3, what should be the value of P to move the block B, if P is horizontal. [4+6]
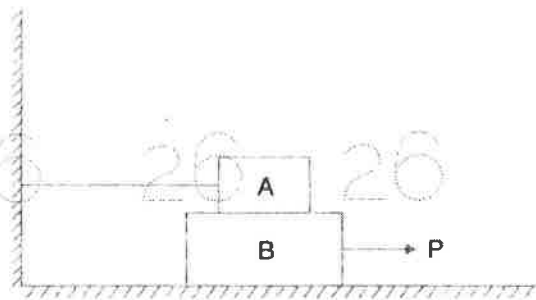


**Figure: 4**

**OR**

5.a) A screw jack has a square thread of 75 mm mean diameter and 15 mm pitch. The load on the jack revolves with the screws. The coefficient of friction at the screw thread is 0.05. i) Find the tangential force to be applied to the jack at 360 mm radius, so as to lift a load of 6 kN weight. ii) State whether the jack is self-locking or not.

b) Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 r.p.m. The coefficient of friction between the belt and pulley is 0·25, angle of lap $160^0$ and maximum tension in the belt is 2·5 kN. [5+5]

6. Find the second moment of the shaded portion shown in the figure 5 about its centroidal axis. [10]
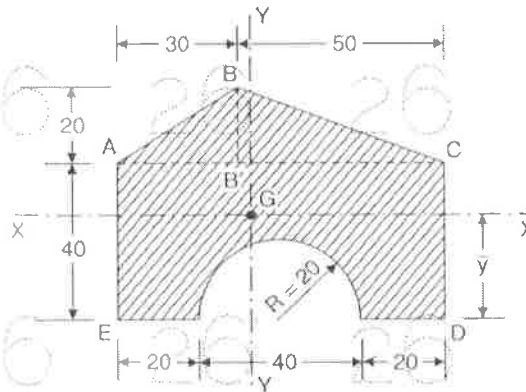


**Figure: 5**

OR

7.a) State and prove the theorems of Pappus-Guldinus.

b) Find the centroid of the lamina shown in figure 6. [5+5]
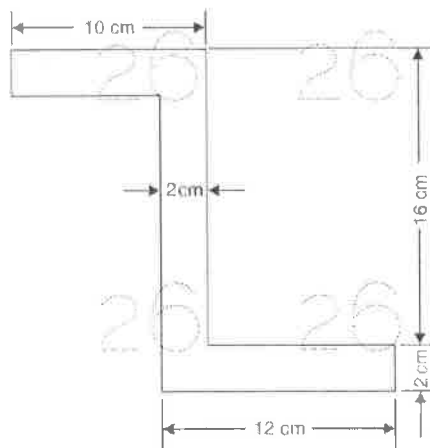


**Figure: 6**

8.a) A car starts from rest on a curved road of radius 250 m and attains a speed of 18km/hour at the end of seconds while travelling with a uniform acceleration. Find the tangential and normal acceleration of the car 30 seconds after it started.

b) A block weighing 1 kN is resting on a horizontal plane as shown in the figure 7. Find the magnitude of force P required to give the block an acceleration of 3 m/sec$^2$. The coefficient of friction between the block and plane is 0.25. [5+5]



**Figure: 7**

OR

9.a) A body of mass 6 kg is suspended by a light rope wound round a solid disc of 60 kg and diameter 50 cm, the other end of the rope being fixed to the periphery of the pulley. Find i) acceleration of the descending mass, ii) pull in the rope, and iii) velocity after the mass has descended 15 m. Take g as 9.8 m/s$^2$.
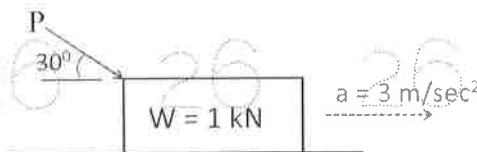
b) A stone is dropped into a well with no initial velocity and 4 seconds later the splash is heard. Then a second stone is thrown downwards into the well with an initial velocity 'v' and the splash is heard in 4.0 seconds. If the velocity of sound is constant at 336mps, determine the initial velocity of the second stone. [5+5]

10.a) Find the time period of oscillation of a simple pendulum of length 1 m, if this pendulum hangs from the ceiling of an elevator moving with i) an upward acceleration of g/10 ii) a downward acceleration of g/10, find its time period.

b) Two bars are welded together as shown in the figure 8. Segment AB weighs 60N and segment CD weighs 30N. The assembly starts from rest at the given position and rotates in a vertical plane about a horizontal axis at A. compute the angular velocity of assembly after 90$^0$ counter clockwise rotation. Also find the reaction of A. [5+5]
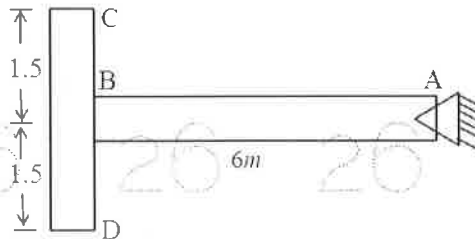


**Figure: 8**

**OR**

11.a) A particle, moving with simple harmonic motion, performs 10 complete oscillation per minute and its speed, is 60% of the maximum speed when it is at a distance of 8 cm from the centre of oscillation. Find amplitude, maximum acceleration of the particle. Also find speed of the particle, when it is 6 cm far from the centre of oscillation.

b) The system shown in the figure 9 is connected by flexible, inextensible cords. If the system starts from rest, find the distance $d$ between A and the ground so that the system comes to rest with body B just touching A. [5+5]



**Figure: 9**

---ooOoo---

Code No: 111AL

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year Examinations, December - 2017
MATHEMATICAL METHODS
(Common to EEE, ECE, CSE, EIE, IT, ETM)

Time: 3 hours                                                                 Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
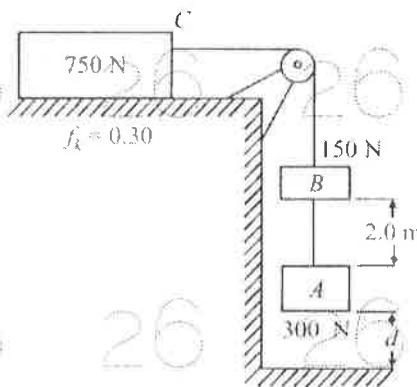Part B consists of 5 Units. Answer any one full question from each unit. Each
question carries 10 marks and may have a, b, c as sub questions.

