[Time: 2 Hours] [Marks: 60]

Please check whether you have got the right question paper.

N.B: 1. Question No.1 is Compulsory.
2. Attempt any **three** questions from remaining **five** questions.
3. Figures to the right indicate Full marks.
4. All questions carry equal marks.
5. Atomic weights: - H=l, C=12, N=14, O=16, S=32, CI=35.5, Ba=137.3,
Ca=40. Mg=24, Na=23.

1. Answer **any five** from the following:-   **15**
   a) Distinguish between anodic and cathodic coatings for corrosion prevention.
   b) What are Fuels? Give its classification.
   c) Give Composition, Properties and Uses of **magnalumin**.
   d) What are composite materials? Mention its applications.
   e) Explain the green chemistry principal 'Accident prevention'.
   f) Explain with example, how the nature of volatile oxide film formed on the surface
      of metal influences the rate of corrosion.
   g) 1.5 g of the same coal sample in a Bomb-calorimeter experiment gave 0.36 g
      $BaSO_4$. Calculate percentage of S in the coal sample.

2. a) Explain the mechanism of following types of corrosion:-   **06**
       i) Galvanic corrosion   ii) Waterline corrosion
    b) Define cracking of hydrocarbons. Explain fixed bed catalytic cracking.   **05**
    c) Calculate % Atom Economy for the following reaction   **04**
       $C_6H_6 + Cl_2 ---\rightarrow C_6H_5CI + HCI$

3. a) A fuel sample has the following composition: $C_2H_4 = 38\%$, $C_2H_6 = 14\%$, $CO = 7\%$, **06**
       water vapour = 2.0% and rest is nitrogen. Calculate the volume of oxygen and air
       required for complete combustion of $5m^3$ of fuel.
    b) Explain Conventional and Greener route for synthesis of Adipic acid. Mention the **05**
       green Chemistry principle involved.
    c) How do the following factors related to nature of environment affect corrosion?   **04**
       i) Relative area of anode and cathode   ii)Temperature

4. a) What are nonferrous alloys? Distinguish between brass and bronze.   **06**
    b) What is the principle of cathodic protection? Explain impressed current protection **05**
       method.
   c) Write a note on sandwich panel composites.   **04**

Turn Over

5. a) What is Biodiesel? Give 'Trans-esterification', reaction to obtain Biodiesel from **06** vegetable oils. Mention its advantages.

    b) What is powder metallurgy? Explain Mechanical Pulverisation and Atomization **05** methods for manufacturing metal powders.

    c) What are the important properties of composite materials? **04**

6. a) Mention methods for applying metal coatings on the metals? Give brief account of **05** Metal cladding

    b) A coal sample contains, C=82%, O=6%, H= 4%, S =1.5%, N =1 % and Ash= 5.5%. **05** Calculate the GCV and NCV of given coal sample.

    c) Discuss the various steps involved in powder metallurgy and mention its application. **05**

(**3** hours)   [Total Marks: **60**]

N.B   (1)   Question **No. 1** is **compulsory**. Solve **any Three** out of remaining five questions.
         (2)   Use your **Judgment** for **any unspecified dimension**.
         (3)   Use **First Angle** Method of projection only.
         (4)   Retain **all construction lines**.
         (5)   **Figures** to the **right** indicate **full marks**.

1.   **(a)**   A wheel of 50 mm diameter rolls on a straight horizontal line.   **6**
                   Draw the locus of a point 'P' on the periphery of the wheel for one revolution of the wheel. Initial position of point 'P' on the wheel is in contact with the straight line.

