1ST SEM./ COMMON TO ALL /2023(W) NEW
Th-1 Computer Application

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
    a) Write the function of CPU.
    b) Differentiate between analog computer and digital computer
    c) Define time sharing operating system.
    d) What are the benefits of e-mail?
    e) What is the difference between file and folder?
    f) State the logical operators provided by 'C' Compiler.
    g) Define flowchart.
    h) What is an array?
    i) Define Compiler.
    j. State four major areas in which internet are used?

2. Answer **Any Six** Questions 6 x 5
    a) Explain different components of computer with block diagram.
    b) Differentiate between Application and System software.
    c) Define operating system. Explain different types of operating system.
    d) Draw a flowchart to find sum of 10 random numbers.
    e) Define virus. What are the symptoms and prevention of virus attack?
    f) Write a program to find factorial of a number.
    g Define network and explain different types of network.

    Answer Any Three Questions

3   Define memory hierarchy. Explain the main features of various types of memory present at different levels of this hierarchy. 10

4   What is file access? Explain various types of file access method. 10

5   Define topology. Describe various types of topology with diagram. 10

6   Draw a flowchart and write a C program to find out largest among Three numbers. 10

7   Write Short notes on (any two): 10
    I.   Generations of Computer
    II. Loops in C language
    III. Data transmission mode.

Full Marks: 80   Time- 3 Hrs
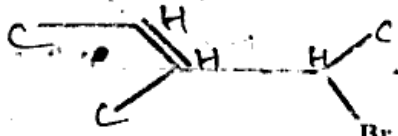
Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1.   Answer All questions
    a. State Faraday's 2nd law of electrolysis.   2 x 10
    b. What is calorific value of fuel?
    c. To which class the compound C_5H_8 belongs and why?
    d. Write the electronic configuration Cu.
    e. Define isobar. Give a suitable example of it.
    f. What do you mean by ferroalloy? Give an example of ferroalloy.
    g. Define saturated hydrocarbon.
    h. Define double salt. Give an example complex salt.
    i. What is a molal solution?
    j. What are insecticides?

2.   Answer Any Six Questions   6 x 5
    a. Explain the gravity separation method of concentration of ores.
    b. 500 ml of an aqueous solution contains 2.85 gm of $MgCl_2$. Calculate normality of the solution.
    c. Give the IUPAC names/structural formulae of the following compounds.
        (i) 4-Chloro-3-methylhex-4-en-2-ol

        (ii) 3-Bromopenta-1,3-dien-2-ol

        (iii)

        (iv) $CH_3 - CH = C - CH - CH_3$ with CH_3 and OH substituents

        (v) $CH_3CH(Br)CH=C(Cl)CH_2CH_3$

    d. Find the pH of 0.01M H_2SO_4 solution.
    e. Write down the purposes of lubrication.
    f. Define and explain vulcanisation of raw rubber.
    g. Define coordinate bonding. Explain the formation of ammonium ion.

        Answer Any Three Questions

3   (a) Write down the conditions of aromaticity.   5
    (b) Write down the composition and uses of PVC.   5
4   (a) State and explain Aufbau principle.   5
    (b) Explain the importance of P^H in paper industries.   5
5   (a) Write down the composition and uses of LPG.   5
    (b) What are the advantages of vulcanized rubber over raw natural rubber?   5
6   (a) Define Bronsted-Lowry theory of acids and bases with examples.   5
    (b) Distinguish between thermoplastics and thermosetting.   5
7   (a) Write down the functions of calcinations during metallurgical operation.   5
    (b) Explain protection of corrosion by Galvanisation.   5

1

Th-3   Engineering Mathematics - I

Full Marks: 80   **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1.   Answer **All** questions   2 x 10

a. Evaluate $Sin\ 4365^0$

b. Find the value of $\dfrac{\cos 15^0 + \sin 15^0}{\cos 15^0 - \sin 15^0}$

c. Find the co-ordinates of the center of the circle
   $2x^2 + 2y^2 - 6x + 8y - 4 = 0$.

d. Find the distance between the points $(2, 3, 4)$ and $(3, 5, 4)$.

e. If $A = \begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 1 \\ 5 & 2 \end{pmatrix}$ then evaluate $A + 2B$.

f. Find the equation of the sphere with its center at (1, 2, 3) and radius 7 unit.

g. At x= 0^0, evaluate $\begin{vmatrix} \cos x & \sin x \\ \sin x & \cos x \end{vmatrix}$

h. Find the intercepts cut off by the line 2x+3y+1=0.

i. Find the order of the matrix B if [3 4 2] x B = [2 1 0 3 6].

j. Evaluate $Sin(\tan^{-1} x + \cot^{-1} x)$

2.   Answer **Any Six** Questions   6 x 5

a. Prove that $\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3 = \pi$

b. If $A + B = \dfrac{\pi}{4}$, prove that $(1 + \tan A)(1 + \tan B) = 2$

c. Prove without expanding, $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

d. Find the equation of the line which passes through the point (1,2) and perpendicular to the line 4x + 3y + 5=0.