## PART- A
(25 Marks)

1.a) Prove that $h\Delta = \log(1+\Delta) = -\log(1-\Delta) = \sin^{-1}(\mu\delta)$. [2]

b) If $y = a_o + a_1 x$, $\sum x_i = 15$, $\sum y_i = 30$, $\sum x_i y_i = 110$, $\sum x_i^2 = 55$ then find $a_1$. [3]

c) Find square root of a number N by Newton-Raphson method. [2]

d) Find first approximation of $y' = x + y$ if $y(0) = 1$ by picards method. [3]

e) Express f(x) = x as a Fourier Series in $(-\Pi, \Pi)$. [2]

f) Prove that $F\{f(ax)\} = \frac{1}{a}\bar{F}\left(\frac{p}{a}\right)$, where $\bar{F}(p) =$ Fourier transform of f(x). [3]

g) Eliminate arbitrary function from $z = f\left(x^2 + y^2 + z^2\right)$. [2]

h) Find the general solution of $\sqrt{p} + \sqrt{q} = 1$. [3]

i) If $\phi = 3x^2 y - y^3 z^2$ find grad $\phi$ at (1, -2, -1). [2]

j) Find the curl of the vector $xyz\bar{i} + 3x^2 y\bar{j} + (xz^2 - y^2 z)\bar{k}$. [3]

## PART-B
(50 Marks)

2.a) Find f(2.5) using Newton's forward formula from the following table.

| x | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| y | 0 | 1 | 16 | 81 | 256 | 625 | 1296 |

b) Using Lagranges interpolation formula, find y(10) from the following table.

| x | 5 | 6 | 9 | 11 |
|---|---|---|---|---|
| y | 12 | 13 | 14 | 16 |

[5+5]

**OR**

3.a) Fit a second degree polynomial to the following data by the method of least squares.

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 1 | 1.8 | 1.3 | 2.5 | 6.3 |

b) Find the parabola of the form $y = ax^2 + bx + c$ passing through the points (-1, 2), (0, 1) and (1, 4). [5+5]

4.a) Find a root of the equation $x - \cos x = 0$ using bisection method correct to two decimals places.

b) Find $f'(6)$ from the following data

| $x$ | 0 | 2 | 3 | 4 | 7 | 9 |
|------|---|----|----|-----|-----|-----|
| $f(x)$ | 4 | 26 | 58 | 112 | 466 | 922 |

[5+5]

**OR**

5.a) Find y(0.1) and y(0.2) using R-K fourth order formula given that $y' = x^2 - y$ and y(0) = 1.

b) Use Milne's method to find y(0.8) and y(1.0) from $y' = 1 + y^2, y(0) = 0,$ if $y_1 = 0.2027, y_2 = 0.4228, y_3 = 0.6841.$ [5+5]

6. Find the Fourier series of $f(x) = x \sin x, \ -\Pi < x < \Pi.$ Hence deduce that

$$\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \ldots = \frac{1}{4}(\Pi - 2).$$ [10]

**OR**

7.a) Using Fourier integral show that $e^{-ax} = \frac{2a}{\Pi} \int_0^\infty \frac{\cos \lambda x}{\lambda^2 + a^2} d\lambda, \ (a > 0).$

b) Find $F_s^{-1}\left\{\frac{s}{1+s^2}\right\}.$ [5+5]

8.a) Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x, 0) = 6.e^{-3x}.$

b) If a string of length $l$ is initially at rest in equilibrium position and each of its points is given the velocity $V_o \sin^3 \frac{\Pi x}{l}$, find the displacement $y(x,t).$ [5+5]

**OR**

9. An infinitely long plane uniform plate is bounded by two parallel edges and an end at right angles to them. The breadth is π. This end is maintained at a temperature $u_o$ at all points and the other edges are at zero temperature. Determine the temperature at any point of the plate in the steady state. [10]

10. Show that $\iint_s \bar{F}.\hat{n}ds = \frac{3}{2}$ where $\bar{F} = 4 \times zi - y^2 j + yzk$ and S is the surface of the cube bounded by the planes $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1.$ [10]

**OR**

11. Verify Stoke's theorem for $\bar{F} = (x^2 + y - 4)i + 3xyj + (2xz + z^2)k$ over the surface of hemisphere $x^2 + y^2 + z^2 = 16$ above the xoy plane. [10]

---ooOoo---

**R16**

Time: 3 hours                                                                Max. Marks: 75

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each
question carries 10 marks and may have a, b, c as sub questions.

## PART- A
(25 Marks)

1.a)  What are the conditions for constructive and destructive interference?  [2]
  b)  What are the two types of diffractions? Give differences between them.  [3]
  c)  Explain Malus's law.  [2]
  d)  Explain spontaneous and stimulated emission of radiation with energy level diagram.  [3]
  e)  Explain the basic principle of an optical fiber.  [2]
  f)  Explain the term 'numerical aperture' and 'acceptance angle'.  [3]
  g)  Write an expression for inter planar spacing of a cubic crystal structure.  [2]
  h)  Derive the packing fraction of FCC crystal.  [3]
  i)  State Bragg's law and give the condition for constructive interference.  [2]
  j)  Write notes on 'point defects' in crystals  [3]

## PART-B
(50 Marks)

2.a)  With a ray diagram discuss the interference in thin films(Reflected light).
  b)  Derive the condition for constructive and destructive interference in the case of reflected system.
  c)  A parallel beam of light $\lambda=5890$ A$^0$ is incident on a glass plate ($\mu=1.5$) such that angle of refraction is $60^0$. Calculate the smallest thickness of the plate which will make it appear dark by reflection.  [10]

OR

3.a)  Discuss the theory of Newton rings with relevant diagram in the reflected light.
  b)  Derive the expressions for the diameters of dark and bright rings.
  c)  Newton rings are observed in the reflected light of wavelength 5900 A$^0$. The diameter of tenth dark ring is 0.5cm. Find the radius of curvature of the lens used.  [10]

4.a)  What is double refraction?
  b)  Explain briefly optic axis and its characteristics.
  c)  Discuss the construction and working of Nicol Prism.  [10]

OR

5.a)  What are Einstein's coefficients? Derive relation between them.
  b)  What do you understand by Population Inversion?
  c)  Describe He-Ne Laser and its applications.  [10]

6.a) Explain briefly different types of optical fibers.
 b) Derive numerical aperture in terms of fractional difference in refractive indices.
 c) Write any three applications of optical fibers. [10]

**OR**

7.a) Draw the block diagram of an optical fiber communication system and explain the function of each block.
 b) Derive an expression for acceptance angle for an optical fiber.
 c) What are the different losses in optical fibers? Write brief note on each. [10]

8.a) Classify the various Bravias lattice types in the crystal systems.
 b) Zinc has HCP structure. The height of the unit cell is 0.494 mm. The nearest neighbor distance is 0.27 mm. Calculate the volume of the unit cell.
 c) Describe the structure of diamond. [10]

**OR**

9.a) Determine the inter-planar spacing between the two parallel planes with miller indices (h,k,l) in a cube of side 'a'.
 b) Sketch the following planes of a cubic unit cell: **(001), (120)** and $\left(\bar{2}11\right)$.
 c) A plane makes intercepts 1, 2 and 3 $A^0$ on the crystallographic axes of an ortho-rhombic crystal with a:b:c = 3:2:1. Determine the miller indices of this plane. [10]

10.a) How the X-ray diffraction can be employed to determine the crystal structure? Explain.
 b) Describe with neat diagram, Laue's method of determination of crystal structure.
 c) X-rays of wavelength 1.5418 $A^0$ are diffracted by (111) planes in a crystal at an angle $30^0$ in the first order. Calculate the inter atomic spacing. [10]

**OR**

11.a) Write notes on surface defects in crystals.
 b) What is Burger's Vector? Explain.
 c) Explain edge dislocation and screw dislocation. [10]

---ooOoo---

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year I Semester Examinations, December - 2017
**MATHEMATICS-II**
(Common to CE, ME, MCT, MMT, AE, MIE, PTM, CEE, MSNT)

Time: 3 hours                                                               Max. Marks: 75

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each
question carries 10 marks and may have a, b as sub questions.

