

Time : 3 Hours

Max Marks : 80

- N.B. : 1) Question number 1 is **compulsory**
 2) Answer **any three questions** from the remaining questions Q2 to Q6.
 3) Figures to the right indicate full marks

Q.1 a) Solve $\frac{dy}{dx} + \frac{4x}{x^2+1}y = \frac{1}{(x^2+1)^3}$ (5)

b) Evaluate $\int_0^{2a} x^2 \sqrt{2ax - x^2} dx$ (5)

c) Solve $(D^3 + 3D^2 + 3D + 1)y = e^{-x}$ (5)

d) Change to polar coordinates and evaluate $\int_0^a \int_y^a x dx dy$ (5)

Q.2 a) Solve $\frac{dy}{dx} = 2 + \sqrt{xy}$ (6)

with $x_0 = 1.2$, $y_0 = 1.6403$ by Euler's modified formula for $x = 1.4$, $x = 1.6$

b) Evaluate $\iint y dx dy$ throughout the area bounded (6)
 by $x=0$, $y = x^2$ and $x + y = 2$.

c) Solve $(4xy + 3y^2 - x)dx + x(x + 2y)dy = 0$ (8)

Q.3 a) Evaluate the integral $\int_0^2 \int_1^2 \int_0^{yz} x y z dx dy dz$ (6)

b) Assuming the validity of differentiation under the integral sign, (6)

Prove that $\int_0^1 \frac{x^a - x^b}{\log x} dx = \log \frac{a+1}{b+1}$

c) Solve $(D^3 + D)y = \sin x$ (8)

Q.4 a) Solve $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = \frac{e^{-2x}}{x^5}$ (6)

b) Change the order of integration for the integral $\int_0^a \int_{y^2/a}^y f(x,y) dx dy$ (6)

c) Solve $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$, (8)

Using the method of variation of parameters

Q.5 a) Find $\int_0^1 \int_0^y x y e^{-x^2} dx dy$ (6)

b) Apply Runge-Kutta method of fourth order to find an approximate value of y at $y=0.2$ if $\frac{dy}{dx} = x + y^2$ given that $y=1$ when $x=0$ in steps of $h=0.1$ (6)

c) Solve $\frac{dy}{dx} \cosh x = 2(\cosh x)^2 \sinh x - y \sinh x$ (8)

Q.6 a) Evaluate $\int_0^3 e^{\sqrt{x}} dx$ by Simpson's $3/8^{\text{th}}$ rule. Take $h = 0.25$. (6)

b) Solve $(x^3 y^3 + xy) dy = dx$ (6)

c) Evaluate $\int_0^2 y^4 (8 - y^3)^{-1/3} dy$ (8)

[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 the remaining questions Nos.2 to 6
 3 Assume Suitable data wherever required.
 4 Figures to the right indicate marks.

- Q1 Attempt any five from the following (3 marks each) 15**
- 1(a) Explain why we see beautiful colors in thin film when is exposed to sun light.
 (b) What is the difference between spontaneous and stimulated emission?
 (c) Calculate V number for an optical fiber having numerical aperture 0.25 and core Diameter 20 μm if it is operated at 1.55 μm .
 (d) Explain physical significance of divergence.
 (e) Explain the measurement of frequency of AC signal using CRO.
 (f) What are different techniques to synthesis nanomaterial?
 (g) A grating has 620 rulings/mm and is 5.05mm wide. What is the smallest wavelength interval that can be resolved in the third order at $\lambda=481\text{nm}$?
- Q2 A** Derive the conditions for maxima and minima due to interference of light reflected from thin film of uniform thickness. **08**
B Derive the expression for numerical Aperture for a step index fiber. The N.A. of an optical fiber is 0.5 and core R.I. is 1.54. Find refractive index of cladding **07**
- Q3 A** With neat sketch explain principle, construction, energy diagram and specially of Nd : YAG laser **08**
B What is meant by diffraction & diffraction grating? How it is useful for determination of wavelength of monochromatic source? **07**
- Q4 A** Show that divergence of a curl is equal to zero **05**
B Explain the construction & working of CRT **05**
C Diameter of the 15th dark ring was 0.59 cm in a Newton's ring experiment. When a liquid is used in placed of air, the diameter of that ring is decreased by 0.09 cm. What is the refractive index of the liquid? **05**
- Q5 A** Explain the working of AFM with a neat diagram & its applications **05**
B Write integral form of all Maxwell's equations **05**
C An electron enters a uniform magnetic field (B) = 0.23 wb/m² at an angle 45 to B determine the radius and pitch of the helical path. Speed of electron is 3×10^7 m/s. **05**
- Q6 A** What is curl of a vector? Explain its significance. **05**
B What is holography? Differentiate between Holography and photography **05**
C What do you understand by anti-reflection coating? Derive the conditions with proper diagram **05**

