

MIDWESTERN UNIVERSITY
FACULTY OF ENGINEERING
Examination Control Division

Exam	Regular/Back		
Level	BE	Full Marks	50
Program	Civil/Hydropower	Pass Marks	25
Year/Part	I/I	Time	3 Hrs.

2073 Chaitra

Subject: Basic Computer Concept and Programming (CO101)

- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
- Figures in margin indicate full marks.

- 1 What is computer? Explain the application of computer in different fields. [1+3]
- 2 Why flow chart is required? Explain different symbols used in the flow chart and explain with suitable example. [1+3]
- 3 Define symbolic constant. Write a C program to find the area and perimeter of a circle. [1+4]
- 4 What are formatted and unformatted input/output functions? Distinguish between puts() and putchar() with suitable example. [2+3]
- 5
 - a) Mention different types of conditional statements with syntax. 3
 - b) Write a C program to determine whether a given number is 'even' or 'odd' and print the message:
 NUMBER IS ODD
 Or
 NUMBER IS EVEN 4
- 6 What is the difference between an array and variable? Explain the declaration and initialization of one and two dimensional array with example. [1+4]
- 7 What is call by value in function? Write a C program to swap two numbers using a temporary variable. [1+5]
- 8
 - a) Explain pointer with suitable diagram. [2]
 - b) Write the output of the following program.(Given: &a=263204 and &ptr1=263200) [2]

```
main()
{
int a = 51;
int *ptr1,**ptr2;
ptr1 = &a;
ptr2 = &ptr1;
printf("a=%d\n",a);
printf("&a= %d\n",&a);
printf("ptr1=%d\n",ptr1);
printf("&ptr1= %d\n",&ptr1);
printf("**ptr1=%d\n",*ptr1);
printf("ptr2=%d\n",ptr2);
printf("**ptr2= %d\n",*ptr2);
printf("***ptr2= %d\n",**ptr2);
```

}

9 What is a structure? Write a C program to accept and display the record of two books which has member book_title, book_author and book_id. [1+5]

10 Write the purpose of the following functions: 4
 a) fopen() b) fclose() c) fscanf() d) fprintf() e) fgets () f) fputs () g) fgetc () h) fputc ()

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Exam	Retake		
Level	BE	Full Marks	50
Program	Civil/Hydro	Pass Marks	25
Year/Part	I/I	Time	3.0 Hrs.

2074 Kartik

Subject: Construction Materials (CE102)

- Attempt all questions
- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
- Provide necessary figures with labeling.
- Figures in margin indicate full marks.

- 1.a. Define construction materials with suitable examples. Explain the following terminologies [1+3]
 a) Creep b) Elastic Limit c) Poisson's Ratio d) Plasticity e) Specific Weight f) Hardness
- b. What do you mean by stones? Discuss the requirements of stones that are used in various construction projects. [3]
- c. Provide the broad classification of aggregates with examples. What are the properties of aggregates used in building construction? [2x1.5]
2. What are constituents of ideal brick earth? In detail, describe all the field tests for bricks. [2+4]
- a.
- b. How does IS712-1973 classify lime? Illustrate with examples the use of lime in present construction technology. [2+2]
3. List out the various oxides in cement. With the help of appropriate figures explain the [6]
 a. hydration mechanism of hydraulic cements.
- b. What is Varnish and why is it used? [4]
4. What are the various defects in timber? Explain the preventive measures for prevention of [5]
 a. timber from deterioration.
- b. What are the purposes of thermal and mechanical treatment in steel? Explain various thermal [5]
 and mechanical treatment of steel.
5. Write Short Notes on [4x2.5
 a.]

- i) White Wash
- ii) Bitumen
- iii) Compression test for stones
- iv) Use of copper in construction

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2073 Chaitra

Subject: CE102 Construction Materials

- Attempt all questions
- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
- Provide necessary figures with labeling.
- Figures in margin indicate full marks.