## PART- A

(25 Marks)

1.a) Find the Laplace transform of $\cosh^3 2t$. [2]

b) Find the Laplace transform of $e^{-3t}(2\cos 5t - 3\sin 5t)$. [3]

c) Evaluate the improper integral $\int_{0}^{\infty} \sqrt{x} e^{-x} dx$ using Gamma function. [2]

d) Evaluate the improper integral $\int_{0}^{1} \dfrac{dx}{\sqrt{-\ln x}}$ using Beta and Gamma functions. [3]

e) Find the area bounded by the curves $x^2 = y^3, x = y$ using double integration. [2]

f) Change the order of the integration $\int_{y=0}^{1} \int_{x=0}^{y+4} \dfrac{2y+1}{x+1} dx dy$ and evaluate the integral. [3]

g) Find $\nabla \phi$, when $\phi = 3x^2 y - y^3 z^2$ at the point (1, -2, -1). [2]

h) Find the directional derivative of the function $f(x,y,z) = 2xy + z^2$ at the point (1, -1, 3) in the direction of the vector $i + 2j + 2k$. [3]

i) If $R = t\bar{i} - t^2\bar{j} + (t-1)\bar{k}$ and $S = 2t^2\bar{i} + 6t\bar{k}$, evaluate $\int_{0}^{2} R. S \, dt$. [2]

j) Evaluate the line integral $\oint_{C}(3x^2 - 8y^2)dx + (4y - 6xy)dy$, where $C$ is the boundary of the region $y = \sqrt{x}, y = x$. [3]

## PART-B

(50 Marks)

2.a) Find the Laplace transform of $\sin\sqrt{t}$. Hence find $L\left(\dfrac{\cos\sqrt{t}}{\sqrt{t}}\right)$.

b) Prove that $\int_{t=0}^{\infty} \int_{u=0}^{t} e^{-t}\left(\dfrac{\sin u}{u}\right)du\,dt = \dfrac{\pi}{4}$. [5+5]

OR

3.a) Find the inverse Laplace transform of $\ln\left(\dfrac{s+1}{s-1}\right)$.

b) Find the inverse Laplace transform of $\dfrac{1}{s^3(s^2+a^2)}$ using the convolution theorem.

[5+5]

4.a) Prove that $\displaystyle\int_0^a \dfrac{dx}{(a^n-x^n)^{1/n}} = \dfrac{\pi}{n}\cosec\left(\dfrac{\pi}{n}\right)$.

b) Evaluate $\displaystyle\int_0^\pi x\sin^7 x\cos^4 x\,dx$ using Beta and Gamma functions. [5+5]

**OR**

5. Prove that $\displaystyle\int_0^{\pi/2} \dfrac{d\theta}{\sqrt{1-\dfrac{1}{2}\sin^2\theta}} = \dfrac{[\Gamma(1/4)]^2}{4\sqrt{\pi}}$. [10]

6.a) Evaluate $\displaystyle\int_0^1\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}} \dfrac{dzdydx}{\sqrt{1-x^2-y^2-z^2}}$, by changing to spherical polar coordinates.

b) Evaluate the integral $\displaystyle\int_{-1}^1\int_0^z\int_{x-z}^{x+z}(x+y+z)\,dzdydx$. [5+5]

**OR**

7. Find by triple integration, the volume of the paraboloid of revolution $x^2+y^2=4z$ cut off by the plane $z=4$. [10]

8. Prove the following vector identities:

a) $\nabla(\phi_1\phi_2) = \phi_1\nabla(\phi_2)+\phi_2\nabla(\phi_1)$      b) $\nabla\left(\dfrac{\phi_1}{\phi_2}\right) = \dfrac{\phi_2\nabla\phi_1-\phi_1\nabla\phi_2}{\phi_2^2}, \phi_2\neq 0$. [5+5]

**OR**

9. If $R=xi+yj+zk$, show that: a) $\nabla r = \dfrac{R}{r}$    b) $\nabla\left(\dfrac{1}{r}\right) = -\dfrac{R}{r^3}$    c) $\nabla r^n = nr^{n-2}R$

d) $\nabla(a.R) = a$, where $a$ is a constant vector and $r=|R|$. [10]

10. State the Stokes' theorem. Verify it for the vector field $F=(2x-y)i-yz^2 j-y^2 zk$ over the upper half surface of $x^2+y^2+z^2=1$, bounded by its projection on the $xy$ - plane. [10]

**OR**

11. State the Green's theorem in a plane. Verify it for $\oint_c e^{-x}(\sin y\,dx+\cos y\,dy)$ where $c$ is the rectangle with the vertices $(0,0)$, $(\pi,0)$, $\left(\pi,\ \dfrac{\pi}{2}\right)$ and $\left(0,\ \dfrac{\pi}{2}\right)$. [10]

---ooOoo---

R13

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year Examinations, December - 2017
**ENGINEERING PHYSICS**
(Common to CE, EEE, ME, ECE, CSE, CHEM, EIE, IT, MCT, ETM, MMT, AE, AME, MIE, PTM, MSNT, AGE)

Time: 3 hours                                                                    Max. Marks: 75

Note:   This question paper contains two parts A and B.
        Part A is compulsory which carries 25 marks. Answer all questions in Part A.
        Part B consists of 5 Units. Answer any one full question from each unit. Each
        question carries 10 marks and may have a, b, c as sub questions.

## PART- A

(25 Marks)

| | | |
|---|---|---|
| 1.a) | What is unit cell? | [2] |
| b) | What are the Miller indices? How they are obtained? | [3] |
| c) | Define de-Broglie's hypothesis. | [2] |
| d) | What are the matter waves? | [3] |
| e) | Define Electric Susceptibility. | [2] |
| f) | Distinguish between Soft and Hard Magnetic Materials. | [3] |
| g) | Define interference. | [2] |
| h) | Explain Population Inversion. | [3] |
| i) | Define Time of Reverberation. | [2] |
| j) | What are the nanomaterials? | [3] |

## PART-B

(50 Marks)

| | | |
|---|---|---|
| 2.a) | Describe seven crystal structures with diagrams. | |
| b) | Derive an expression for packing factor of BCC crystals. | |
| c) | Write notes on point defects. | [3+4+3] |

**OR**

| | | |
|---|---|---|
| 3.a) | Describe in detail the structure of Diamond. | |
| b) | Calculate the ratio $d_{100} : d_{110} : d_{111}$ for simple cubic structure. | |
| c) | Write a note on Frenkel and Schottky Defects. | [4+3+3] |

| | | |
|---|---|---|
| 4.a) | Describe Davisson and Germer's Experiment. | |
| b) | Explain Maxwell-Boltzmann distribution law. | |
| c) | Derive an expression for effective mass of an electron. | [4+3+3] |

