

Con. 5979-13.

(OLD COURSE)

LJ-10180

(3 Hours)

[Total Marks : 100

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

(2) Attempt any four questions from out of remaining six questions.

(3) Figure to the right indicate full marks.

1. (a) Solve $\frac{dy}{dx} = 1 + y^2$ with initial conditions $x_0 = 0, y_0 = 0$ by Taylor's method where $h = 0.2$. 3
- (b) Solve $(D^4 + 2D^2 + 1)y = 0$. 3
- (c) Evaluate $\int_0^\pi \int_0^{a \sin \theta} r dr d\theta$. $r dr d\theta$ 3
- (d) $\int_{-1}^1 \int_{-2}^2 \int_{-3}^3 dx dy dz$. 3
- (e) Evaluate $\int_0^\infty x^{1/4} e^{-\sqrt{x}} dx$. 4
- (f) Using Euler's method, find the approximate value of y when $\frac{dy}{dx} = x^2 + y^2$ and $y = 1$ when $x = 0$ at $y = 2$ in five steps is $h = 0.2$, at $x = 1$. 4
2. (a) Prove that $\int_0^\infty \frac{x}{(1+x^4)^{5/4}} dx = \int_0^\infty \frac{dx}{\sqrt{1+x^4}} = \frac{\pi}{2\sqrt{2}}$. 6
- (b) Solve $\frac{dy}{dx} = xy$ with initial conditions $y(1) = 2$ and find y at $x = 1.2$ by Runge-Kutta Method of Fourth order. 6
- (c) Solve $\frac{dy}{dx} = xy + y^2 e^{(-x^2/2)} \log x$. 8
3. (a) Solve $y(x+y)dx - x(y-x)dy = 0$ 6
- (b) Prove that $\int_0^1 \frac{x^a - 1}{\log x} dx = \log(1+a), a \geq 0$. 6
- (c) Solve by the method of variation of parameters $\frac{d^2y}{dx^2} + y = \frac{1}{1 + \sin x}$. 8

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4. (a) Solve $y(xy + e^x) dx - e^x dy = 0$. 6
- (b) Solve $x^2 \frac{dy}{dx} - x \frac{dy}{dx} + 2y = x \log x$. 6
- (c) Solve $\frac{d^2y}{dx^2} + 2y = x^2 e^{3x} + e^x - \cos 2x$. 8
5. (a) The Charge q on the plate of a condenser of the capacity C charged through a resistance R by a steady voltage V satisfies the differential equation $R \frac{dq}{dt} + \frac{q}{c} = V$. If $q = 0, t = 0$, show that $q = CV(1 - e^{-t/RC})$. Find also the current flowing into the plate. 6
- (b) Change the order of integration $\int_0^1 \int_{2y}^{2(1+\sqrt{1-y})} f(x, y) dx dy$. 6
- (c) Evaluate $\iiint xyz(x^2 + y^2 + z^2) dx dy dz$ over the first octant of the sphere $x^2 + y^2 + z^2 = a^2$. 8
6. (a) Find the length of the cardioid $\rho = a(1 - \cos \theta)$ 6
- (b) Change into polar coordinates and evaluate $\int_0^a \int_0^{\sqrt{a^2 - x^2}} e^{-(x^2 + y^2)} dy dx$. 6
- (c) Evaluate $\iint_R xy dx dy$ over the region R given by $x^2 + y^2 - 2x = 0, y^2 = 2x, y = x$. 8
7. (a) Find the area bounded by $y^2 = 4ax$ and $x^2 = 4ay$. 6
- (b) Find the mass of Lamina bounded by curve $ay^2 = x^3$ and line $y = x$ if the density at a point varies as the distance of the point from x -axis. 6
- (c) Find the volume bounded by cylinder $x^2 + y^2 = a^2$ and the plane $z = 0$ and $y + z = b$. 8

(OLD COURSE)

(2 Hours)

[Total Marks : 75

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions from the **remaining**.
 (3) Mention **suitable** examples wherever **necessary**.
 (4) Draw structure wherever applicable.