- 1.a. Define construction materials with suitable examples. Explain the following terminologies [1+3]
 a) Fatigue b) Yield Strength c) Poisson's Ratio d) Modulus of elasticity e) Elastic Limit
 f) Toughness
- b. Define stone from the perspective of a civil engineer. Elaborate the geological and chemical classification of stones. [3]
- c. Briefly illustrate the characteristics of aggregates. [3]
2. What are the various forms in which clay is found in nature? Describe the characteristics of [1+5]
 a. first class brick and second class brick.
- b. Cement has been one of the major construction materials of this century. Describe briefly, with necessary process diagram, the manufacture process of cement. [4]
3. Define briefly standard test of cement and the selection of mortar in civil engineering works. [6]
 a.
- b. Differentiate between thermosetting plastics and thermoplastics. What are the properties of an ideal paint? [2+2]
4. What do you understand by the term "Seasoning of Timber"? Explain in detail the various [5]
 a. ways of assuring seasoning.
- b. Describe the properties and uses of Mild Steel and High Carbon Steel. [5]

5. Write Short Notes on (Any Four)

[4x2.5
]

a.

- v) Distemper
- vi) Types of glasses
- vii) Setting time test of cement
- viii) Sieve analysis and Compressive strength
- ix) Properties of construction materials

The End

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Examination Control Division

2073 Chaitra

Exam	Regular/Back		
Level	BE	Full Marks	50
Program	Civil	Pass Marks	25
Year/Part	I/I	Time	3 Hrs.

Subject: Engineering Physics (SH105)

- Attempt all questions
- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
- Figures in margin indicate full marks.

- 1 (a) Define compound pendulum. Show that the motion of compound pendulum is simple harmonic in nature and derive its time period. Show that the point of oscillation and point of suspension are interchangeable. (5)
- (b) (i) The equation of a transverse wave in a stretched wire is $y=2\sin(30t-\pi)$, where y is in centimeter, t is in second. Find amplitude, wavelength, frequency and speed of wave. (2)
- (ii) Transverse wave on a string have a wave speed 8m/s, amplitude 0.07m, wavelength 0.32m. The wave travel in negative x- direction, and $t = 0$, the $x = 0$ and of the string has its maximum upward displacement. Find the frequency, period, wave number and wave equation of the wave. (3)
- 2 (a) What are ultrasonic waves ? Explain any one method of production of ultrasonic waves in lab. What are the uses of ultrasonic waves? (5)
- (b) (i) Two thin converging lenses of powers 5D and 4D are placed coaxially 10cm apart. Find the distance between two principal points. (2)
- (ii) Two glasses have dispersive powers in the ratio of 2:3. These glasses are to be used in the manufacture of an achromatic objective of focal length 20cm. What are the focal lengths of lenses. (2)
- 3 (a) What are coherent sources, why do we need these sources for interference ? Describe the necessary theory for interference in thin films. (5)

- (b) Two very narrow slits are spaced $1.8\mu\text{m}$ apart and are placed 35cm from a screen. What is the distance between the first and second dark lines of the interference pattern when the slits are illuminated with coherent light with wave length 550nm ? Also find the distance between first and second bright lines if the whole system is totally immersed in water. (Refractive index of water is 1.33) (5)
- 4 (a) What are Maxwell's equations? Derive the ampere's law modified by Maxwell. Using Maxwell's equations Derive wave equation of electromagnetic waves in free space in terms of electric and magnetic field. (5)
- (b) Three point charges each $3 \times 10^{-7}\text{C}$ are placed at the corner of an equilateral triangle whose side is 1m what is the electric field at one of the vertices of the triangle due to these charges. (5)
- 5 (a) State Biot-Savart law. Using it derive the expression for magnetic field at a point on the axis of a current carrying circular coil. (5)
- (b) (i) A copper wire is stretched to make it 0.1% longer. What is the percentage change in resistance? (3)
- (ii) A silver wire 2.6mm in diameter transfer a charge of 420C in 80min . Silver contains 5.8×10^{20} electrons per cubic meter. What is the current in the wire and magnitude of drift velocity of the electron in the wire? (2)