[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 out of remaining five.
 3. Figure to the right indicates full marks.
 4. Atomic weights C=12,S=32,N=14,H=1,O=16,Cl=35.5.

- 1 Answer **any five** from the following **15**
- (a) Write a reaction for preparation of Biodiesel and explain why is it considered as green fuel?
 - (b) Write any one function of binder, pigments and lubricants in paints?
 - (c) Calculate Gross calorific value of a coal sample having composition C = 75%, O = 8%, H= 10%, S = 1% and remaining being ash.
 - (d) Write the composition, properties and uses of Gun metal.
 - (e) List any six principles of green chemistry.
 - (f) Define and classify composite materials.
 - (g) Distinguish between anodic coating and cathodic coating.
- 2 (a) Define corrosion. Explain the mechanism of wet corrosion with respect to acidic medium. **6**
- (b) i) 0.3 g of coal sample on combustion gave 0.03 g of barium sulphate precipitate. Calculate the percentage of Sulphur in the sample. **3**
ii) Write industrial applications of supercritical CO₂. **2**
 - (c) What are the characteristics of composite materials? **4**
- 3 (a) What is cracking? With the help of diagram explain moving bed catalytic cracking. **6**
- (b) i) What is shape memory alloys? Write its two applications? **3**
ii) Explain in brief effect of pH on rate of corrosion. **2**
 - (c) Calculate the percentage atom economy of the following reaction with respect to the product Ethyl benzene **4**
- $$\text{C}_6\text{H}_6 + \text{C}_2\text{H}_5\text{Cl} \xrightarrow{\text{AlCl}_3} \text{C}_6\text{H}_5\text{C}_2\text{H}_5 + \text{HCl}$$
- Ethylbenzene
- 4 (a) How do the following factors affect the rate of corrosion? **6**
- i) Purity of metal,
 - ii) Relative Cathodic and anodic area,
 - iii) Position of metal in electrochemical series
- (b) i) Explain how catalysts help in making the reaction green? **3**
ii) Define matrix phase and dispersed phase **2**
 - (c) Write applications of powder metallurgy. **4**

- 5 (a) Calculate weight and volume of air required for complete combustion of 10 kg of coal sample having following composition, C =80%, H =10%, O=5%, S =2%, N =2% and remaining ash. (M.W.of air =28.949) **6**
- (b) i) Draw a neat labelled diagram for electrochemical corrosion in neutral medium **3**
ii) What are the applications of fuel cell? **2**
- (c) Write conventional and green route for synthesis of Adipic Acid and explain the principle of green chemistry involved in it. **4**
- 6 (a) What is compacting in powder metallurgy? Explain powder injection moulding method with the help of a neat diagram. **6**
- (b) i) Write a short note on sandwich panel composites. **3**
ii) Explain the effect of Aluminium oxide film on rate of corrosion. **2**
- (c) Explain any four characteristics of good fuel. **4**
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Time : 3 Hours

Total Marks : 80

- N.B.:(1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

Q1 Attempt the following (05 Marks each)

- Write an algorithm to check entered number is Prime or not.
- Write a C program to take the details of two books such as name of book, author name and book id using structure. Display the same details.
- Write a short note on "Derived Data Types in C".
- Write a C program to create a file and write data into file.