1

e) Find the equation of the circle passing through the point (7,3) having radius 3 units and whose center lies on the line $y = x - 1$.

f) Find the equation of the plane which passes through the point (3, 4, -1) and parallel to the plane 2x - 3y + 5z +7 = 0.

g) Find the equation of sphere if the end points of its diameter are (-1, 2, 3) and (2, 5, 6).

Answer **Any Three** Questions

3
a) Solve by matrix inverse method,   7
   2x - y = 2, 3x + 2y = 17

b) If $\begin{bmatrix} x-2 & 3 \\ z-5 & 0 \end{bmatrix} = \begin{bmatrix} 2 & y+1 \\ -2 & 0 \end{bmatrix}$, Find the value of x, y, z.   3

4
a. Find the equation of the plane passing through the point (3, 2, 1) and • 5 the intersection of planes 2x + 3y - 4z + 1 = 0 and 3x - y + z + 2= 0.

b. Find the equation of the circle passing through the points (0, 0), (3,0)   5 and (0, 4). https://www.sctevtonline.com

5
a. If $A+B+C = \pi$, prove that $\sin 2A+\sin 2B+\sin 2C=4\sin A.\sin B.\sin C$ 5

b. Prove that $\cos 20^0.\cos 40^0.\cos 60^0.\cos 80^0 = \dfrac{3}{16}$ 5

6
a. Verify that $(AB)^T = B^T.A^T$, where $A = \begin{pmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \end{pmatrix}, B = \begin{pmatrix} 1 & 2 \\ 2 & 0 \\ -1 & 1 \end{pmatrix}$ 5

b. Solve by Crammer's rule, 4x + 5y =3, 3x - 2y = 8.   5

7 Find the distance of the point (1, 2) from x + 2y + 1 =0 measured   10
parallel to the line 3x -y + 1 = 0.

2

Full Marks: 80   **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1.   Answer **All** questions   2 x 10

a.   Evaluate $Sin\ 4365^0$

b.   Find the value of $\dfrac{\cos 15.^0 + \sin 15^0}{\cos 15^0 - \sin 15^0}$

c.   Find the co-ordinates of the center of the circle
$2x^2 + 2y^2 - 6x + 8y - 4 = 0.$

d.   Find the distance between the points (2, 3, 4) and (3, 5, 4).

e.   If $A = \begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 1 \\ 5 & 2 \end{pmatrix}$ then evaluate A+ 2B.

f.   Find the equation of the sphere with its center at (1, 2, 3) and radius 7 unit.

g.   At x= 0^0, evaluate $\begin{vmatrix} \cos x & \sin x \\ \sin x & \cos x \end{vmatrix}$

h.   Find the intercepts cut off by the line 2x+3y+1=0.

i.   Find the order of the matrix B if [3 4 2] x B = [2 1 0 3 6].

j.   Evaluate $Sin(\tan^{-1} x + \cot^{-1} x)$

2.   Answer **Any Six** Questions   6 x 5

a.   Prove that $\tan^{-1} 1 + \tan^{-1} 2 + \tan^{-1} 3 = \pi$

b.   If $A + B = \dfrac{\pi}{4}$, prove that $(1+\tan A)(1+\tan B)=2$

c.   Prove without expanding, $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

d.   Find the equation of the line which passes through the point (1,2) and perpendicular to the line 4x + 3y + 5=0.

1

e. Find the equation of the circle passing through the point (7,3) having radius 3 units and whose center lies on the line $y = x - 1$.

f. Find the equation of the plane which passes through the point (3, 4, -1) and parallel to the plane 2x - 3y + 5z +7 = 0.

g. Find the equation of sphere if the end points of its diameter are (-1, 2, 3) and (2, 5, 6).