**OR**

| | | |
|---|---|---|
| 5.a) | Explain Heisenberg's Uncertainty Principle. | |
| b) | Describe Kronig-Penny Model. | |
| c) | Write a note on Phase space and Ensembles | [3+4+3] |

6.a) Describe the phenomenon of electronic polarization and obtain an expression for electronic polarizability.
  b) Explain Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve.
  c) Write a note on Meissner Effect. [4+4+2]

**OR**

7.a) Derive an equation for Bohr Magneton.
  b) Explain Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment.
  c) Distinguish between Type-I & Type-II Superconductors. [3+4+3]

8.a) Describe Newton rings experiment.
  b) Explain construction of Nicol prism.
  c) Derive an expression for acceptance angle and numerical aperture. [3+3+4]

**OR**

9.a) What is Double refraction?
  b) Describe construction and working principle of Ruby laser system.
  c) Write the important applications of optical fibers. [3+4+3]

10.a) What is Hall effect?
  b) Describe construction and working principle of LED.
  c) Describe Sol-gel method for the preparation of nanomaterials. [2+4+4]

**OR**

11.a) Discuss construction of Photo Diodes.
  b) Derive an expression for Sabine's Formula for Reverberation Time.
  c) Explain the quantum confinement effects in nanomaterials. [3+4+3]

---ooOoo---

**R09**

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
### B.Tech I Year Examinations, December - 2017
### MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, CHEM, EIE, BME, IT, ETM, MMT, AE, BT, AME, MIE, PTM, MSNT, AGE)

Time: 3 hours                                                              Max. Marks: 75

**Answer any five questions**
**All questions carry equal marks**
- - -

1.a) Test the convergence of the series $\dfrac{x}{1.2}+\dfrac{x^2}{2.3}+\dfrac{x^3}{3.4}+\dfrac{x^4}{4.5}+\dots$

 b) Find the interval of convergence of the series $\sum_{n=1}^{\infty}(-1)^n n(x+1)^n \dfrac{1}{2^n}$   [8+7]

2.a) Expand $\ln(1+x)$ in powers of x.

 b) Find the shortest distance from origin to the surface $xyz^2=2$.   [7+8]

3.a) Show that the radius of curvature of the curve $xy^2=a^3-x^3$ is $\dfrac{3a}{2}$.

 b) Trace the curve $r^2=a^2\cos 2\theta$.   [7+8]

4.a) Find the surface area of the solid formed by revolving the cardioid $r=a(1+\cos\theta)$ about the initial line.

 b) Evaluate by changing order of integration $\int_0^1\int_{x^2}^{2-x} xy\,dy\,dx$.   [8+7]

5.a) Solve the differential equation $(1+y^2)+(x-e^{\tan^{-1}y})\dfrac{dy}{dx}=0$

 b) A copper ball is heated to a temperature of $80^0 C$. Then at time t=0 it is placed in water which is maintained at $30^0 C$. If at t=3 minutes, the temperature of the ball is reduced to $50^0 C$ then find the time at which the temperature of the ball is $40^0 C$.   [7+8]

6. Solve $(D^2-4D+4)y=8x^2 e^{2x}\sin 2x$   [15]

7.a) Find L{3sin3tcos2t}.
 b) Solve the following differential equation using Laplace transforms $\dfrac{d^2 y}{dt^2}+2\dfrac{dy}{dt}+2y=5\sin t$ with $y(0)=0$ and $y'(0)=0$.   [7+8]

8.a) Find a unit normal vector to the surface $x^3+y^3+z^3=3$ at the point $(1,-2,1)$.

 b) Applying Green's theorem, evaluate $\int_c (y-\sin x)dx+\cos x\,dy$, where C is the plane triangle enclosed by the lines $y=0, x=\dfrac{\pi}{2}$ and $y=\dfrac{2x}{\pi}$.   [7+8]

---ooOoo---

**R07**

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
## B.Tech I Year Examinations, December - 2017
## BASIC ELECTRONIC DEVICES AND CIRCUITS
### (Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 80

### Answer any five questions
### All questions carry equal marks
- - -

1.a) Discuss the difference between the electromagnetic and electrostatic deflection.
  b) Discuss the motion of an electron between two parallel plates under the influence of applied potential.  [8+8]

2. Discuss the following diodes with neat sketches.
   a) PN-junction diode　　b) varactor diode　　c) Zener diode　　d) photo diode
   [16]

3.a) Show that the full wave rectifier is twice efficient as a half wave rectifier.
  b) Differentiate between the series and shunt voltage regulators.  [8+8]

4.a) Explain why BJTs are called bipolar devices and FETs are called unipolar devices.
  b) Draw the two transistor model of an SCR and explain its operation with the help of $V - I$ characteristics.  [6+10]

5.a) What is thermal runaway? How can it be avoided?
  b) Draw the voltage divider bias circuit and derive an expression for its stability factor.
   [6+10]

6. Draw the AC equivalent of CE amplifier with fixed bias using h-parameters model and derive equations for input impedance, output impedance, voltage and current gains.
   [16]

7.a) What is the effect of voltage series negative feedback on the following performance measures of BJT amplifier i) input resistance ii) output resistance iii) bandwidth and iv) distortion and noise.
  b) Compare negative and positive feedbacks.  [10+6]

8.a) Explain the principle of operation of RC phase shift oscillator.
  b) Derive an expression for frequency of oscillations of Colpitts oscillator.  [8+8]

---ooOoo---

Code No: 131AC

**R16**

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
### B.Tech I Year I Semester Examinations, December - 2017
### ENGINEERING PHYSICS
### (Common to CE, ME, MCT, MMT, AE, MIE, PTM, CEE, MSNT)

Time: 3 hours                                                           Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each
question carries 10 marks and may have a, b, c as sub questions.

### PART- A
(25 Marks)

1.a) What are the conditions for coherence?                                      [2]
  b) Distinguish between Fresnel and Fraunhoffer diffraction.                    [3]
  c) State Malu's law.                                                           [2]
  d) Distinguish between spontaneous and stimulated emission of radiation.       [3]
  e) Define the terms numerical aperture and acceptance angle.                   [2]
  f) What are the applications of optical fibres?                                [3]
  g) Define the terms unit cell and lattice parameters.                          [2]
  h) Calculate packing factor of BCC and FCC lattices.                           [3]
  i) State Bragg's law.                                                          [2]
  j) What are point defects?                                                     [3]

### PART-B
(50 Marks)

2.a) Describe interference in thin films by reflected light.
  b) Explain single slit diffraction quantitatively.                            [5+5]
                                    OR
3.a) Describe Newton's rings experiment to determine wave length of light.
  b) Discuss the theory of N-slits diffraction.                                 [5+5]

4.a) Explain the theory of double refraction.
  b) Discuss the working principle of quarter wave plate.                       [5+5]
                                    OR
5.a) Describe the construction, principle and working of He-Ne laser.
  b) What are the applications of lasers?                                       [5+5]

6.a) Derive the expression for numerical aperture and acceptance angle of a fibre.
  b) What are the classification of attenuation in fibres?                      [5+5]
                                    OR
7.a) Distinguish between step index and graded index fibre.
  b) Explain total internal reflection principle in fibres.                     [5+5]