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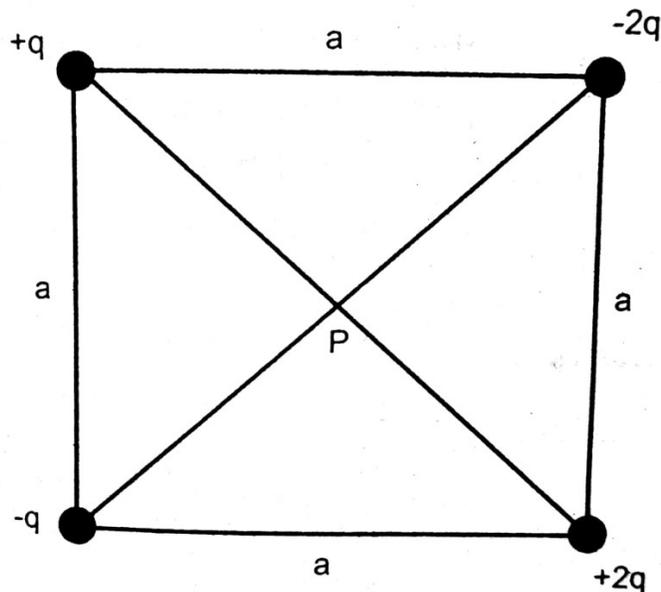
2074 Chaitra

Engineering Physics (SH105)

- Attempt all questions
- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
- Figures in margin indicate full marks.

- 1 (a) What are particle velocity and wave velocity? Find the relation between them. Find the differential equation and its possible solution of damped harmonic oscillation. (5)
- (b) (i) A simple pendulum of length 20cm and mass 5gm is suspended in a car travelling with constant speed 70m/s around a circle of radius 50m . If the pendulum undergoes small oscillations in a radial direction about its equilibrium position, what is the frequency of oscillation? (2)
- (ii) A wave travelling along a string is described by in which numerical Constants are in SI units. a) What is the amplitude of this wave? b) What are the wavelength, period and frequency of the wave? c) What is the velocity of wave? D) What is the displacement cm and sec ? (3)

- 2 (a) What is Doppler's effect? Find the expression for the apparent frequency of note when observer is in motion and source is at rest, source is in motion and observer is at rest and both observer and source are in motion.
- (b) (i) Two thin converging lenses of focal lengths 15cm and 20cm are placed coaxially 10cm apart. An object is placed at a distance of 24cm from the first lens. Find the position of the principal points. Also find the nature and position of image.
- (ii) It is desired to make a converging achromatic lens of focal length 30cm by using two lenses of material A and B. If the dispersive powers of A and B are in the ratio of 1:2, find the focal length of each lens.
- 3 (a) What are half and quarter wave plate? Explain. Give the mathematical theory of linearly, circularly and elliptically polarized light.
- (b) (i) Newton's rings are formed by reflected light of wavelength 5895 \AA with a liquid between the plane and curve surfaces. If the diameter of the 5th bright ring is 3mm and radius of curvature of the curved surface is 100cm, calculate the refractive index of the liquid.
- (ii) The path difference between the intensity at central maxima and at a point on the screen is of the wavelength. Find the ratio of intensity at this point to that at the center of the central maxima.
- 4 (a) What are Maxwell's equations? Derive the ampere's law modified by Maxwell. Using Maxwell's equations derive wave equation of electromagnetic waves in free space in terms of electric and magnetic field.
- (b) What is the direction and magnitude of electric field at the center of square of the figure. Assume that



and cm.