Answer **Any Three** Questions

3

a. Solve by matrix inverse method,   7
    2x - y = 2, 3x + 2y = 17

b. If $\begin{bmatrix} x-2 & 3 \\ z-5 & 0 \end{bmatrix} = \begin{bmatrix} 2 & y+1 \\ -2 & 0 \end{bmatrix}$, Find the value of x, y, z.   3

4

a. Find the equation of the plane passing through the point (3, 2, 1) and   5
the intersection of planes 2x + 3y - 4z + 1 = 0 and 3x - y + z + 2= 0.

b. Find the equation of the circle passing through the points (0, 0), (3,0)   5
and (0, 4).

5

a. If $A+B+C = \pi$, prove that $\sin 2A+\sin 2B+\sin 2C=4\sin A.\sin B.\sin C$ 5

b. Prove that $\cos 20^0.\cos 40^0.\cos 60^0.\cos 80^0 = \dfrac{3}{16}$ 5

6

a. Verify that $(AB)^T = B^T.A^T$, where $A=\begin{pmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \end{pmatrix}, B=\begin{pmatrix} 1 & 2 \\ 2 & 0 \\ -1 & 1 \end{pmatrix}$ 5

b. Solve by Crammer's rule, 4x + 5y =3, 3x - 2y = 8.   5

7. Find the distance of the point (1, 2) from x + 2y + 1 =0 measured   10
parallel to the line 3x -y + 1 = 0.

2

TH-4 Engineering Mechanics

Full Marks: 80   **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions   2 x 10
    a. What do you mean by coplanar forces?
    b. Define "Friction" and co-efficient of the friction.
    c. State the Perpendicular Axis Theorem.
    d. What is the condition of reversibility of a lifting machine?
    e. State the Newton's 1st law of motion.
    f. Differentiate between couple and moment of a force.
    g. State and explain the Polygon law of forces.
    h. Differentiate between simple gear train and compound gear train.
    i. Define co-efficient of Restitution.
    j. What do you mean by Centroid?

2. Answer **Any Six** Questions   6 x 5
    a. State and prove the Lami's Theorem.
    b. What are the laws of friction? Explain in details.
    c. In a simple axle and wheel arrangement, radii of effort wheel and axle is 240
       mm and 40mm respectively. Find the efficiency of the machine, if a load of
       600N can be lifted by an effort of 120N.
    d. A circular hole of 50mm diameter is cut out
       from a circular plate of 100mm diameter as
       shown in figure. Find the centroid of the
       section.

    e. The resultant of two concurrent forces is perpendicular to the smaller force and
       angle between the forces is 120°. If the bigger force is 60N, find the smaller
       one.
    f. A bullet of 10gm mass is fired horizontally with a velocity of 1000m/s from a
       gun of mass 50kg. Find (a) velocity with which the gun will recoil and (b) force
       necessary to bring the gun to rest in 250mm.
    g. Define simple lifting machine. Explain and establish the relation between
       efficiency, mechanical advantage and velocity ratio of a simple machine

1

Answer Any Three Questions

3. For a weight lifting machine, an effort of 40N can lift a load of 1kN and an effort of 55N can lift a load of 1.5 kN. Find the law of the machine. Also find maximum mechanical advantage and maximum efficiency of the machine. Take velocity ratio of the machine as 48.   10

4. The following forces act at a point   10
       i) 20N inclined at 30° towards north of east
       ii) 25N towards north
       iii) 30N towards north-west
       iv) 35N inclined at 40° towards south of west
   Find the magnitude and direction of the resultant force.

5. A body of weight 450 N is pulled up an inclined plane by a force of 300N. The inclination of the plane is 30° to the horizontal and the force is applied parallel to the plane. Determine the co-efficient of friction.   10

6. Find the moment of inertia of the given figure about the Centroidal YY axis   10
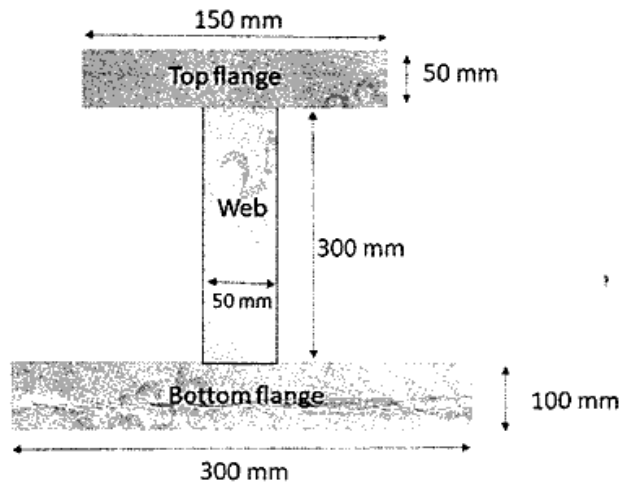
7. The value of greatest resultant and least resultant of two forces are 17N and 3N respectively. Determine the resultant force if the angle between the forces is 120⁰.   10