      (b)   Figure below shows a pictorial view of an object. Using first angle method of projection draw the following orthographic views:
                   a) Front View (along direction X)   **4**
                   b) Left Hand Side View   **4**
                        Insert 6 dimensions   **1**
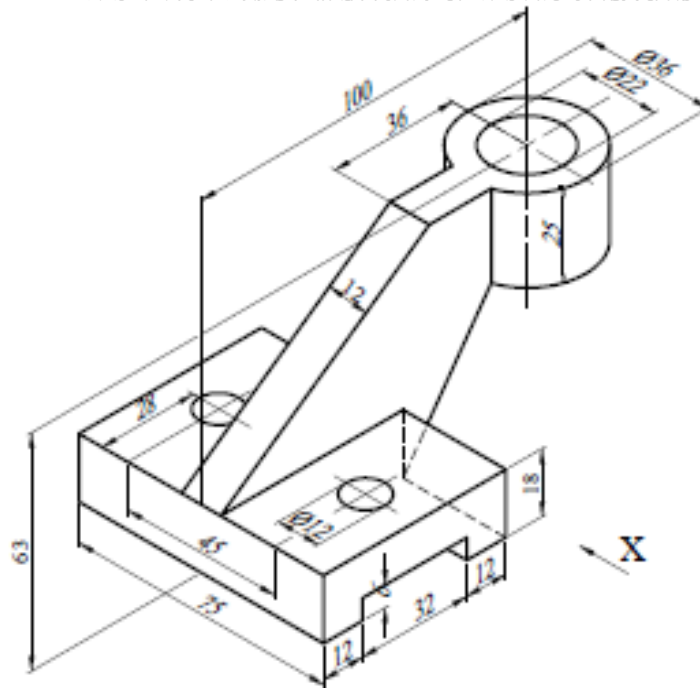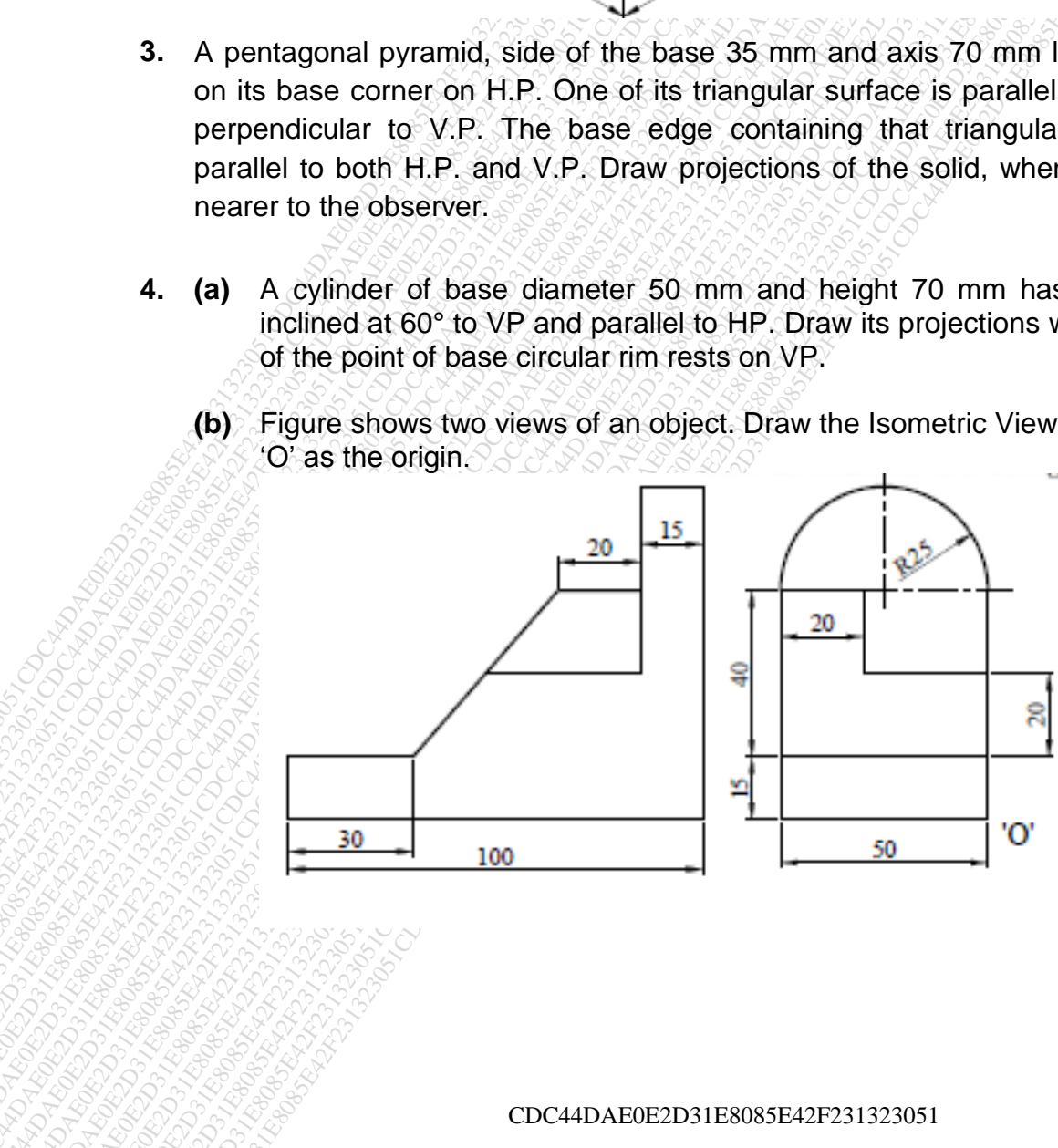