8.a) What are miller indices? Explain the procedure to index a plane.
  b) Calculate atomic radius in the case of BCC and FCC lattices.  [5+5]

OR

9.a) Discuss the classification of crystal systems.
  b) Find the relation between inter planar spacing and lattice parameters in a cubic system.  [5+5]

10.a) Discuss X-Ray diffraction Laue method to determine lattice parameters.
  b) Distinguish between Frankel and Schottky defects.  [5+5]

OR

11.a) Describe powder method to determine lattice parameters of a crystal.
  b) Distinguish between interstitial and substitutional defects.  [5+5]

---ooOoo---

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year I Semester Examinations, December - 2017
ENGINEERING CHEMISTRY
(Common to EEE, ECE, CSE, EIE, IT, ETM)

Time: 3 hours							Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

## PART- A

(25 Marks)

1.a)	Write various units of hardness and the relationship between them.		[2]
 b)	Write short notes on Caustic Embrittlement.					[3]
 c)	What is the role of salt bridge in constitution of an electrochemical cell?		[2]
 d)	Write down the cell reaction of methanol-oxygen fuel cell and its applications.	[3]
 e)	What is functionality of a monomer? What is its significance in polymer chemistry?
 										[2]
 f)	What is tacticity? How polymers are classified based on tacticity of polymers?	[3]
 g)	Describe the composition and applications of LPG.				[2]
 h)	Define Gross and Net calorific values of a fuel and their units.			[3]
 i)	What are the characteristics of a good refractory?				[2]
 j)	What is viscosity index of a lubricant? Explain.				[3]

## PART-B

(50 Marks)

2.a)	What is mean by Defluoridation of water? Give an account about Nalgonda technique.
 b)	Write a brief note on "Reverse Osmosis".
 c)	Calculate the Total hardness of a water sample which shows following analysis: $Ca(HCO_3)_2$ = 4.86 mg/L; $Mg(HCO_3)_2$ = 5.84 mg/L; $CaSO_4$ = 6.8 mg/L and $MgSO_4$ = 8.4 mg/L.							[4+3+3]

OR

3.a)	What are the steps involved in the treatment of Potable water? Explain.
 b)	Explain the Ion-Exchange method of purification of hard water.			[6+4]

4.a)	Describe the construction and functioning of Ni-Cd battery with relevant chemical reactions involved in the charging and discharging.
 b)	What is reference electrode? Explain the construction and working principle of calomel electrode with a neat diagram.
 c)	What is Nernst equation? What are its applications?				[4+4+2]

OR

5.a)	Describe the Working principle of lead acid battery with relevant chemical reactions involved during charging and discharging processes.
 b)	Write an account on lithium ion batteries.					[5+5]

6.a)  Describe the methods of preparation and Engineering applications of Dacron and Poly vinyl chloride.

b)  Write short note on polylactic acid and polyvinyl alcohol.

c)  Give an account on FRP's.                                                                          [4+4+2]

**OR**

7.a)  Discuss about free radical chain and step-growth polymerization with appropriate examples.

b)  Describe the preparation, properties and applications of butyl rubber and thiokol rubber.
                                                                                                       [6+4]

8.a)  Give an account of Ultimate analysis of coal and state its significance.

b)  Write short on cetane rating.                                                                      [6+4]

**OR**

9.a)  Give an account about production of gasoline from crude oil.

b)  What is cracking? Explain Moving Bed catalytic cracking in detail.                                  [5+5]

10.a)  Write a short note on flash and fire point of a lubricant.

b)  What is lubrication? Explain boundary lubrication briefly.

c)  What are the advantages of composites?                                                             [5+3+2]

**OR**

11.a)  Write the chemical reactions that are taking place during the setting of cement.

b)  What are extreme pressure additives? Why these additives are used for lubrication.

c)  What is role of gypsum in the manufacturing of cement?                                             [4+3+3]

---ooOoo---

Code No: 111AE

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
### B.Tech I Year Examinations, December - 2017
### ENGINEERING CHEMISTRY
### (Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, ETM, MMT, AE, AME, MIE, PTM, AGE)

Time: 3 hours                                                          Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each
question carries 10 marks and may have a, b, c as sub questions.

## PART- A
(25 Marks)

1.a) Write the Principle involved in Pitting corrosion. [2]
  b) Define Conductivity and molar conductivity for the solution of an electrolyte. Discuss their variation with concentration. [3]
  c) Explain the functionality of monomer with suitable examples. [2]
  d) Explain the variation of Physical properties of polymer with their molecular weight by taking one example. [3]
  e) Sample of ground water has 150mg/L of $Mg^{2+}$. Calculate the hardness expressed in milli-equipments per litre. [2]
  f) Write the disadvantages of zeolite process which is used to purify water. [3]
  g) Write the differences between octane number and cetene number. [2]
  h) Why should an ideal fuel have moderate ignition temperature? [3]
  i) What is condensed phase rule equation? Explain the terms involved in it. [2]
  j) Explain 'Triple Point' in a one compound system of phase diagram. [3]

## PART- B
(50 Marks)

2.a) Write the Chemical reaction of recharging the lead storage battery, highlighting all the materials that are involved during recharging.
  b) What is paint? Explain its constituents and functions. [5+5]
### OR
3.a) What are reference electrodes? Describe the construction of Calomel electrode.
  b) Discuss the differences between Galvanizing and Tinning with neat diagrams.
  c) What is the principle involved in $CH_3OH-O_2$ fuel cell. [4+4+2]

4.a) Write the structure of Isotactic, Syndiotactic and Atactic forms by taking suitable example.
  b) Explain the chemical reactions involved in setting and hardening of cement.
  c) Write short notes on Vulcanization. [3+4+3]
### OR
5.a) Differentiate Thermo plastics and Thermosetting plastics with suitable examples.
  b) Write the preparation properties and engineering applications of styrene rubber.
  c) Write the mechanism of Thin Film Lubrication. [3+4+3]

6.a) Explain the Principle involved in the estimation of hardness of water by EDTA method.
 b) What is Caustic Embrittlement? Write the causes of it and explain the preventive methods.
 c) What are parameters for portable water? [4+3+3]

**OR**

7.a) Explain principle and method of purification of domestic water by Reverse Osmosis and also write its significance.
 b) What is Calgon conditioning? Explain.
 c) Explain Chemical equations involved in Lime soda process. [4+2+4]

8.a) What is Cracking? What are its objectives? Explain 'Fixed bed catalytic cracking' with neat diagram.
 b) What is Dulong's formula? How to calculate calorific value by Dulong's method.[5+5]

**OR**

9.a) Explain how coal sample is analysed by ultimate method. Write its significance.
 b) What is synthetic petrol? With neat diagram explain how to prepare synthetic petrol by Fischer-Tropsch's process. [5+5]

10.a) What is phase diagram? Explain phase diagram of Iron-Carbon with respective to heat treatment and cooling curves.
 b) Explain the classification, electrical and optical properties of colloids. [5+5]