- 5 (a) Using ohm's law derive the relation between current density and electric field. 5
State and explain joule's law of heating. How can you verify it experimentally?
- (b) (i) A square loop of wire of edge length 'a' carries current I. show that at the 3
center of the loop the magnitude of magnetic field produced by the current is
given by .
- (ii) An electron is projected into a magnetic field of flux density 10T with a 2
velocity of m/s in a direction right angle to the field. Compute the magnetic 2
force on the electron.

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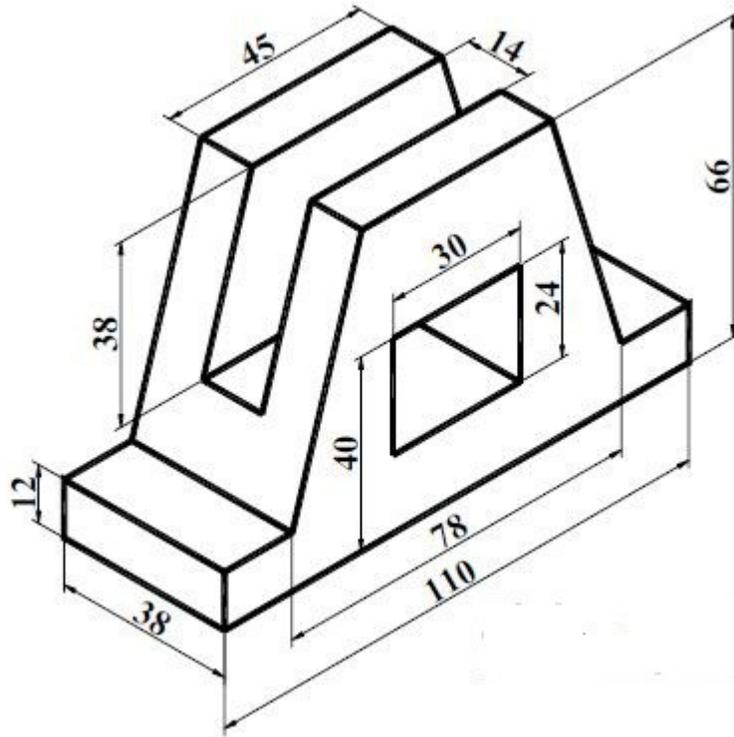
2074 Kartik

Exam	Retake		
Level	BE	Full Marks	50
Program	Civil/ Hydro	Pass Marks	25
Year/Part	I/I	Time	4 Hrs.

Subject: Engineering Drawing (ME101)

- ✓ *Attempt all questions*
- ✓ *Assume suitable values, with stipulation, if necessary.*
- ✓ *Figures in margin indicate full marks.*

1. Construct a Hyperbola when the distance of focus from the directrix is equal to 40 mm and eccentricity is $3/2$. [5]
2. Construct a regular Octagon having one side 30 mm. [5]
3. Draw an involute of a circle having diameter 49 mm. [7]
4. Draw a 75° angle with the help of compass and trisect it. [3]
5. Draw the orthographic projection of the given isometric drawing with all necessary dimensions. [10]



6. A coin of 45mm diameter rolls over a horizontal table without slipping. A point on a circumference of the coin is in contact with the table surface in the beginning and after one complete revolution. Draw the path traced by the point. Draw a tangent at any point on the curve. [6]
7. Draw a projection of the following points on the following reference line. [4]
- 30mm above H.P and 20mm in front of V.P.
 - 40mm below H.P and 20mm behind V.P.
8. A circular cone, side of base 35mm and height 50mm stands with its base on HP and base is parallel to VP and nearer to it. It is cut by a plane perpendicular to VP, inclined at 45° to HP and passing through a point on the axis, 35mm above the base. Draw the sectional top view and lateral surface. [10]

