1ST SEM ./ COMMON /2022(W)

Th-4a&b Basic Electrical and Electronics Engineering

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(i)Lumen (ii)Kirchhoff's Voltage Law
b. What do you mean by electron emission? Give an example.
c. What is Ohm's Law? Also write the mathematical expression associated with it
d. Classify the types of DC Generator.
e. Write any two differences between intrinsic and extrinsic semiconductor.
f. Define (i) RMS value (ii) Form factor in AC supply.
g. If in a DC circuit network, two resistors of 2 ohm and 4 ohm connected in parallel are supplied with 20V DC supply, what will be the voltage drop in 4 ohm resistor?
h. What is passive transducer? Give an example.
i. Draw the CE configuration of transistor.
j. What do you mean by impedance triangle?

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

a. What are the main parts and principle of operation of DC motor?
b. Describe about the PMMC type measuring instruments briefly.
c. Explain different types of basic filter circuits with proper circuit diagram.
d. An AC series RL circuit is made up of a resistor that has a resistance value of 150 Ω and an inductor that has an inductive reactance value of 100 Ω. Calculate the impedance and the phase angle theta (θ) of the circuit.
e. Briefly describe the operating principle of LVDT with a neat diagram
f. Write a short note on Sodium Vapour Lamp with a neat diagram.
g What are the differences between vacuum tube & semiconductor?

3 10

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

(i). 2 Bulbs of 40 W for 6 h/day
(ii). 2 Tube lights of 50 W for 8 h/day
(iii). 1 TV of 120 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 short notes on (i) Zener Diode (ii) Transistor oscillator 10
5 Describe about Amplitude Modulation & Frequency Modulation in details. 10
6 Explain about the thermal power station in details with a neat diagram. 10
7 Draw and explain the block diagram of CRO and also state its applications. 10

1ST SEM ./COMMON /2022(W)
TH1-A COMMUNICATIVE ENGLISH

Full Marks: 80 **Time03**

Answer All Questions
Figures in the Right hand Margin indicate Marks

Q.1 **Answer ALL questions.**

Khairi's story started on October 5, 1974 when 12 Kharia tribals of Similipal brought a two-month old tiger cub to Saroj Raj Chaudhury, an officer of the Indian Forest Service. Saroj noticed that it was a female-famished and confused. His first experience of what was to become his passion in life was angry snarls and scratching claws. But, the veteran forester and instinctive lover of wildlife knew how to handle a hungry, angry cub. He imitated the sounds of a mother-tigress. "Within minutes, her confidence was firmly anchored in the fostering human," is how he recalled those first few minutes between the legends.

Early next morning, Saroj started for his inspection of the Tiger Reserve area. I tagged along in the jeep that snaked through narrow road in the woods amidst lush foliage. My mother gave me a gun for my eighth birthday. As a young man, I shot wildlife with abandon. But soon, I realized that there is greater happiness in conserving these beautiful animals that do no wanton harm to man" is one of the things he told me about his life during that long travel.

At that time, he was an authority on the tiger and Director of Project Tiger in India. Saroj introduced the Tiger Tracing Method of tiger and census where the pugmarks of each animal with distinctive measurements and characteristics are meticulously recorded.

A **Give brief answers to the following:**

i. How and when did Mr. Chaudhury come across Khairi? 02

ii. In what condition did he find it? 02

iii. How did he manage the hungry and confused cub? 02

iv. What was his contribution to the tiger project? 02

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

i Very hungry 02

ii Reckless harm 02

C. Make sentences using the following words (any one): 02
realise, imitate

D. Supply a single word substitute to: 02
One who pays careful attention to every detail is ------.

E Make a note of the above passage 04

Q.2. **Answer Any Five of the following:** 05×02

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

ii. How did the people in the street respond to the poem written by the narrator?

iii. What is the joke about the Indian and Japanese workers at the Maruti Suzuki company?

iv. What are the qualities of a good team player?

v. How does the poet value her friendship?

vi. Why did Ralph do the wicked act?

Q.3. **Do as Directed.**

A. Fill in the blanks with appropriate choices/ following instructions given in the brackets.

i. He is ----(a/an) M.A. in economics. 02

ii. There are -----(a few, a little) students in the class. 02

iii. You ----- (should/ought to) obey your parents. 02

Iv When I -----(reach) the station the train------(already leave) .(Use the correct tense of the verb) 02

V Please maintain discipline. (Change the voice) 02

Q.4. Write a paragraph in about 120 words on any one of the following topics: Knowledge without skill, The things I learnt during lockdown 05×01

Q 5. Answer any one of the following: 05×01

You are the secretary of the students' union. Draft a notice regarding a meeting to be held for discussion about annual function for information of all students.

Or

Write a report on World Youth Skill Day celebration in your college.