Q2 Solve any Two (10 Marks each)

- Write a program to find largest and smallest elements of an array.
- Explain One dimensional and Two dimensional array with example.
- Write a C program to display following pattern using nested loops.

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*  
**  
***  
****  
*****
```

Q3 Solve any Two (10 Marks each)

- What is recursion? Write a program using recursion to find the factorial value of given integer number.
- Explain Nested loops in C. Write a program to find factorial value of first 10 numbers.
- Write an algorithm to sort n numbers in ascending order.

Q4 Solve any Two (10 Marks each)

- What is function in C? Write a C program to swap the values of two variables using call by Reference.
- What is Flowchart? Draw all basic symbols of flowchart and write its purpose.
- Explain i) Relational Operators
ii) Conditional Operators

Q5 Solve any Two (10 Marks each)

- Write a C program to count the number of Upper Case and Lower Case characters from a given sentence.
- Explain for loop, while loop and do-while loop with example.
- Explain with example Formatted Input and Output functions in C.

Q6 Write short note on (05 Marks each)

- continue and break statement.
- pointers in C.
- union in C.
- switch statement .

Duration: 2 Hours

Total Marks 40

N. B. 1) Question No. 1 is compulsory.

2) Attempt any three questions out of remaining five questions.

3) Figures to the right indicate marks.

4) Answers to all sub questions should be attempted and grouped together.

1. A) "Communication is the exchange of meaning between individuals through a common system of symbols" Explain the process of communication in the light of above statement with a suitable diagram. **4 Marks**

B) Explain briefly the linguistic barrier with two examples **2 Marks**

C) Draw the layout of Complete Block Format **2 Marks**

D) Match the following **2 Marks**

A

B

i) Kinesics

a) The study of space in communication.

ii) Haptics

b) The study of silence as a means of communication.

iii) Occulesics

c) The study of touch.

iv) Proxemics

d) The study of eye contact.

e) The study of body movements related to speech

2. A) As a purchase manager of Satyam Computers, 9 Naidu Road Hyderabad, 500007, you had ordered thirty laptops from The Modern Computer Limited, M. G. Road Chennai, but when consignment arrived you found some pieces are in a damaged condition. Write a complaint letter to sales manager asking for replacement of laptops. (Complete Block Format) **6 Marks**

B) What are the two types of vertical communication? Discuss the merits of downward communication **4 Marks**

3. A) Write a short note on any two **6 Marks**

1. You Attitude

2. Feedback

3. Proxemics

4. Letter head

B) Explain any 4 principles of business correspondence. (4C's) **4 Marks**

4. A) Write a set of instructions on using elevator. **4 Marks**
- B) Write a technical description of process of titration. **4 Marks**