2.   Figure below shows a pictorial view of an object. Using first angle method of projection draw the following orthographic views:
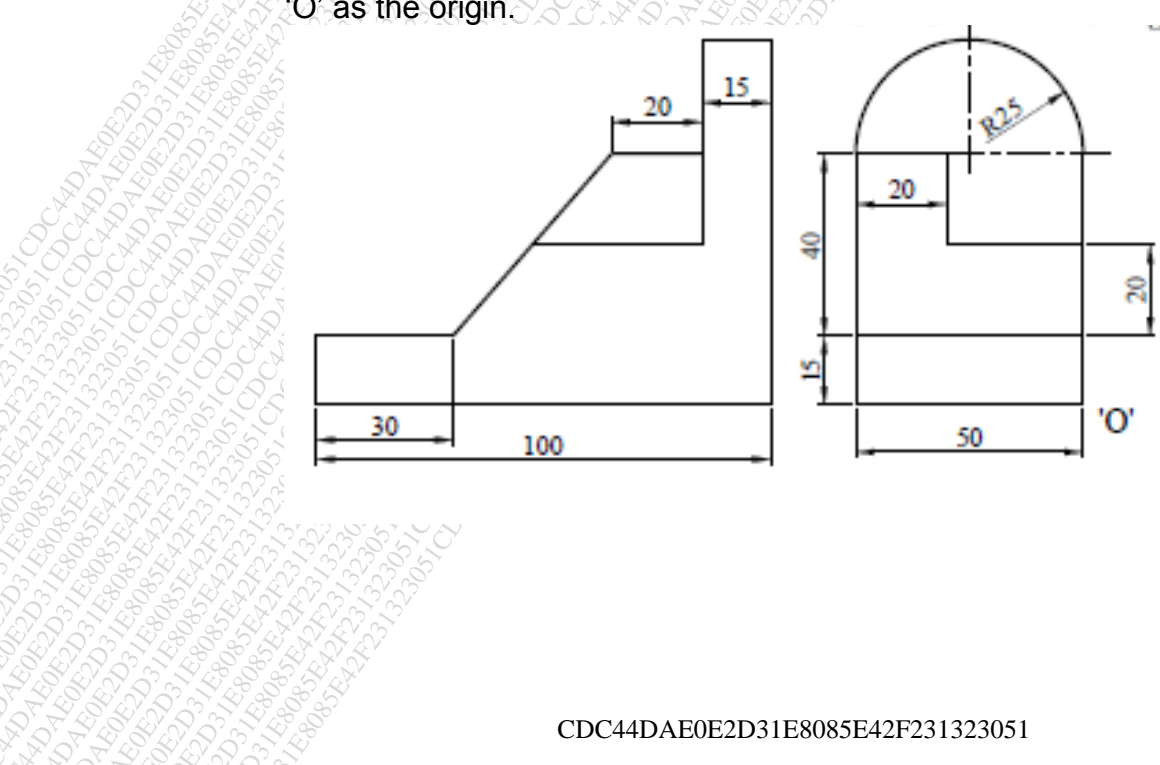   a) Elevation View   **4**
         b) Sectional Side View (Along A-A)   **4**
         c) Plan View   **5**
   Show at least 10 major dimensions   **2**

TURN OVER

3. A pentagonal pyramid, side of the base 35 mm and axis 70 mm long, is lying **15** on its base corner on H.P. One of its triangular surface is parallel to H.P. and perpendicular to V.P. The base edge containing that triangular surface is parallel to both H.P. and V.P. Draw projections of the solid, when its apex is nearer to the observer.