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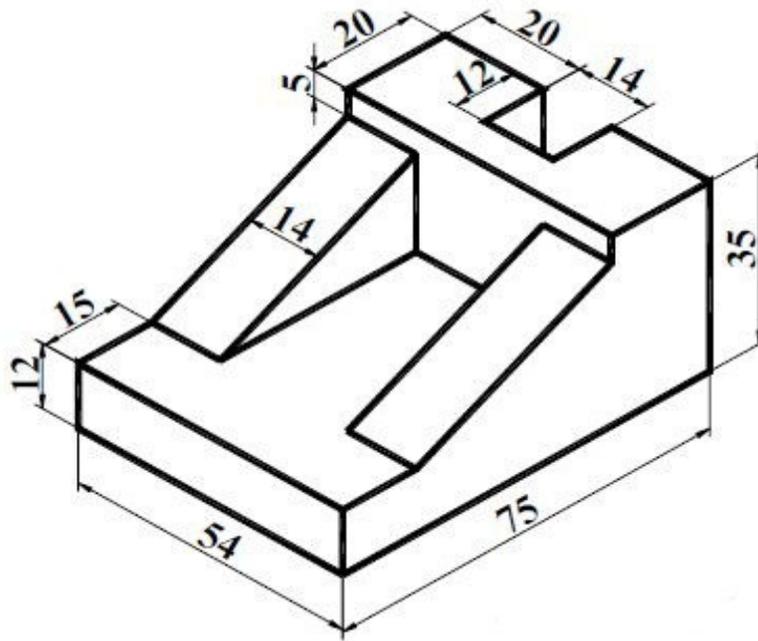
2073 Chaitra

Exam	Regular/Back		
Level	BE	Full Marks	50
Program	Civil/ Hydro	Pass Marks	25
Year/Part	I/I	Time	4 Hrs.

Subject: Engineering Drawing (ME101)

- ✓ *Attempt all questions*
- ✓ *Assume suitable values, with stipulation, if necessary.*
- ✓ *Figures in margin indicate **full marks**.*

1. Construct an ellipse when the major and minor axes are 85mm and 45mm by using concentric method. [6]
2. Construct a regular heptagon within a circle, radius 60 mm. The corners of the heptagon must lie on the circumference of the circle. [4]
3. Draw an Involute of circle having diameter 50 mm. Also draw a tangent to the curve at any point on it. [7]
4. Draw a line whose length is greater than 72 mm and divide the same into 7 equal parts and proportionately in the ratio of 1:2:3. [3]
5. Draw the orthographic projection of the given isometric drawing with all necessary dimensions. [10]



6. Draw a cylindrical helix if the diameter of the cylinder is 45mm and the pitch is 72mm. [6]
7. A straight line PQ 40mm long is parallel to VP and inclined at an angle of 45° to HP. The lower end P is 12mm above HP and 22mm in front of VP. Draw the projection of line. [4]
8. A cylinder of 50 mm diameter and axis 80 mm long stands with its base on HP. It is completely penetrated by a horizontal cylinder of 40 mm diameter and axis 76 mm long such that their axes bisect each other at right angles. The axis of the penetrating cylinder is parallel to VP. Draw the projections showing curves of intersection. [10]

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Year/Part	I/I	Time	3 hrs.

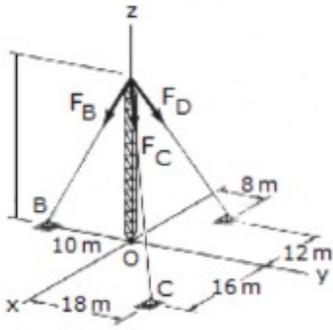
2074 Kartik

Subject: Applied Mechanics I (Statics) (CE101)

- Attempt all questions
- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
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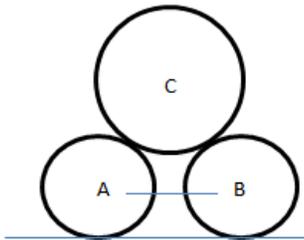
- 1 Classify the mechanics. Describe briefly the importance of applied mechanics. [1+1]
 .a.