**OR**

11.a) With neat phase diagram explain Lead-Silver two component system.
 b) Write short notes on:
   i) Langmuir adsorption isotherm.
   ii) Applications of Colloids. [5+5]

---ooOoo---

Code No: 51008

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year Examinations, December - 2017
MATHEMATICAL METHODS
(Common to EEE, ECE, CSE, EIE, BME, IT)

Time: 3 hours
Max. Marks: 75

**Answer any five questions**
**All questions carry equal marks**
- - -

1.a) Reduce the matrix $A = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 2 & 0 & 1 \\ 1 & 4 & 5 & -1 \end{pmatrix}$ to normal form and hence find its rank.

b) Solve the system of equations $3x+2y+7z=4,\; 2x+3y+z=5,\; 3x+4y+z=7$
using LU decomposition method. [7+8]

2.a) If $\lambda$ is an Eigen value of a non-singular matrix $A$, then show that $\dfrac{1}{\lambda}$ is an Eigen value of

$A^{-1}$ and $\dfrac{|A|}{\lambda}$ is an Eigen value of $Adj\, A$.

b) Diagonalize the matrix $A = \begin{pmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{pmatrix}$. [5+10]

3.a) Express the matrix $A = \begin{pmatrix} 2 & 3 & -1 \\ -1 & 4 & 1 \\ 5 & 0 & 6 \end{pmatrix}$ as the sum of a symmetric matrix and a skew-

symmetric matrix.
b) Find the rank, index, nature and signature of the quadratic form $Q = 2(xy + yz + zx)$.
c) Prove that all the Eigen values of a Hermitian matrix are real. [5+5+5]

4.a) Find a positive root of the equation $x^3 - 4x - 9 = 0$ correct to three decimal places by
bisection method.
b) Apply Lagrange's interpolation formula to find $f(10)$ and $f(10.5)$ from the table
given below. [7+8]

| x : | 5 | 6 | 9 | 11 |
|------|----|----|----|----|
| f(x): | 12 | 13 | 14 | 16 |

5.a) Find $\dfrac{dy}{dx}$ and $\dfrac{d^2 y}{dx^2}$ at $x = 0$ from the following table.

| x: | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| y: | 4 | 8 | 15 | 7 | 6 | 2 |

b) Fit an exponential curve of the form $y = ae^{bx}$ to the following data:     [7+8]

| x: | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| y: | 7 | 11 | 17 | 27 |

6.a) Find the approximate value of $y(0.2)$ for $y' = x + y^2$, $y(0) = 1$ using Taylor's series method.

b) Given $y' = \dfrac{y - x}{y + x}$, $y(0) = 1$. Compute $y(0.1)$ by Euler's method with $h = 0.02$.     [7+8]

7.a) Find the Fourier series to represent the function $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$ and hence

deduce that $1 + \dfrac{1}{3^2} + \dfrac{1}{5^2} + \ldots\ldots = \dfrac{\pi^2}{8}$.

b) Obtain the half-range Fourier cosine series for the function $f(x) = x$ in $(0, \pi)$.     [10+5]

8.a) Form a partial differential equation by eliminating the arbitrary functions $f$ and $g$ from $z = y f(x) + x g(y)$.

b) Solve $yzp + xzq = xy$.

c) Solve $p + q = pq$.     [5+5+5]

---ooOoo---

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year Examinations, December - 2017
**ENGINEERING MECHANICS**
(Common to CE, ME, MMT, AE, AME, MIE, PTM)

Time: 3 hours

Max. Marks: 75

**Answer any five questions**
**All questions carry equal marks**
*Illustrate your answer with NEAT sketches wherever necessary*

- - -

1.  A system of four forces P, Q, R and S of magnitudes 5 kN, 6 kN, 8 kN, and 4 kN respectively acting on a body are shown in rectangular coordinates in figure 1. Find the moments of the forces about the origin O. Also find the resultant moment of the forces about O. [Coordinates of: A(6,10), B(10,8), C(9,7) – all distances are in meters and the figure 1 is not to scale]. [15]
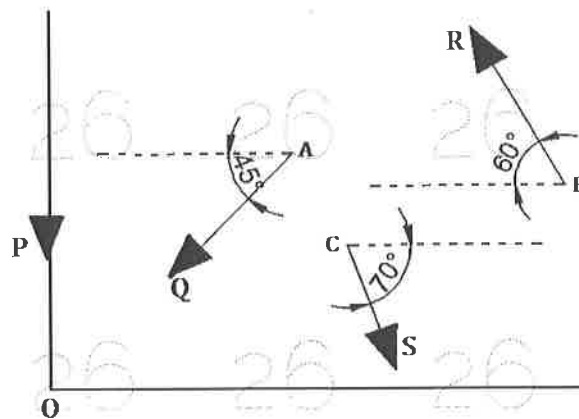


**Figure: 1**

2.a) State and prove Lami's theorem.

   b) A boat is moved uniformly along a canal by two horses pulling with forces $P = 890$ N, and $Q = 1068$ N, acting under an angle $\alpha = 60^0$. Determine the magnitude of the resultant pull on the boat, and find the angles $\beta$ and $\gamma$. (Refer to Figure 2). [7+8]
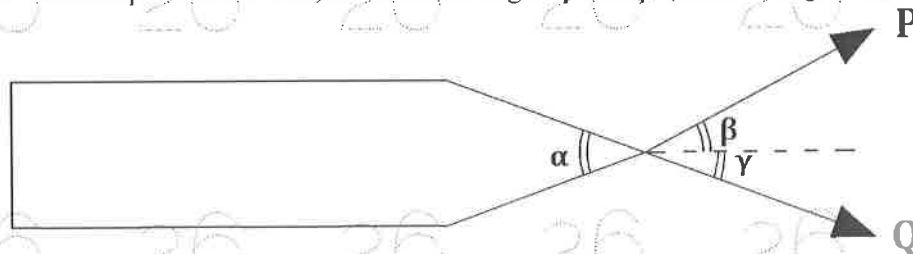


**Figure: 2**

3.a) A steel ball of diameter 150 mm rests centrally over a concrete cube of size 150 mm. Determine the centre of gravity of the system, taking the weight of concrete as 25,000 N/m$^3$ and that of steel as 80,000 N/m$^3$.

   b) Establish the work – energy equation for translation. [7+8]

4. A rectangular R.C.C. column is centrally cast over an R.C.C. bed as shown in figure 3. The column is of section 30 × 45 cm and height 4 m. The concrete bed is of size 3 × 4.5 m and thickness 30 cm. Find the mass moment of inertia of the column and bed combination about its vertical centroidal axis. Mass density of concrete = 2500 kg/m$^3$. [15]
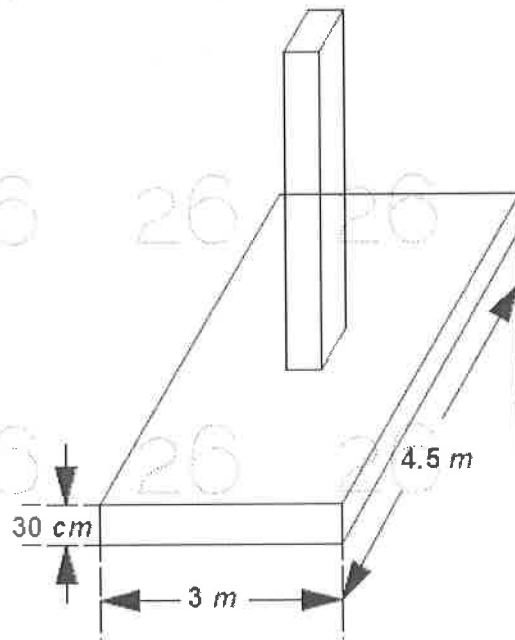