4. **(a)** A cylinder of base diameter 50 mm and height 70 mm has its axis **6** inclined at 60° to VP and parallel to HP. Draw its projections when one of the point of base circular rim rests on VP.

   (b) Figure shows two views of an object. Draw the Isometric View taking **9** 'O' as the origin.

TURN OVER

5. A right circular cone with base diameter 50mm and axis 65mm long, rests on its **15** base on HP. It is cut by an AIP inclined at 45° to HP and bisects the axis of cone. Draw the FV, Sec. TV and TSS. Also draw development of remaining portion of the cone.

6. (a) A line AB 70 mm long has its end A on HP ad 25 mm in front of VP. Its top **9** view and front view measures 60 mm and 40 mm respectively. Draw the projections of the line, if the end point B lies in first quadrant. Also determine its inclinations with HP and VP.

(b) Figure shows two views of an object. Draw its Isometric View taking 'O' as **6** the origin.
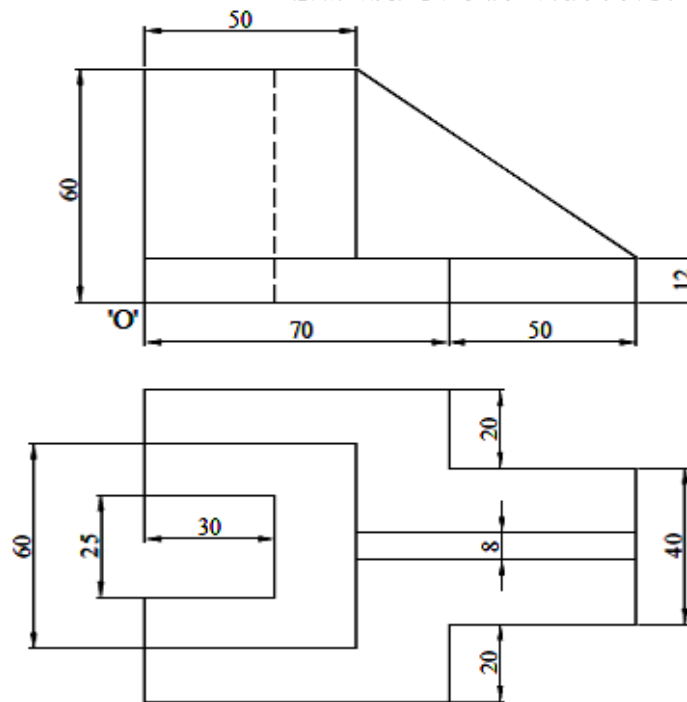
(3 Hours)   **[Total Marks : 80]**

N.B. (1) Question No.1 is **compulsory**.
      (2) Attempt any **three** questions from remaining.
      (3) Figures to **right** indicate **full marks**.
      (4) Assume suitable **data** wherever **necessary**.

1. (a) What is recursion? Write a program to find x^y using recursion   4
  (b) State any two library functions string.h along with its syntax, use an example   4
  (c) What is a pointer? Explain how the pointer variable declared and initialized.   4
  (d) Write the output for following code   4

```
#include<stdio.h>
int main()
{
        int val=1;

        do{
                val++;
                ++val;
        }while(val++>25);

        printf("%d\n",val);

        return 0;
}
```

  (e) Write a program to validate whether accepted string is palindrome or not. .   4
2. (a) Write a program to multiply two matrices after checking compatibility.   10
  (b) What is file? What are the different functions available to read data from file? Specify the different modes in which files can be opened along with syntax.   10
3. (a) Write a program to find transpose of matrix without making use of another matrix.   10
  (b) Define a structure consisting of following elements   10
      1. student roll_no
      2. student name
      3. student percentage
  Write a program to read records of 5 students and display same.
4. (a) Write a program to calculate summation of series.   10

$$\frac{1}{1!}+\frac{2}{2!}+\frac{3}{3!}+...+\frac{n}{n!}$$

  (b) Draw the flowchart for finding the roots of quadratic equation. Write the program for same.   10
5. (a) Write a program to implement calculator with following operations using switch case   10
      1. add two numbers
      2. Subtract two numbers