Q 6. A. **Answer any Two of the following:** 05×02

i. Write a letter to your friend inviting him to your sister's marriage.

ii. You are the owner of Reeta Electronics, Bapuji Nagar, Bhubaneswar. You have received a packet of fans instead of mixer grinders. Draft a letter of complaint to M/S Bajaj Electronics, Faridabad, New Delhi.

iii. Write a letter to the superintendent of your hostel requesting him/her to take necessary steps for the maintenance of water tanks and water purifier of your hostel.

B. Rourkela Steel Plant has invited applications for the post of Junior Engineer from diploma-holders in Civil, Electrical and Mechanical Engineering. Apply for the post and enclose your resume' or C.V. 10

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

i. Discuss the stages of communication in detail with the diagram.

ii. Write short notes on body language and communication barriers.

iii. What is communication and what are the different types of communication?

1ST SEM. /COMMON ./ 2022(W)

Th-2 Engineering Chemistry

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 are insecticides? Give two examples.

b. Define isotope with suitable example.

c. Mention the basic steps involved in the metallurgical operation.

d. Define Huckel's rule for aromaticity.

e. What is double salt? Give an example.

f. How temporary hardness can be removed?

g. What is degree of polymerization?

h. Define lubricant. Give an example of a semi-solid lubricant.

i. What is Galvanisation?

j. To which class of compound C_4H_{10} belongs and how?

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

a. Define covalent bond. Explain the formation of CH_4 molecule.

b. What are bio-fertilizers? Give some examples.

c. What are the differences between thermoplastic and thermosetting polymers?

d. a. Write the structural formula of the following organic compounds:

(i)But-1-en-3-yne
(ii) 3,4-dimethyl pentan-2-ol
(iii)Tert-butyl alcohol

b. Write the IUPAC name of

(i) CH_3- $CH(C_2H_5)$- $CH(C_2H_5)$- CH_3
(ii) CH_3 $CH(Cl)CH(Br)CH_2CH(NO_2)CH_3$

e. Explain the froth floatation method of concentration of ores.

f. Define Normality. 4 grams of NaOH are present in 2 litre of its solution. Find its normality and molarity.

g What is a lubricant? Write the major functions of lubricants.

3	a.	State and explain Bohr's atomic model.	6 + 4
	b.	Write down the composition and uses of Brass and Bronze.	
4	a.	What are saturated and unsaturated hydrocarbons? Is benzene saturated? Justify your answer.	5+5
	b.	Explain Bronsted-Lowry Theory of Acid and Bases	
5		State and explain Faraday's 1^{st} and 2^{nd} law of electrolysis. How many grams of calcium will be deposited at the cathode by passing 15 ampere of currents through molten $CaCl_2$ for 30 minutes?	4+4+2
6	a.	Write the composition and uses of PVC.	5 + 5
	b.	Define fuel. What are the characteristics of a good fuel?	
7	a.	How hard water can be softened by Ion-exchange process?	6 + 4
	b.	Differentiate between calcination and roasting.	

1ST SEM ./COMMON / 2022(W)

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. Find the value of $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix}$.

b. Find x and y when $\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$.

c. Find the minimum and maximum value of $5\sin x + 12\cos x$.

d. Find $\tan\left(\frac{\pi}{4} + 2\cot^{-1} 3\right)$.

e. Determine the ratio in which the line segment joining $(2, -3)$ and $(5, 6)$ is divided by x −axis.

f. Find the perpendicular distance from the point $(2, 1)$ to the straight line $12x - 5y + 9 = 0$.

g. Find the equation of the circle which touches the x −axis and whose centre is at the point $(3, 4)$.

h. Find image of the point $(1, -2, 4)$ with respect to YZ−plane.

i. Find the direction cosines of a straight line whose direction ratios are 1, 2, 3.

j. Find the centre and radius of the sphere
$3x^2 + 3y^2 + 3z^2 - 12x - 6y + 9z + 1 = 0$.

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

a. Without expanding prove that

$$\begin{vmatrix} a & a^2 & a^3 \\ b & b^2 & b^3 \\ c & c^2 & c^3 \end{vmatrix} = abc\,(a-b)(b-c)(c-a)$$

b. Solve the following equations by Matrix Method,
$x + 2y = 3$ and $3x + y = 4$

c. Prove that $\sin 10^\circ . \sin 30^\circ . \sin 50^\circ . \sin 70^\circ = \frac{1}{16}$

d. Find the equation of the straight line which passes through the point $(3, 4)$ and sum of its intercepts on the axes is 14.

e. Find the equation of plane passing through the point $(2, -2, -1)$ and parallel to the plane $2x + y - 3z - 2 = 0$.

f. Find the equation of the sphere whose centre at $(3, 1, -2)$ and the sphere passing through the point $(1, 1, 2)$.

g If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \pi$, show that $x + y + z = xyz$.