**Figure: 3**

5. Using the method of sections, determine the forces in the members GE, GC and BC of the plane shown in figure 4. Indicate whether these members are in tension or compression. [15]
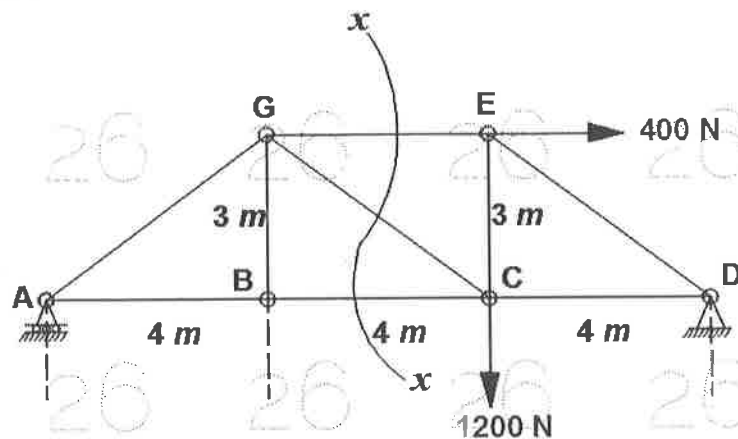


**Figure: 4**

6. A stone dropped into a well falls vertically down with a constant acceleration of 9.81 m/s$^2$. The sound of impact of stone on the bottom of the well is heard after 6.5 s. If the velocity of sound is 336 m/s, what is the depth of the well? [15]

7.  Find the axial forces in the bar DE of the simple truss which is loaded as shown in figure 5. Use the method of virtual work. [15]
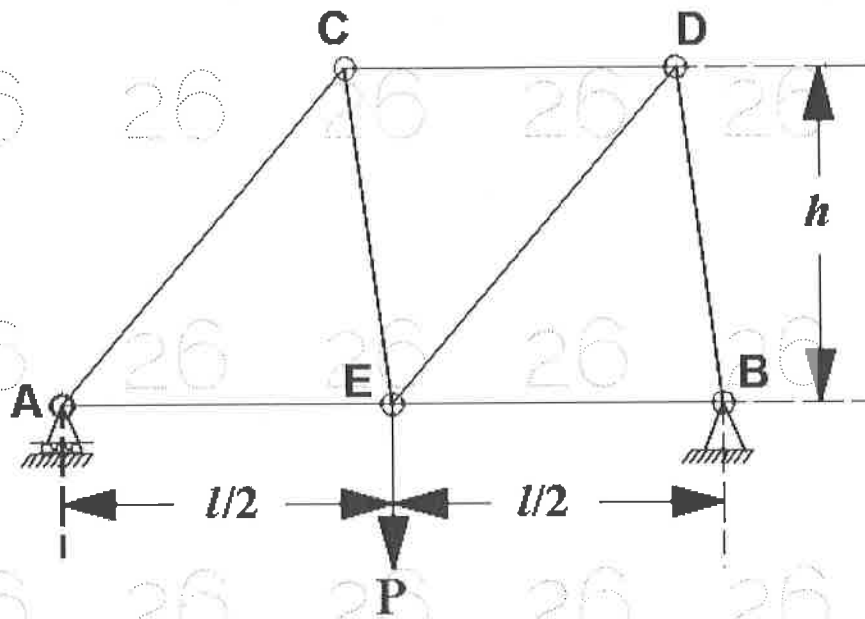


**Figure: 5**

8.a)  When should we use the Work – Energy Principle and when should we use $F = ma$? Explain with examples.

b)  Explain the Work – Energy Applications to particle motion in Connected Systems. [7+8]

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year Examinations, December - 2017
**C PROGRAMMING AND DATA STRUCTURES**
(Common to EEE, ECE, CSE, IT, BT)

Time: 3 hours

Max. Marks: 80

**Answer any five questions**
**All questions carry equal marks**

- - -

1.a) What is an algorithm? Write Pseudo code for adding two integer numbers.
  b) Write the structure of the C program and explain it.
  c) Write a C program to generate numbers from 1 to 1000 using while loop.          [6+4+6]

2.a) What is a Function? Explain different user defined functions with example.
  b) What is a recursive function? Write a C program to find factorial of a number using recursion.          [8+8]

3.a) Write a C Program to multiply two matrices.
  b) Explain dynamic memory management functions.          [8+8]

4.a) What is a Structure? Explain different ways of defining Structure with example.
  b) Explain nested structures with suitable example.
  c) List the differences between Structure and Union.          [6+4+6]

5.a) List the differences between the text files and binary files.
  b) List and Explain formatted I/O functions.
  c) Write a C program to append a data to already existing file.          [6+4+6]

6.a) What is a Linear Search? Write a linear search program to find an element in an array.
  b) Explain Quick sort with suitable example.          [8+8]

7. What is doubly linked list? Explain an algorithm to insert new node at the beginning at middle position and at the end of a doubly Linked List.          [16]

8.a) What is tree traversal? Explain the different traversal techniques with example.
  b) Explain BFS technique with an example.          [8+8]

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**R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, December - 2017
ENGINEERING MECHANICS
(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, ETM, MMT, AE, MIE, PTM, CEE, MSNT)

Time: 3 hours

Max. Marks: 75

**Note:** This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

## PART- A

(25 Marks)

| | | |
|---|---|---|
| 1.a) | State the theorem of varignon. | [2] |
| b) | Write the equations of equilibrium of a coplanar system of forces. | [3] |
| c) | Define rolling resistance. | [2] |
| d) | Define wedge and write the equilibrium conditions for ladder friction. | [3] |
| e) | Define centroid and centre of gravity of a area. | [2] |
| f) | Define principal axes and principal moment of inertia. | [3] |
| g) | Define radius of gyration and polar moment of inertia. | [2] |
| h) | Differentiate between "Mass moment of inertia" and "Area moment of inertia". | [3] |
| i) | Differentiate the kinematics and kinetics. | [2] |
| j) | State work-energy principle for Linear and angular motion of a rigid body. | [3] |

## PART-B

(50 Marks)

2.a)   A 800N Cylinder is supported by the frame ABC, figure 1 which is hinged at A, and rests against wall AD. Determine the reactions at A, B, C and D.
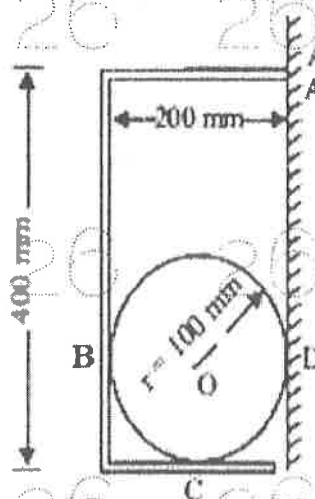


Figure: 1

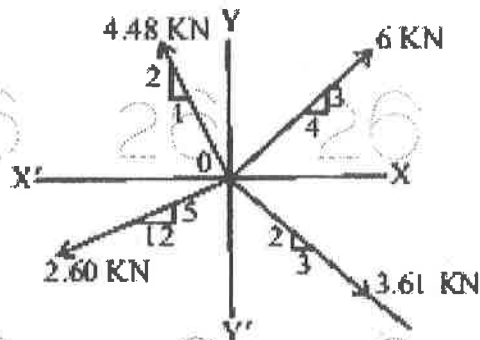b) The body shown in figure 2 is acted upon by four forces. Determine the resultant.