8. Prove that the moment of inertia of a rectangular section having width 'b' and depth 'd' about x-x axis is $bd^3/12$.   10

Th-2 ENGINEERING PHYSICS

Full Marks: 80   **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1.   Answer **All** questions   2 x 10
   a. Write the S.I units of the following physical quantities :
        (i)   Force   (ii) Temperature   (iii) Electric Current   (iv) Frequency
   b. Calculate the total capacitance of 2 capacitors of capacitance 3 F, 2 F connected
      in parallel.
   c. State Parallelogram law of vector addition
   d. Define co-efficient of friction.

   e. Write two properties of Ultrasonic waves.
   f. State First Law of Thermodynamics.
   g. Define Refractive Index of a Medium.
   h. What is the condition for maximum horizontal range for a projectile ?
   i. Write two applications of LASER.
   j. State Ohm's law .

2.   Answer **Any Six** Questions   6 x 5
   a. Check the correctness of the following equation $s = 2ut + at^2$ where symbols
      posses usual meaning .
   b. State Faraday's Laws of Electromagnetic induction.
   c. Differentiate between longitudinal and transverse wave motion .
   d. Write down properties of magnetic lines of force.
   e. State Kepler's laws of planetary motion .
   f. Define Critical angle and Total internal reflection with diagram.
   g. State and explain Coulomb's law of electrostatics.
   h. Explain different methods to reduce friction.

   Answer Any Three Questions

3   Derive the expressions for (i) Displacement, (ii) Velocity and (iii) Acceleration of   3+5+2
       a particle moving in simple harmonic motion.

4   Establish the relationship between α, β and Υ where the symbols posses usual   10
       meaning.

5   Obtain the formulae for (i) Time of flight, (ii)Maximum height attained by a   5+5
       projectile fired with initial velocity 'u' by making an angle 'θ' with the horizontal.

6   Derive the condition of balance of a Wheatstone Bridge using Kirchhoff's law.   4+6

7   Calculate the amount of heat required to raise the temperature of 20 gram of   10
       ice at -20 °C to steam at 100 °C.

1

Full Marks: 80

Answer any five Questions including Q No.1& 2   Time- 3 Hrs
Figures in the right hand margin indicates marks

1.   Answer **All** questions

   a.   Define(i)Amplitude factor (ii) Kirchhoff's Current Law   2 x 10

   b.   What are the differences between DC and AC supply?

   c.   Write any two merits of full wave bridge rectifier.

   d.   Why is the average value of sinusoidal signal calculated in half cycle?

   e.   State any two uses of integrated circuits.

   f.   A resistor of 6 ohm and an inductive reactance of 8 ohm are connected in series to a 250V, 50Hz supply. Calculate the current flowing in the circuit network.

   g.   What do you mean by photoconductive transducer?

   h.   Classify different types of Transistor configuration.

   i.   What do you mean by star rating concept of home appliances?

   j.   What do you mean by electron emission? Give an example

2.   Answer **Any Six** Questions

                                      6 x 5

   a.   What are the main parts and principle of operation of DC generator?

   b.   Describe the alternating current (AC) through pure capacitance with phasor diagrams. https://www.sctevtonline.com

   c.   Explain the working of Super heterodyne Radio Receiver briefly.

   d.   A shunt generator delivers 450 A at 230 V and the resistance of the shunt field and armature are 50 Ω and 0.03 Ω respectively. Calculate the generated EMF.

   e.   Describe about the MI type measuring instruments briefly.

   f.   Write a short note on Mercury Vapour Lamp with a neat diagram.

   g   Briefly describe the operating principle of LVDT with a neat diagram

                                                          10

3.   Calculate the electricity bill amount for a month of 30 days, if the following devices are used as specified :

(i). 3 Bulbs of 40 W for 6 h/day
(ii). 2 Tube lights of 50 W for 8 h/day
(iii). 2 computers of 40 W for 6 h/day
(iv). 2 fans of 70 W for 8 h/day