3 a. Solve the following equations by Cramer's Rule, 5
$2x - 3y + 5 = 0$ and $5y - 3x - 8 = 0$

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

4 a. Find the equation of the circle which passes through the points 7
$(1, -2)$ and $(4, -3)$ and has its centre lies on the line $3x + 4y = 7$.

b. If the point (x, y), $(1, -2)$ and $(3, -4)$ are collinear, 3
prove that $x + y + 1 = 0$.

5 a. Find the equation of the sphere passing through $(1, 2, -3)$ and 5
$(3, -1, 2)$ and centre lying on X −axis.

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

6 a. In a ΔABC if $m\angle A = 90^\circ$, prove that $\tan^{-1} \frac{b}{a+c} + \tan^{-1} \frac{c}{a+b} = \frac{\pi}{4}$, 5
where a, b and c are the sides of the triangle.

b. Verify that $[AB]^T = B^T A^T$, 5
where $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 2 & 0 \\ -1 & 1 \end{bmatrix}$.

7 a. Find the equation of a straight line parallel to the line 6
$2x + 3y + 11 = 0$ and sum of its intercepts on the axes is 15.

b. If $A + B = 45^\circ$, show that $(1 + \tan A)(1 + \tan B) = 2$. 4

2ND SEMESTER/ COMMON / 2022(S)

Th1(b) 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 symbols used for the following expression in flowcharts (I/o, Decision Making, Processing, Connector)
b. Interpret MICR
c. Define MIPS
d. Identify which are variables .....
(rama, r-ama, r_ama, rama2, 3rama, r@ama)
e. Distinguish between file and folder
f. Define algorithm
g. Compare between compiler and interpreter
h. Interpret WWW
i. Define array
j. Write four antivirus softwares

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

a. Compare between time sharing and multiprogramming operating system
b. Draw a flow chart to get the factorial of a given number
c. Write on several type of operators used in C programming language
d. Explain different mode of data processing
e. Summarise different types of data transmission mode
f. Explain how you could able to know that a computer system is virus affected
g. Compare between 3rd and 4th generation computers

3. Draw a flow chart and write a program in C to get the addition of all even numbers from 1 to 99 10

4 Write on sequential, direct and ISAM file access method 10

5 Briefly write on several types of networking devices used to form a network 10

6. Summarise the features of DOS,UNIX and WINDOWS operating system 10

7. Classify memory in details 10

2nd. SEM. /COMMON/ 2022(S)

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

1. a) Define Modulus Function and represent it graphically.

b) Evaluate $\lim_{x\to 0} \frac{x}{\sqrt{1+x}-\sqrt{1-x}}$

c) Differentiate $\sec^{-1}\left(\frac{\sqrt{a^2+x^2}}{a}\right)$ with respect to x.

d) Define unit vector and find the unit vector of the given vector $2\hat{\imath} + 3\hat{\jmath} + 6\hat{k}$.

e) *Evaluate the integral* $\int \left(e^{3\ln x} - e^{4\ln x}\right) dx$.

f) Define Homogeneous Function and State Euler's Theorem.

g) Find the value of α *so that* $\vec{a} = \hat{\imath} + \hat{\jmath} + \alpha\hat{k}, \vec{b} = 4\hat{\imath} - 3\hat{k}$ are perpendicular to each other.

h) Find the order and degree of the following differential equation $\frac{d^2y}{dx^2} = \frac{3y+\frac{dy}{dx}}{\sqrt{\frac{d^2y}{dx^2}}}$

i) *Find the value of* $\int_{-2}^{2} |x|\, dx$.

j) If $y = t^2$ *and* $x = t^3$ *find* $\frac{dy}{dx}$ *at* $t = 1$.

2 Answer **Any six** questions: 6 x 5

a) If $f(x) = \begin{cases} ax^2 + b, if\ x < 1 \\ 1, if\ x = 1 \\ 2ax - b, if\ x > 1 \end{cases}$ is continuous at $x = 1$, then find the value of 'a' and 'b'.

b) Find $\frac{dy}{dx}$ *if* $y = (\ln x)^{\tan x}$.

c) Determine the area within the curve $y^2 = 4ax$ and the x-axis, the ordinate x=4.

d) Evaluate $\int \frac{\tan x + \tan\alpha}{\tan x - \tan\alpha} dx$.

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

f. Find the scalar and vector projections of the vector $2\hat{i} - 3\hat{j} - 6\hat{k}$ on the line joining the points (3,4,-2) and (5,6,-3).

(g) Find $\frac{dy}{dx}$ *if* $x = \frac{2t}{1+t^2}, y = \frac{2t}{1-t^2}$.