[5+5]



Figure: 2

OR

3.a) Concurrent forces 3P, 7P and 5P act respectively along three directions, which are parallel to the side of an equilateral triangle taken in order. Determine the magnitude and direction of the resultant.

b) What do you understand by resultant of a force system and which are the methods used for determining the resulting of coplanar concurrent force system? Four forces having magnitudes of 20N, 40N, 60N and 80N respectively, are acting along the four sides (1m each), of a square ABCD taken in order, as shown in figure 3. Determine the magnitude and direction of the resultant force. [5+5]
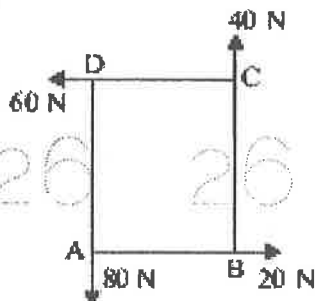


Figure: 3

4.a) What is the characteristics of frictional force? Describe the laws of coulomb friction, explaining the concept of equilibrium of bodies involving dry friction.

b) Two equal bodies A and B of weight 'W' each are placed on a rough inclined plane. The bodies are connected by a light string. If $\mu_A = 1/2$ and $\mu_B = 1/3$, show that the bodies will be both on the point of motion when the plane is inclined at $\tan^{-1} (5/12)$. [5+5]

OR

5.a) Explain the principles of operation of a screw-jack with a neat sketch.

b) A body of weight 100N rests on a rough horizontal surface ($\mu = 0.3$) and is acted upon by a force applied at an angle of $30^0$ to the horizontal. What force is required to just cause the body to slide over the surface? [5+5]

6.a) Determine the distance of the center of gravity of a homogeneous truncated right circular cone from the plane of the base if the radius of the base is $r_1$ the radius of the top $r_2$ and the altitude of the truncated portion $h$.

b) Determine the mass moment of inertia of a solid right circular cylinder of uniform density with respect to its centroidal diameter the radius of the cylinder is R and its length is H.

[5+5]

7.a) Derive an expression to determine the moment of inertia of a semi circle about its diametric base.

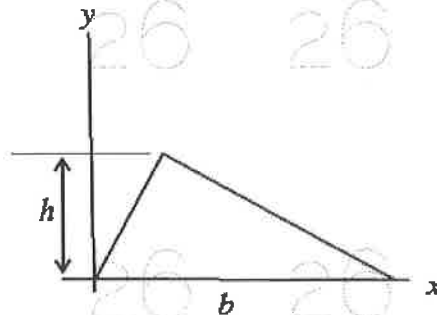b) Determine the y coordinate of the centroid of a uniform triangular lamina as shown in Figure 4. [5+5]



**Figure: 4**

8. Derive the expression form mass moment of inertia of prism along three axes. [10]

OR

9. Discuss about the expression for finding mass moment of inertia of a cylinder of radius **R** and height **h** about its base. [10]

10.a) A body moves along a straight line and its acceleration 'a' which varies with time 't' is given by a =6-4t. Five seconds after the start of observation, the velocity is 18 m/s. The distance moved by the body 8 sec after the start of observation of motion from origin is 75 m. Determine:
i) The acceleration, velocity and distance from the origin at the start of observation.
ii) The time after the start of observation at which the velocity becomes zero and the distance travelled from the origin.

b) A man weighing 90 kg stands in a boat so that he is 6 m from pier on the shore. He walks 2.4 m in the boat toward the pier and then stops. How far from the pier will he be at the end of this time? The boat weighs 120 kg and there is assumed to be no friction between it and water. [5+5]

OR

11.a) A vehicle accelerates a glider of 125 kg mass from rest to a speed of 50 km/hr. Make calculations for the work done on the glider by the vehicle. What change would occur in the kinetic energy of the glider if subsequently its velocity reduces to 20 km/hr on the application of brakes?

b) A stone is dropped into a well and falls vertically with constant acceleration $g =9.81$ m/s$^2$. The sound of impact of the stone on the bottom of the well is heard 6.5 sec after it is dropped. If the velocity of sound is 340 m/s, find the depth of the well. [5+5]

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
B.Tech I Year Examinations, December – 2017
**ENGINEERING CHEMISTRY**
(Common to CE, EEE, ME, ECE, CSE, CHEM, EIE, BME, IT, MCT, ETM, AE, BT, AME, MIE, PTM)

Time: 3 hours                                                                                      Max. Marks: 75

**Answer any five questions**
**All questions carry equal marks**
- - -

1.a) Write the cell reaction, working principle and applications of Ni-Cd battery.
 b) Define EMF of the cell. Calculate EMF of the cell with $E^0$ value of zinc is -0.76V, $E^0$ value of copper is 0.34 V.                                          [7+8]

2.a) Differentiate Galvanization from Tinning.
 b) What is cathodic protection? Explain sacrificial anodic method of protection.      [7+8]

3.a) Why Natural rubber should be vulcanized? Explain.
 b) What are liquid crystal polymers? Write their applications.                    [7+8]

4.a) Sample of water contains following impurities:
 $Mg(HCO3)2$ = 73mg/l,  $CaCl2$  = 222 mg/l, $MgSO4$= 120mg/l,  and $CaSO4$ = 272 mg/l. Calculate the temporary and permanent hardness in degree clark.
 b) What are scales and sludges? Discuss the causes and effects and give preventive method for scales and sludges.                                              [7+8]

5.a) What is critical micelle concentration? Write the working principles of soap.
 b) Write the derivation and significance of BET adsorption isotherm.             [7+8]

6.   A sample of coal is found to have 70 % of carbon, 6% of hydrogen, 12% oxygen, 1.5% of sulfer, 3.5% nitrogen, and remaining is ash. Find out the minimum amount of air required for complete combustion of 5 kg of coal.                              [15]

7.a) What is the difference between triple point and eutectic point? Explain.
 b) Draw the neat diagram of water system. Describe the lines, curves and triple point.
                                                                              [7+8]

8.a) Write the chemical reactions involved in setting and hardening of cement.
 b) Give the classification, suitable examples and applications of electrical and thermal insulators.                                                            [7+8]

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