- b. The tower of 5m height is supported by three cables as shown in figure. If $F_B = 520\text{ N}$, $F_C = 680\text{ N}$, $F_D = 560\text{ N}$. Find the resultant force and moment about origin. [5]

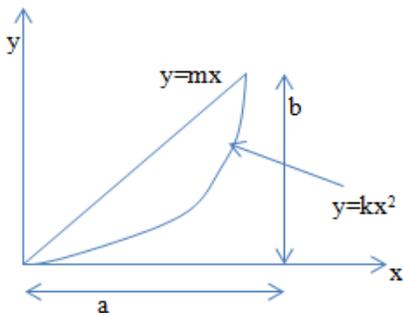


- 2.a. A body weight 120KN rests on a rough plane inclined at 30° with horizontal. A force p acts on the body through its C.G. and parallel to the plane. Find the minimum force required to move the in upward direction. [4]

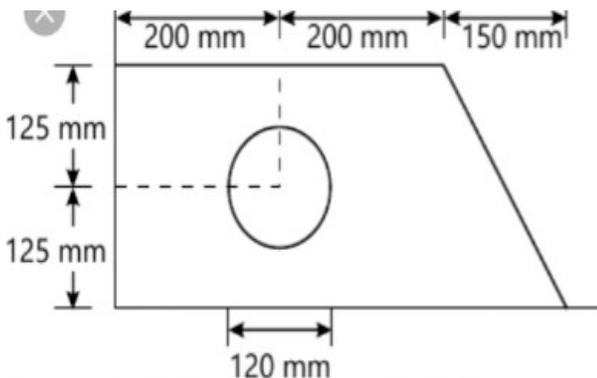
- b. In the given figure, three cylinders $R_A = 15\text{ cm} = R_B$ and $R_C = 20\text{ cm}$. $W_A = 1000\text{ N} = W_B$ and $W_C = 1500\text{ N}$. Cylinders A and B are connected at their centers by a string AB of length 40cm. Find the force in the string AB and all contact forces. [5]



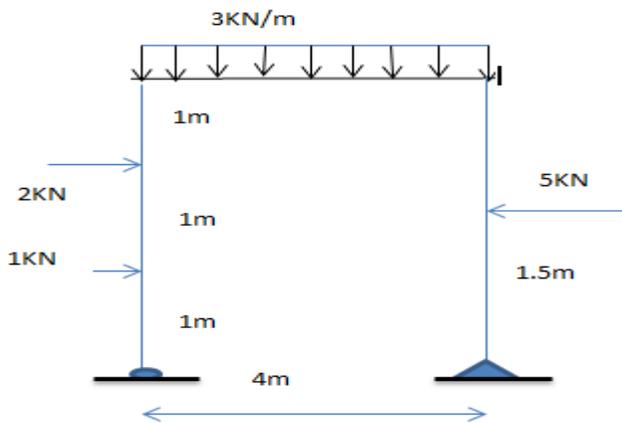
- 3.a. Find I_{xx} and I_{yy} by direct integration method. [5]



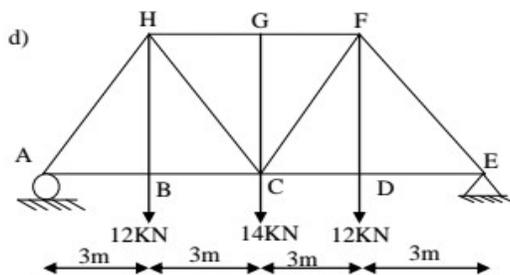
- b. Find the centroid of composite figure as shown. [5]



- 4.a. Analyze the simply supported frame as shown and hence draw SF and BM diagrams. Also show the salient features. [7]



- b. Calculate the member force of the truss as shown. [6]



- 5.a. Acceleration of a particle moving along straight line is defined by relation by $a=8-x$ where a is acceleration in m/s^2 and x is position in m. the particle starts from rest at $t=0$ and $x=0$. determine : [5]

- Velocity of particle when $x=10m$.
- Position of particle when velocity is zero.
- Velocity of particle when acceleration becomes zero.