        3. Multiply two numbers
        4. Divide two numbers

(b) What do you mean by FILE? What are the different functions available to read data from file? Specify the different modes in which file can be opened along with syntax.   10

6. (a) Write a program to generate following patterns.   10

    1. 1
        1 2
        1 2 3
        1 2 3 4
        1 2 3 4 5

    2. 1
        2 3
        3 4 5
        6 7 8 9

(b) Explain call by value and call by reference with example.   10

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Time: 2 Hours   Marks: 60

N.B.
1. Question **No.1** is Compulsory.
2. Attempt **any three** questions from the remaining questions Nos. 2 to 6
3. Assume suitable data wherever required.
4. Figures to the right indicate marks.

Q.1.   Attempt **any Five**

a)   Find the divergence of vector function $\vec{A} = x^2\hat{\imath} + x^2y^2\hat{\jmath} + 24x^2y^2z^3\hat{k}$ 03

b)   What is antireflection coating? What should be the refractive index and   03
minimum thickness of the coating?

c)   A glass material A with which an optical fibre is made has a refractive Index   03
of 1.55.This material is clad with another material whose refractive index is
1.51. The light in the fibre is launched from air. Calculate the numerical
aperture of the fibre.

d)   What is the difference between Bottom up approach and Top down approach   03
with respect to nanotechnology?

e)   Write the difference between LED and Laser Diode.   03

f)   How is Lissajous figures used to measure unknown frequency?   03

g)   A parallel beam of light of wavelength 5890 Å is incident on a glass plate   03
having refractive index μ =1.5 such that the angle of refraction in the plate is
60^0.Calculate the smallest thickness of the glass plate which will appear dark
by reflected light.

Q.2   a)   With the help of a proper diagram and necessary expression, explain how   08
Newton's ring experiment is useful to determine the radius of curvature of a
plano convex lens. In a Newton ring's experiment the diameter of 5th dark
ring is 0.336 cm and the diameter of 15th dark ring is 0.590cm.Find the radius
of curvature of a plano convex lens, if the wavelength of light used is 5890Å .

b)   What is monomode and multimode fibre? Explain the term V-number.   07
Calculate the number of modes a step index optical fibre of diameter 40µm
will transmit as its core and cladding refractive indices are 1.5 and 1.46
respectively. Wavelength of light used is 1.5 µm.

Q.3   a)   With a neat energy level diagram describe the construction and working of   08
He-Ne laser. What are its merits and demerits?

b)   What is diffraction grating and grating element? Explain the experimental   07
method to determine the wavelength of the spectral line using diffraction
grating?

Q.4   a)   With a neat diagram explain the construction and working of scanning   05
electron microscope

b)   Derive the Bethe law for electron refraction.   05

c)   Derive the condition for absent spectra in grating.   05

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Q.5 a) Draw the block diagram of an optical fibre communication system and explain the function of each block.   05

b) Derive Maxwell's third equation.   05

c) An electron enters a uniform magnetic field $B = 0.23 \times 10^{-2}$ Wb/m^2 at 45^0 angle to B. Determine radius and the pitch of helical path. Assume electron speed to be 3×10^7 m/s   05

Q.6 a) If $\vec{A} = x^2 z \hat{\imath} - 2y^2 z^2 \hat{\jmath} + xy^2 z \hat{k}$. Find $\nabla \cdot \vec{A}$ at point (1,-1,1).   05

b) A Newton's rings set up is used with a source emitting two wavelengths $\lambda_1 = 6000\text{Å}$ and $\lambda_2 = 4500\text{Å}$. It is found that n^{th} dark ring due to 6000Å coincides with $(n+2)^{th}$ dark ring due to 4500Å. If the radius of curvature of the lens is 90 cm, find the diameter of nth dark ring for 6000Å 05

c) Differentiate between stimulated and spontaneous emission.   05

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Time: 3 hours   Marks: 80

N.B   1) Question **No. 1** is **Compulsory**.