3 i If $\sqrt{1-x^6} + \sqrt{1-y^6} = k(x^3 - y^3)$, prove that

$\frac{dy}{dx} = \frac{x^2}{y^2}\sqrt{\frac{1-y^6}{1-x^6}}$

ii Evaluate $\lim_{x\to 0} \frac{1-cos^3x}{xsin2x}$. 3

4 i If $u = \tan^{-1}(x^2 + y^2 + z^2)$, *show that* $xu_x + yu_y + zu_z = sin2u$ 7

ii If sum of two unit vectors is a unit vector, show that the magnitude of their difference is $\sqrt{3}$. 3

5 i Evaluate $\int \frac{2x+11}{\sqrt{x^2+10x+29}}dx$. 6

ii If $y = \tan^{-1} x$, *prove that* $(1 + x^2)y_2 + 2xy_1 = 0$ 4

6 i Solve the following differential equation 7

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

ii Find the derivative of $y = e^x$ *by first principle.* 3

7 i In a triangle AOB, angle AOB=90^0. If P, Q are the points of trisection of $\overline{AB}$, prove that $OP^2 + OQ^2 = \frac{5}{9}AB^2$ *by vector method.* 6

ii Evaluate $\int e^x \left(\frac{1}{x^2} - \frac{2}{x^3}\right)dx$. 4

IIND SEM ./COMMON / 2022(S)

Th4(a) - 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. State the Law of Conservation of Linear momentum.
b. What is fundamental unit and derived units with examples?
c. What is coefficient of friction?
d. Write down the expression for Velocity Ratio of a Simple wheel and Axle.
e. What is Coplanar Concurrent Forces?
f. State Newton's 1st law of motion.
g. What is Self Locking machine?
h. What is the distance of centroid of a semi circular area from the base?
i. Define Force and its unit in S.I system.
j. Define Couple and its unit.

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

a. Derive the relation between Mechanical Advantage, Velocity Ratio and Efficiency of a Lifting machine.
b. In a lifting machine, an effort of 15N can lift a load of 300N and an effort of 20N can lift a load of 500N. Find the law of machine. Also find the effort required to lift a load of 880N.
c. What is Gear Train .Derive its velocity ratio of a Simple Gear Train.
d. State and Proof the Polygon Law of Forces.
e. Find the angle between two equal forces p, when their resultant is equal to (i) p and (ii) p/2
f. State and prove Lami's theorem.
g. The following forces act at a point
   (i) 20N inclined at 30^0 towards North to East.
   (ii) 25N towards North
   (iii) 30N towards North west, and
   (iv) 35N inclined at 40^0 towards south of west.
   Find the magnitude and direction of the resultant force.

3 State Triangle Law of force and proof Parallelogram Law of Force. 10

4 Define Centroid. 10
An I- section has the following dimensions in mm units.
Bottom flange= 300x100
Top flange= 150x50
Web= 300x50
Determine mathematically the position of centre of gravity of the section.

5 Define Angle of repose. 10
A body of weight 500N is pulled up an inclined plane, by a force of 350N. The inclination of the plane is 30^0 to the horizontal and the force is applied parallel to the plane.
Determine the co-efficient of friction.

6 A body of weight 70KN is suspended by two strings whose lengths are 6cm and 8cm from two points in the same horizontal level. The horizontal distance between the two points is 10cm. 10
Determine the tensions of the strings.

7 Define Coefficient of Restitution. What are various types of Impacts? Discuss any one of them. 10

2nd Sem./ COMMON / 2022(S)
Th-2A 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 SI unit of i) Frequency ii) Temperature
b. State Triangle's law of vector addition
c. Define vector product of 02 vectors.
d. What is Static Friction ?
e. Define Universal Gravitational Constant (G)
f. Write any two application of Ultrasonic wave.
g. Define Latent heat.
h. What is refractive Index ?
i. Define Magnetic Flux Density.
j. Mention the value of relative permittivity of free space.

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

a. Check the correctness of $T = 2\pi\sqrt{l/g}$ using Dimensional analysis.
Where the symbols used have their usual meaning

b. State Kepler's Law of Planetary Motion..
c. State Laws of Limiting Friction.
d. Differentiate between Transverse wave and Longitudinal wave-motion.
e. Draw with labelled diagram Refraction pattern through material of Prism
f. Compare Fleming's Left hand and Right hand rule.
g. State and explain Coulomb's law in magnetism.

3 Find the equations for i)Maximum height ii) Total time of Flight and iii) Horizontal range , when the projectile is fired at an angle with the horizontal 10

4 Obtain the equations for (i) Displacement (ii) velocity (iii) Acceleration of a particle in Simple Harmonic Motion (SHM) 3+4+3

5 How much heat is required to convert 10 gm of ice at -5°C to steam at 100°C? 10

6 State Kirchhoff's laws. Derive the condition of balance in a wheatstone Bridge 4+6

7 Write the Principle, Properties and Applications of LASER 10