- b. Write short notes on : (any three) [6]

- Rigid and deformable body.
- Types of friction and impending motion.
- Types of support condition and types of load.
- Relation between bending moment and shear force.



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Exam	Regular		
Level	BE	Full Marks	50
Program	Hydropower	Pass Marks	25
Year/Part	I/I	Time	3 Hrs.

- Candidates are required to answer the questions in their own words as far as possible.
- Assume suitable values, with stipulation, if necessary.
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1. (a) State the postulates of Bohr's theory. Mention its success and limitation. (3+1+1)
 (b) Define electrode potential and standard electrode potential? Standard reduction electrode potential of Zn and Cu are -0.74v and +0.34v respectively. Write the cell reaction and cell notation for Zn-Cu cell. (1+1+3)

2. (a) What is catalyst? How do the catalysts affect the rate of chemical reaction? Give examples. (2+3)
 (b) Why is ozone layer regarded as boon on the earth? Give its photochemistry. (1+4)

3. (a) Define organic polymer? Explain preparation and uses of nylon-6,6 and teflon. (1+2+2)
 (b) Define transition metals? Why do transition metals form colourful compounds? Write the reason of magnetism. (1+3+1)

4. (a) What is hybridization? Explain the formation of $[\text{Ni}(\text{NH}_3)_4]^{2+}$ ion on the basis of valence bond theory and predict its geometry and magnetic behaviour. (1+4)
 (b) What are explosives? Give the preparation and uses of trinitrotoluene (TNT). (1+2)
)
 (c) What are paints? Write their functions. (1+1)
)

5. (a) What is optically active compound? Explain the geometrical isomerism with suitable examples. (1+4)
)
 (b) Define elimination reaction? Discuss the E^1 and E^2 mechanism with factors governing them. (1+4)
)

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Exam	Regular/Back		
Level	BE	Full Marks	50
Program	Civil/Hydr o	Pass Marks	25
Year/Part	I/I	Time	3 hr s.

2073 Chaitra

Subject: Applied Mechanics I (Statics) (CE101)

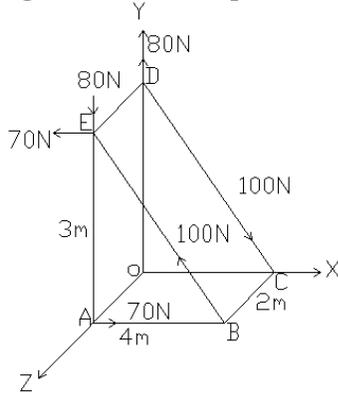
- Attempt all questions

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1 Describe briefly the concept of particle, rigid body and deformable body. [3]

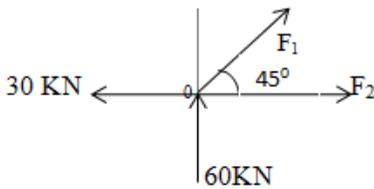
a.

b. Three pairs of couples are acted on the triangular block as shown in figure below. Determine the single resultant couple [5]

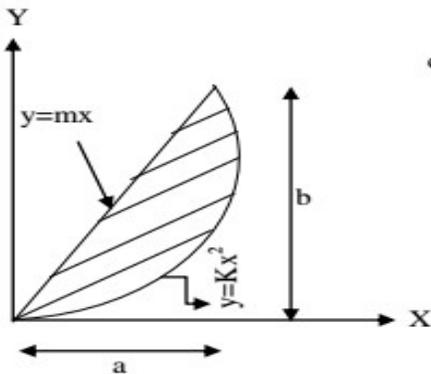


2.a. Prove that couple is a free vector. A body weight 120KN rests on a rough plane inclined at 30° with horizontal. A force 'p' acts on the body through its C.G. and parallel to the plane. Find the minimum force required to move the in upward direction. [2+3]