- C) What are the blocks of effective listening **2 Marks**
5. A) Distinguish between the following instructions: **4 Marks**
1. Caution & Warning
 2. Note & Precaution
- B) What role does non-verbal communication play in making public speaking effective? **4 Marks**
- C) List the differences (attempt any one) **2 Marks**
1. Listening & hearing
 2. Physical & Psychological Barrier
6. A) You are the General Secretary of the staff club of your organization. To organize a dinner & to celebrate the Founders Day make an enquiry to Tasty-bite Caterers giving all the necessary details. (Use Complete Block Format to write a letter) **6 Marks**

B) Read the passage & answers the questions.

Many great inventions are initially greeted with ridicule and disbelief. The invention of the airplane was no exception. Although many people who heard about the first powered flight on December 7, 1903 were excited and impressed, others reacted with pearls of laughter. The idea of flying an aircraft, was repulsive to some people, such people called Wilbur and Orville Wright, the inventors of the first flying machine, impulsive fools. Negative reactions, however, did not stop the Wrights. Impelled by their desire to succeed, they continued their experiments in aviation. Orville and Wilbur Wright had always had a compelling interest in aeronautics and mechanics. As young boys they earned money by making and selling kites and mechanical toys. Later, they designed a newspaper-folding machine, built a printing press, and operated a bicycle-repair shop.

In 1896, when they read about the death of Otto Lilienthal, the brothers' interest in flight grew into a compulsion. Lilienthal, a pioneer in hang-gliding, had controlled his gliders by shifting his body in the desired direction. This idea was repellent to the Wright brothers, however, and they searched for more efficient methods to control the balance of airborne vehicles. In 1900 and 1901, the Wrights tested numerous gliders and developed control techniques. The brothers' inability to obtain enough lift power for the gliders almost led them to abandon their efforts. After further study, the Wright brothers concluded that the published tables of air pressure on curved surfaces must be wrong. They set up a wind tunnel and began a series of experiments with model wings. Because of their efforts, the old tables were repelled in time and replaced by the first reliable figures for air pressure on curved surfaces. This work, in turn, made it possible for the brothers

to design a machine that would fly. In 1903 the Wrights built their first airplane which cost less than \$1,000. They even designed and built their own source of propulsion--a light, weight gasoline engine. When they started the engine on December 17, the airplane pulsed wildly before taking off. The plane managed to stay aloft for 12 seconds, however, and it flew 120 feet. By 1905, the Wrights had perfected the first airplane that could turn, circle, and remain airborne for half an hour at a time. Others had flown in balloons and hang gliders, but the Wright brothers were the first to build a full-size machine that could fly under its own power. As the contributors of one of the most outstanding engineering achievements in history the Wright brothers are accurately called the fathers of aviation.