2) **Answer** any **three** questions from remaining questions.

3) Figures to the right indicate full marks.

Q.1 a) Evaluate $\int_0^\infty \frac{e^{-x^3}}{\sqrt{x}} dx$.   3

b) Find the length of the curve $x = \frac{y^3}{3} + \frac{1}{4y}$ from $y = 1$ to $y = 2$.   3

c) Solve $(D^2 + D)y = e^{4x}$.   3

d) Evaluate $\int_0^1 \int_{x^2}^x xy(x + y)dydx$.   3

e) *Solve*   4
$$(4x + 3y - 4)dx + (3x - 7y - 3)dy = 0.$$

f) Solve $\frac{dy}{dx} = 1 + xy$ with initial condition   4
$x_0 = 0, y_0 = 0.2$ by Taylors series method. Find the
approximate value of y for x=0.4 (step size 0.4).

Q.2 a) Solve $\frac{d^2y}{dx^2} - 16y = x^2e^{3x} + e^{2x} - cos3x + 2^x$.   6

b) Show that $\int_0^\pi \frac{log(1+acosx)}{cosx} dx = \pi sin^{-1}a \; 0 \le a \le 1$.   6

c) Change the order of integration and evaluate $\int_0^2 \int_{2-\sqrt{4-y^2}}^{2+\sqrt{4-y^2}} dxdy$.   8

Q.3 a) Evaluate $\iiint (x + y + z) \, dxdydz$ over the tetrahedron bounded by   6
the planes $\quad x = 0, y = 0, z = 0 \quad and \; x + y + z = 1$.

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b) Find the mass of the lamina bounded by the curves $y = x^2 - 3x$ and $y = 2x$ if the density of the lamina at any point is given by $\frac{24}{25}xy$.

6

c) Solve $x^2 \frac{d^2y}{dx^2} + 3x \frac{dy}{dx} + 3y = \frac{logx \cdot cos(logx)}{x}$.

8

Q.4 a) Find by double integration the area bounded by the parabola $y^2 = 4x$ and the line $y = 2x - 4$.

6

b) Solve $\frac{dy}{dx} + xsin2y = x^3cos^2y$.

6

c) Solve $\frac{dy}{dx} = x^3 + y$ with initial conditions $y(0) = 2$ at x=0.2 in steps of h=0.1 by Runge Kutta method of fourth order.

8

Q.5 a) Evaluate $\int_0^1 x^5 sin^{-1}x \, dx$ and find the value of $\beta \left(\frac{9}{2}, \frac{1}{2}\right)$.

6

b) In a circuit containing inductance L, resistance R, and voltage E, the current i is given by $L\frac{di}{dt} + Ri = E$. Find the current i at time t if at t=0,i=0 and L,R, E are constants.

6

c) Evaluate $\int_0^6 \frac{dx}{1+3x}$ by using i) Trapezoidal ii) Simpsons (1/3)rd and iii) Simpsons (3/8)th rule.

8

Q.6 a) Find the volume bounded by the paraboloid $x^2 + y^2 = az$ and the cylinder $x^2 + y^2 = a^2$.

6

b) Change to polar coordinates and evaluate $\int_0^1 \int_0^x (x + y)dydx$.

6

c) Solve by method of variation of parameters $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{e^x}$.

8

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[Time: 2 Hours]   [Marks:40]

Please check whether you have got the right question paper.

N.B: i)   Question No.1 is compulsory
        ii) Attempt any four from the remaining five questions.
        iii) Figures to the right indicate marks.
        iv) Answers to all sub questions should be attempted and grouped together.

Q.1 A) Define communication. Illustrate it with examples from one existing communication patterns   **3**
            in your college/institute.

   B)   Identify the barriers in the following communication situations: **2**
        i)   The presenter uses only technical terms in a seminar and could not impress the audience.
        ii) The DJ music was so loud that the students could hardly study.
        iii) Inability of the rural audience to understand the speech of the President of America on TV
        iv) A soft drink company launched its new range of soft drinks in the month of December and
             got very poor sales.