Given, the cost of electricity is Rs. 2.5/unit

4. Write a short note on   10
   (i) Basic protective devices used in house hold wiring
   (ii) Single phase Transformer

5. Describe about the Radio Transmitter & Receiver along with their block diagrams.   10

6. Explain about the nuclear powerplant in details with a neat diagram.   10

7. Write a short note on (i) Zener Diode (ii) Bourden tube diaphragm   10

2ND SEM ./COMMON/2023(S) NEW

TH1-A COMMUNICATIVE ENGLISH

Full Marks: 80   **Time :03 hours**

Answer all Questions
Figures in the Right hand margin indicate marks

Answer all questions

Q.1. Read the following passage carefully and do as directed.

My grandmother, like everybody's grandmother, was an old woman. She had been old and wrinkled for the twenty years that I had known her. People said that she had once been young and pretty and had even had a husband, but that was hard to believe. My grandfather's portrait hung above the mantelpiece in the drawing -room. He wore a big turban and loose-fitting clothes. His long white beard covered the best part of his chest and he looked at least a hundred years old. He did not look the sort of person who would have a wife or children. He looked as if he could only have lots and lots of grandchildren. As for my grandmother being young and pretty, the thought was almost revolting. She often told us of the games she used to play as a child. That seemed quite absurd and undignified on her part and we treated it like the fables of the prophets she used to tell us. She had always been short and fat and slightly bent. Her face was a criss-cross of wrinkles running from everywhere to everywhere. No, we were certain she had always been, as we had known her. Old, so terribly old that she could not have grown older, and had stayed at the same age for twenty years. She could never have been pretty; but she was always beautiful. She hobbled about the house in spotless white with one hand resting on her waist to balance her stoop and the other telling the beads of the rosary. Her silver locks were scattered untidily over her pale, puckered face, and her lips constantly moved in inaudible prayer. Yes, she was beautiful. She was like the winter landscape in the mountains, an expanse of pure white serenity breathing peace and contentment.

A Answer the following briefly:

i. How did the grandfather appear in his portrait?   02

ii. What sort of a person did he look in his portrait?   02

iii. How does the author portray his grandmother?   02

iv. Why does he say, "the thought was almost revolting?"   02

B. Find the words from the passage which have the following meanings:

i. shelf   02

ii. not respectable   02

C. Make sentences using the following words on your own (any one):   02

Seem, treat

D. Supply single word substitute to:

Something which is not logical and sensible   02

E Make a note of the above passage   04

Q.2. Answer any five of the following: 05×02

i. What in your opinion was the best lesson that the street taught to the narrator?

ii. Explain the expression 'triumphant hatred'.

iii. What is the difference between criticizing an idea and criticizing an individual?

iv. What is crab mentality?

v. Why did Ralph do the wicked act?

vi. What does the poet pray for?

Do as directed.

A. Fillin the blanks with appropriate choices given in the brackets.

i. It -----rain tonight. (may, can) 02

ii. He is ---- M.A. in English. (a, an) 02

iii. There is ----water in the jug. (little, few) 02

B. Change the voice

i. He reads a newspaper every day. 02

ii Shut the door. 02

4. Write a paragraph in about 120 words on any one of the following topics: 05×01

Your college library or   Online classes

5. Answer any of the following. 05×01

You are the secretary of students' union. Draft a notice regarding the students' picnic to Puri and Konark for information of students.

Or

Write a report on the Blood Donation Camp conducted in your college.

6. A Answer any two of the following: https://www.sctevtonline.com 05×02

i. Your best friend has won the first prize in the state level debate competition. Write a letter to him/her congratulating him/her on his/her success.

ii. You are the owner of Popular Books Corner, Grand Road, Puri. You have received a packet of Engineering Mathematics textbooks instead of Communicative English books from your distributor M/S Padmalaya Books, Satya Nagar, Bhubaneswar. Draft a letter of complaint.

iii. You are staying in your college hostel. You are facing a lot of difficulties as there are no facilities for drinking water there. Write an application to the superintendent of your hostel requesting him/her to take necessary steps for installing a water purifier in your hostel.

B. Tata Steel, Kalinga Nagar, Jajpur has invited applications for the post of 10 Junior Engineer from diploma holders in Civil, Electrical and Mechanical Engineering.

(I) Apply for the post (II) enclose your Resume' or C.V.