1. Why did the Wright Brothers are called as the father of aviation? **1 Mark**
2. What do you mean by glider? **1 Mark**
3. Make a sentence by using phrase 'To reel' **1 Mark**
4. What lesson do you learn from the above passage? **1 Mark**

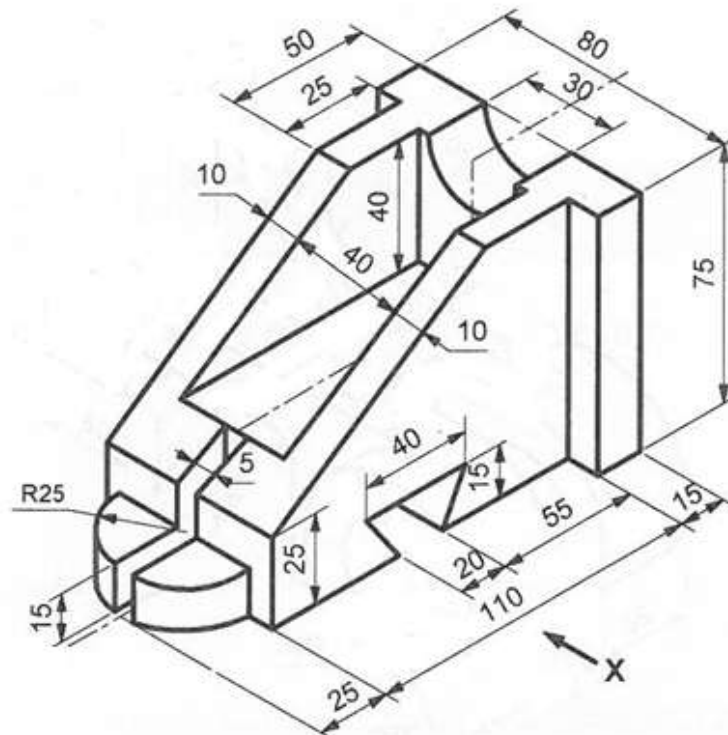
(3 Hours)

[Total Marks: 60]

N.B.-1. Question No.1 is compulsory.

2. Attempt **any three** questions out of remaining **five** questions.
3. Use **first angle method of projection**, unless mentioned otherwise.
4. Write all answers on drawing sheets only and use both the sides of the sheet.
5. Use your own judgment for any unspecified dimension.
6. Retain construction lines.
7. All dimensions are in mm.

- Q. 1 (a)** Draw the curve traced by a point on the circumference of a disc of 50 mm diameter, which rolls along the ground for one complete revolution. Take initial position of generating point as a contact point of disc with ground. Also draw normal and tangent to the curve at any suitable point on the curve. **06**
- (b)** For the object shown in figure, draw the following views: **05**
- (i) Front view in direction of arrow.
 - (ii) Top view **04**



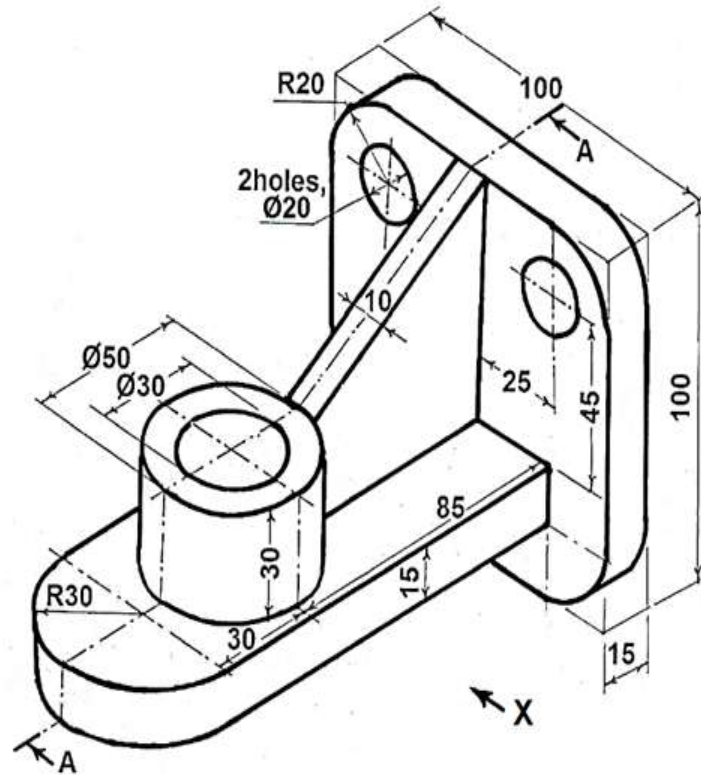
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Q. 2

For the object shown in figure, draw the following views:

- (i) Sectional Front View along section plane A-A
- (ii) Left Hand Side View
- (iii) Top View
- (iv) Show all dimensions

05
04
04
02



Q. 3

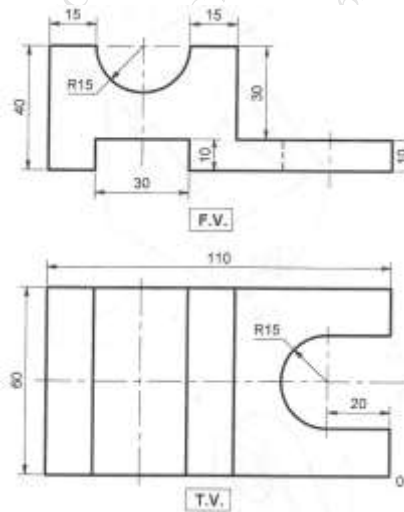
A pentagonal pyramid, base edges 25 mm and axis length 50 mm long has one of its triangular faces in the V.P. and edge of the base contained by that face makes an angle of 30° with H.P. Draw its projections.

15

Q. 4

- (a) A cylinder of diameter 45 and axis 60 mm long is resting on a point of its base on H.P. with axis inclined at 35° to H.P. Draw the projections of cylinder.
- (b) Figure shows two views of an object. Draw isometric view of the object.

06
09



- Q. 5** A regular pentagonal pyramid with the sides of its base 30 mm and height 80 mm rests on an edge of base. The base is tilted until its apex is 50 mm above the level of the edge of the base on which it rests. Draw the projection of the pyramid when the edge, on which it rests, is parallel to the V.P. and the apex of the pyramid points towards V.P. **15**
- Q. 6 (a)** A line AB 65 mm long, has its end A 20 mm above the H.P. and 25 mm in front of V.P. The end B is 40 mm above the H.P. and 65 mm in front of the V.P. Draw the projections of AB and show its inclinations with the H.P. and V.P. **07**
- (b)** Figure shows two views of an object. Draw isometric view of the object. **08**