   C)   Any three differences between General and Technical communication.   **3**

   D)   Match the following: **2**

                        A   B
        i)   Avoid an injury   a.   Reference No
        ii) Marketing goods   b.   Warning
        iii) ACD/38/2771/98   c.   Complete block
        iv) Left aligned   d.   Sales letter

Q.2 A) Write two lines on any two objectives of communication.   **2**

   B)   Any two non-verbal methods of communication during a presentation.   **3**

   C)   As the Purchase Manager of your company you had ordered two dozen personal computers.   **5**
        When the consignment arrived, you found some pieces in damaged condition. Write a
        complaint letter to the Sales Manager of the company asking for replacement or
        compensation. (Complete block)

Q.3 A) **Write short notes on any four:**   **8**
        i)   Signature Block in official letters
        ii) Clarity and Correctness
        iii) Vertical communication
        iv) Advantages of written communication
        v)   Feedback

   B)   **Choose the correct option:**   **2**
        Lower in value: _____ (Deprecate/Depreciate)
        Feeling regret: _____ (Regrettable/Regretful)
        Head of an Institute: _____ (Principle/Principal)
        Tranquility: _____ (Piece/Peace)

Q.4 A) Define the process of communication with the help of diagram and an example. **3**

B) Write the disadvantages of oral communication. **3**

C) Define the following: **4**

i) Lap top ii) Transformer iii) Electric Bulb iv) Mobile phone

Q.5 A) Explain 7Cs of communication. **6**

B) i) State the difference between warning and danger. **1**

ii) What is the difference between a tool and an instrument? **1**

iii) What is the difference between description and instruction? **2**

Q.6 A) Identify the sender, message, medium, channel, receiver and feedback. **3**

i) The Manager gives instructions to the computer operator over telephone about launching their product and how to market it through advertisement.

B) Read the following passage and answer the questions below:

It is time we looked at the latent causes. Where does the strength of India lie? Not in numbers, not necessarily in our moral stands on international issues. In modern times, the strength of a nation lies in its achievement in science and technology. This is not to say that the other fields do not count.

In the 5 decades after independence, we have yet to demonstrate our originality in applied science and technology. Though Japan also started like us, by cultivating the technology of the west, the Japanese adapted, improved and displayed originality in, several areas of science and technology. The generation which was at the helm of affairs in science and technology in our country after independence mostly consisted of self- seekers. By and large the science and technology managers in India concentrated on gaining power and influence. They loved publicity. Most of them stopped doing science while they managed science. Things would have been better, had they been humble enough to acknowledge the difference between doing and managing science. Instead, they claimed that they were the foremost in science and technology, simply because they were at the helm of affairs. As a result they ceased to inspire the younger lot. India continues to be the borrower of science and technology, even though its potential for originality is substantial.

Our achievement in nuclear science and technology may be dazzling to our people. But, in worth and originality they are ordinary and routine. While our own people remain ignorant, the people of other countries know all about the pretensions to knowledge of our nuclear science and technology managers. The veil of secrecy over nuclear deals does not allow any investigations into misdeeds of the people who sabotage good and sincere efforts. The ones at the helm of affairs do make every endeavor to sabotage any genuine efforts, lest they might not get the continued funding if the actual objective is accomplished. International bodies came in as handy tools in this subtle process. The talk of national security comes as an easy weapon to prevent any probe into mismanagement. On nuclear matters the media in our country, by and large, avoid the investigative approach. As a result, the mismatch between promise and performance in the nuclear field does not get exposed as much as that in other fields.\

1. What, according to the passage, is the criterion to decide the strength of the country? **1**

2. What is common between the scientists of Japan and India? **1**

3. What does the author mean by doing science? **1**

4. Pick out the words that is nearest in meaning as the words underlined in the passage. **2**
   a) Pretensions
   i) shortcomings ii) claims iii) apathy iv) access v) permissiveness
   b) Managed
   i) conducted ii) organized iii) trained iv) performed v) maneuvered

5. Pick out the word which is furthest in meaning to the words underlined: **2**
   a) Dazzling
   i) lustrous ii) glaring iii) unnoticeable iv) unexposable v) unscrupulous
   b) Substantial
   i) insignificance ii) extensive iii) independent iv) noteworthy y) uncompromising.

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