Q.7. Answer any two of the following: 05×02

i. Write a short note on body language.

ii. Discuss the types of formal communication in detail.

iii. Communication is a circular process. Justify it.

2ND SEM / COMMON / 2023(S) NEW

Th-1   Computer Application

Full Marks: 80   **Time- 3 Hrs**

Answer any Five Questions including Q No.1 & 2
Figures in the right hand margin indicates marks

1.   Answer **All** questions   2 x 10
   a. Write down any four data types used in C Programming language.
   b. Define Algorithm.
   c. What is FTP?
   d. Draw the flowchart symbol for I/O statement, start/stop and decision statement.
   e. Define Protocol.
   f. What do you mean by compiler?
   g. Define ISAM.
   h. What do you mean by recursion?
   i. What are the logical operators used in 'C' Language?
   j. Define Time Sharing Operating System.

2.   Answer **Any Six** Questions
   a. Distinguish between RAM and ROM.   5 X 6
   b. What is Email? Write down its features.
   c. Give comparison between 3rd and 4th generation of computer.
   d. Explain the various networking devices.
   e. Write down the difference between application software and system software.
   f. Define network and explain various types of network.
   g Define Operating System. Explain the functions of operating system.

3   Define topology and describe the different types of topology used to form a network.   10

4   Draw and explain von Neumann architecture.   10

5   Draw a flowchart and write a program in C to find factorial of a given number N.   10

6   Write down the features of DOS, Windows and Unix?   10

7   Write short notes on any Two.   10

     Data transmission mode

     Array

     Virus

     Loops in C programming language.

1

Th- 2 (b)   Engineering Chemistry

Time- 3 Hrs

Full Marks: 80

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks
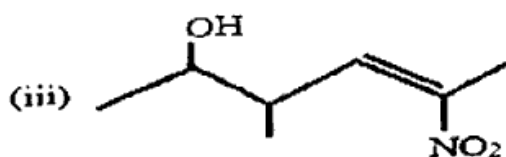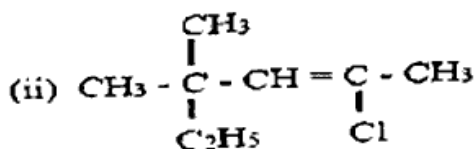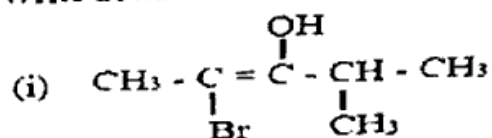
2 x 10

1.   Answer All questions
   a.   What is gangue?
   b.   Define isotone. Give a suitable example of it.
   c.   What do you mean by neutralisation reaction? Give an example of it.
   d.   Define homopolymer. Give an example of it.
   e.   What is calorific value of fuel?
   f.   Define electrovalent bond.
   g.   Define hard water. What is the cause of hardness of water?
   h.   Write down the general formulae of alkane and alkene.
   i.   What are herbicides? Give an example of herbicide.
   j.   Define P^H. What is the range of P^H for acidic solutions?

6 x 5

2.   Answer Any Six Questions
   a.   Explain the mechanism of rusting of iron.
   b.   Write down the IUPAC names/structural formulae of the following:

   (i) $CH_3 - \underset{Br}{C} = \overset{OH}{C} - \underset{CH_3}{CH} - CH_3$

   (ii) $CH_3 - \underset{C_2H_5}{\overset{CH_3}{C}} - CH = \underset{Cl}{C} - CH_3$

   (iii)

   (iv) 5-Bromo-3-chlorohex-4en-3-ol

   (v) 2.4-Dimethylpenta-1.3-diene

   c.   What are the advantages of hot lime soda process over cold lime soda process?
   d.   Define and explain Hund's rule.
   e.   2.45 g of H_2SO_4 is present in 2 litres of its solution. Calculate its molarity and normality.
   f.   Explain magnetic separation method of concentration of ores.
   g.   Define and explain Arrhenius theory of acids and bases.

1

3 (a) State Bohr-Bury scheme.   5
   (b) Explain electrolysis of molten NaCl and predict the products obtained at   5
       different electrodes.