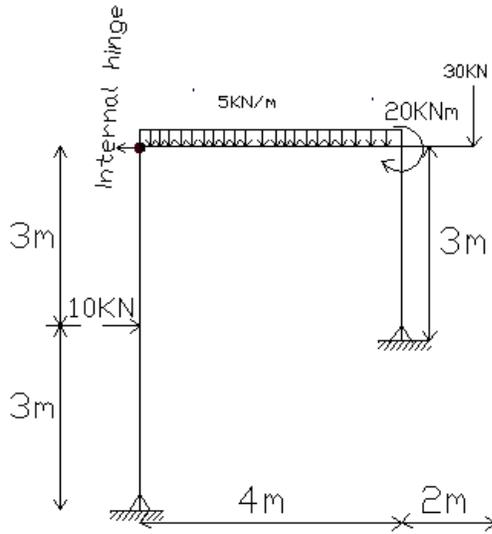
b. Determine the value of F1 and F2 if system of force in equilibrium. [3]



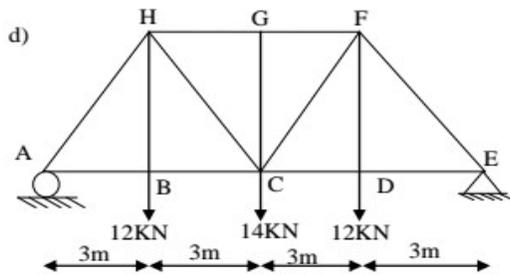
3. Define centroid and center of gravity. State and prove parallel axes theorem for moment of inertia. Find the MOI of given area by direct integration method. [1+2+5]



- 4.a. Draw axial force shear force and bending moment diagram for the given frame. Also indicate salient features if any. [10]



- b. Define type of truss according to stability point of view. Calculate the member force of the truss as shown. [2+5]



- 5.a. The motion of particle is defined by the relation $X=t^2-10t+30$. Where x is expressed as meter and t as second. Determine (a) the time when velocity becomes zero. (b) Velocity of particle at $t=5$ sec. (c) position and total distance travelled by particle when $t=8$ sec. [5]

- b. Write short notes on : (any two) [4]

- v) Principle of transmissibility of force
- vi) Angle of friction and limiting friction
- vii) Relation between BM and shear force

****The End****

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2073 Chaitra

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Attempt all questions

Candidates are required to answer the questions in their own words as far as possible.

Assume suitable values, with stipulation, if necessary.

Figures in margin indicate full marks.

- 1 a** i) State L- Hospital rule and using it, show that . [2+3]
ii) If show that
and
- b.** State and prove Rolle's theorem. Is Rolle's theorem applicable to the function in the interval? [5]
- 2 a.** i) Define continuity and differentiability of a function. Show that differentiability of a function $f(x)=a$, [3+2]
implies continuity but converse may not be always true.
ii) Using Maclaurin's series show that
- b.** i)) Find radius of curvature of the curve $x= a \cos\theta, y= a \sin\theta$ [2+3]
ii. Define asymptotes of the curves with different types. Find asymptotes of .
- 3 a.** i) Find the centre, eccentricity, vertices, foci, directrices, length of axes and latus rectum of the ellipse. [2+3]
ii) Evaluate the integral .
- b.** Find reduction formula for and use it to evaluate. [5]
- OR
- Evaluate also deduce that .
- 4 a.** i). Transformed the equation to axes through the point $(-1, 0)$ parallel to the line bisecting the angles [2+3]
between original axes.
ii) The area bounded by $y = x^2$, below by x-axis and on the right by the line $x = 1$ is revolved about the line $x = -1$. Find the volume of the solid thus generated.
- b.** Define Beta and Gamma functions using Beta and Gamma function [5]
proved that
- 5 a.** a) Define eccentricity of the conic section. Derive the standard equation of Hyperbola in its standard form. [4]
- b.** i) Define vector triple product. If , and find . Also verify that [3+3]
ii) Define the projection of vectors. If the vectors and are coplanar, Find the value of .