4 (a) Write down the composition and uses of alnico and duralumin.   5
   (b) Distinguish between aliphatic and aromatic hydrocarbons.   5

5 (a) Give a brief note on composition and uses of Bakelite.   5
   (b) Define and explain vulcanisation of natural rubber.   5

6 (a) 12 g of NaOH is present in 1.5 lit of its solution. Find P^H of the solution. 6
   (b) Define with examples acidic and basic salts.   4

7 (a) Write down the composition and uses of producer gas and water gas.   4
   (b) What are the outcomes of Rutherford's gold foil experiment?   6

TH-3 ENGINEERING MATHEMATICS - II

Full Marks: 80 Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

a. Evaluate $\lim\limits_{x \to 0} x \sin \dfrac{1}{x} = 0$

b. if $f(x) = mx + c, f(0) = f^{1}(0) = 1 = 2$
then find the value of $f(1)$

c. Determine order and Degree of $2\dfrac{d^2y}{dx^2} = \sqrt{\left(\dfrac{dy}{dx}\right)^3 + 5}$

d. Integrate $\int \dfrac{\cos x}{1+\sin x} dx$

e. Find the unit vector in the direction of the vector $2\hat{\imath} - \hat{\jmath} + 2\hat{k}$

f. Find the derivative of $\sqrt{2x^2 + 3x + 5}$

g. Evaluate $\int_0^3 [x]dx$

h. Solve $\dfrac{dy}{dx} = \dfrac{e^{2x}+1}{e^x}$

i. If $Z = \log(x^2 - y^2)$, then find $\dfrac{\partial z}{\partial x}$ and $\dfrac{\partial z}{\partial y}$

j. if $x = 2t^2$ and $y = 4t$, then find $\dfrac{dy}{dx}$ at $t = 1$

2. Answer **Any Six** Questions 6 x 5

a. Differentiate $x^{\sin x}$

b. Integrate $\int \dfrac{\sec^2\sqrt{x}}{\sqrt{x}} dx$

c. Test the continuity of the function
$F(x) = \begin{cases} \dfrac{|x|}{x} & \text{when } x \neq 0 \\ 1 & \text{when } x=0 \end{cases}$ at $x = 0$

d. prove that $\int \dfrac{dx}{a^2+x^2} = \dfrac{1}{a}\tan^{-1}\dfrac{x}{a} + C$

e. Find Scalar and Vector projection of $\vec{a}$ on $\vec{b}$,
where $\vec{a} = \hat{\imath} - \hat{\jmath} - \hat{k}$ and $\vec{b} = 3\hat{\imath} + \hat{\jmath} + 3\hat{k}$
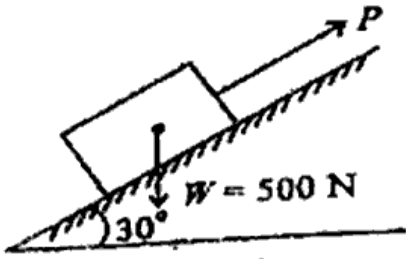
f.

Evaluate $\int_0^{\frac{\pi}{2}} \dfrac{dx}{1 + \sqrt{\tan x}}$

g   Solve $(1 + x^2)dy + (1 + y^2)dx = 0$

3 a)
   Evaluate $\lim\limits_{x \to 0} \dfrac{e^{4x} - e^{3x}}{e^{3x} - e^{2x}}$ 5

   b)
   Find $\dfrac{dy}{dx}$ if $x^y y^x = 1$ 5

4 a) Find the area of parallelogram whose adjacent sides are the vectors   5
       $\hat{i} - 3\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + \hat{k}$
   b) If $y = \tan^{-1} x$ then show that $(1 + x^2)y_2 + 2xy_1 = 0$ 5

5 a) Solve $x \log x \dfrac{dy}{dx} + y = 2 \log x$ 5
   b) Integrate $\int x \tan^{-1} x \, dx$ 5

6 a) Differentiate $5^{\ln \sin x}$ 5
   b) Integrate $\int e^{\cos^2 x} \sin 2x \, dx$ 5

7 a) Evaluate $\lim\limits_{x \to 0} \dfrac{\log(x+1)}{\sqrt{x+1}-1}$ 5
   b) Find the area of the circle $x^2 + y^2 = 16$ 5

Th-4   Engineering Mechanics

Full Marks: 80   Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1.   Answer All questions   2 x 10

a.   Define couple and state its unit in SI system.

b.   State Triangle's law of forces.

c.   Define angle of Repose.

d.   State Perpendicular Axis Theorem.

e.   In a weight lifting machine having a velocity ratio 20 is able to lift a weight of 1KN by an effort of 80N. Show that the machine can work in the reverse direction if the effort is removed.

f.   Define power. Write its SI unit

g.   What do you mean by (i) coplanar forces (ii) concurrent forces

h.   Define free body diagram.

i.   Explain conservation of energy.

j.   Define moment of a force. Classify the moments according to the direction of rotation.

2.   Answer Any Six Questions   6 x 5

a.   The resultant of two concurrent forces is perpendicular to the smaller force and angle between the forces is 120°. If the bigger force is 60N, find the smaller one.

b.   State the Laws of friction.

c.   What is gear train? Derive the velocity ratio of a compound gear train.

d.   A ball of mass 2 kg moving with a velocity of 2 m/s hits directly on a ball of mass 4 kg at rest. The first ball, after impinging, comes to rest. Find the velocity of the second ball after the impact and the coefficient of restitution.

e.   State and prove Lami's theorem.

f.   A single purchase crab winch has 300mm long handle and 120mm diameter drum. Number of teeth on the pinion is 25 and that on wheel 130. if an effort of 20N lifts a load of 300N, find the MA,VR and efficiency of the crab winch.

g   Explain principles of transmissibility and superposition.

3   An electric light fixture weighs 15N hangs from a point "C" by two strings AC and BC. The string is inclined at 60° to the horizontal and BC is at 45° to the horizontal as shown in the figure below. Determine the forces on string AC and BC.   10
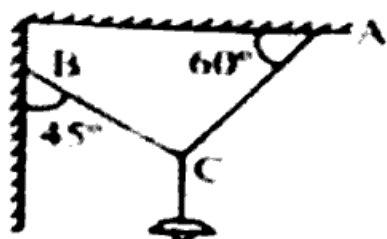
4   A body of weight 500N is lying on a plane inclined at an angle 30°. It is supported by an effort parallel to the plane as shown in figure. Determine the minimum & maximum values of "P" for which equilibrium can exist. Take the co-efficient of friction as 0.35.   **10**

5   Find the position of centroid of 1-section having following dimensions: **10**

      Bottom flange = 300mm x 50mm

      Top flange   = 150mm x 50mm

      Web   = 300mm x 50mm

6   Find law of the machine in which an effort of 19.5N raised a load of 90N and another effort of 15.5N raised a load of 70N. Find what effort is required to lift a load of 100N.   **10**

7   State and explain Newton's laws of motion & equation of motion.   **10**

TH-2(a)   Engineering Physics

Full Marks: 80   **Time - 3 Hrs**

Answer any five Questions including Q.No. 1 & 2
Figures in the right hand margin indicates marks

1.   Answer **All** questions   2 x 10

   a.   Write down the S.I. units of :
      i.   Work
      ii.   Electric Potential
      iii. Frequency
      iv.   Speed

   b.   If $\vec{A} = 2\hat{i} - 3\hat{j} + \hat{k}$ & $\vec{B} = 4\hat{i} + 2\hat{j}$, then find out their dot product.

   c.   Define Angular velocity.

   d.   Three capacitors of capacitance 2F, 3F, & 5F are connected in parallel. Calculate the equivalent capacitance.

   e.   State the First law of Thermodynamics.

   f.   Draw a ray diagram for refraction through prism.

   g.   Define Critical angle.

   h.   What is Optical Fibre ?

   i.   Define ground waves.

   j.   Define Unit Charge.

2.   Answer **Any Six** Questions   5 x 6

   a.   Check the correctness of the physical equation : $S = ut + \frac{1}{2}at^2$.

   b.   Write down the properties of Ultrasonics.

   c.   State and explain Newton's law of gravitation.

   d.   Compare Fleming's Left-hand rule and Right hand Rule.

   e.   Write down properties of magnetic lines of force.

1

f. State and explain Kirchhoff's Laws.

g State Faraday's Laws of Electromagnetic Induction.

3   Derive expressions for (i) Velocity and (ii) Acceleration of a particle   7+3
executing S.H.M.

4   Establish a relation between co-efficient of linear expansion (α),   **(10)**
co-efficient of superficial expansion (β), and co-efficient of cubical
expansion (Υ) of a material.

5   Obtain expressions for (i) Time of flight and (ii) Horizontal range, for   **5+5**
a projectile projected with initial velocity 'u', by making an angle 'θ'
with the horizontal. https://www.sctevtonline.com

6   (i)   State laws of limiting friction .   **(5+5=10)**
    (ii)   Explain different methods to reduce friction.

7   Write short notes on: **(5+5=10)**
    i.   Difference between Heat and Temperature.
    ii. Properties of LASER.