1. Attempt any **five** of the following :- **15**
 - (a) Differentiate between spontaneous emission and stimulated emission.
 - (b) Explain why thin film interference pattern for wedge film is parallel where as for Newton's ring it is circular ?
 - (c) Explain de-broglie's hypothesis ?
 - (d) What spectres would be absent when width of opacity is double than that of the transparency in a grating ?
 - (e) Describe Pirani gauge.
 - (f) Differentiate between soft and hard magnetic material.
 - (g) What is the wave length of neutron, whose energy is 0.025 ev and mass 1.676×10^{-27} kg ?

2. (a) Describe the origin of color on Parallel thin film, with the derivation of constructive and destructive conditions. **8**
- (b) Consider an air core toriod with 500 turns, cross-section 6 cm^2 , mean radius 15 cm, coil current 4 amp. Now calculate m.m.f. (NIo), reluctance (R), M. flux (ψ), M-flux density (B) and M-field intensity (H). **7**

3. (a) By using Time Dependent Schrödiger equation, prove that energy levels of particle in one dimensional box of infinite height are quantized, where as for free particle is continuous. **8**
- (b) A plane wave of monochromatic light falls normally on a uniform thin film of oil which covers a glass plate. Wave length of source when change continuously then complete destructive interference taken place only for wave length 5000 \AA and 7000 \AA . Find the thickness of oil layer when R.I. of oil is 1.3 and that of glass is 1.5. **7**

4. (a) Describe He-Ne laser with suitable energy level diagram by mentioning how metastable state, pumping and population inversion taken place. **5**
- (b) The position and momentum of 1 kev electron are simultaneously measured. If its position is located within 10 nm, then what is the momentum of the particle and what is the uncertainty in its momentum ? Given that mass of electron = 9.1×10^{-31} kg, charge of electron = 1.6×10^{-19} c and $h = 6.63 \times 10^{-34}$ J.S. **5**
- (c) Light incident on a grating with 6000 lines per cm. Find angular separation in 2nd order of two sodium lines of wave length 5890 \AA and 5896 \AA . **5**

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5. (a) Differentiate between step index fiber and graded index fiber and derive the expression for N.A. for both. 5
- (b) Find de-broglie's wave length of a cricket ball having speed 150 km/hr with mass 450 gm and electron having speed 10^5 m/sec. 5
- (c) Define resolving power of a grating. Calculate maximum order possible for a grating with 15,000 lines / inch, with wave length 5893 \AA . 5
6. (a) Prove that diameter of dark ring in Newton's ring is proportional to the square root of natural number and explain why centre of Newton's ring is dark ? 5
- (b) For a step index fiber core R.I. is 1.48, cladding R.I. is 1.38, core radius $50 \mu\text{m}$, wave length of light propagated $1 \mu\text{m}$. Now calculate N.A., normalized frequency (V) and no. of guided modes (Ms). 5
- (c) Compare diagram para and ferromagnetic materials interms of dipole moment and susceptibility. 5
7. Write short notes on any **three**. 15
- (a) Rotary pump
- (b) SEM
- (c) Antireflection.
- (d) Holography.
-

F.E. - SEM II (old) Nov. Dec 2013
Applied chemistry - II
02/12/13

P3-upq-Oct13-2ndHalfoc13 D-97

Con. 6875-13.

(OLD COURSE)

LJ-10200

(2 Hours)

[Total Marks : 75

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

(2) Solve any **four** questions from remaining **six** questions.

(3) **All** questions carry **equal** marks.

(4) Atomic wts : H = 1, C = 12, N = 14, O = 16, Na = 23, Mg = 24, S = 32,
Cl = 35.5, Ca = 40.

1. Solve any **five** from the following :—

15

- What is galvanic corrosion ?
- Write a note on mining of crude petroleum.
- What are the applications of Composite materials.
- List any six principles of green chemistry.
- Explain the carbon membranes.
- Give the composition, properties and uses of Duralumin.
- By Kjeldahl's method, 1.5 g of coal sample was analysed. The ammonia evolved was absorbed in 50 ml of 0.1 N H_2SO_4 . After absorption, the excess H_2SO_4 required 35 ml of 0.1 N NaOH for neutralisation. Calculate the percentage of nitrogen.

2. (a) 2.5 g of air dried coal sample was taken in a silica crucible. After heating it in an electric oven at 105-110°C for 1 hr, the residue weighed 2.410 g. The residue was heated in a silica crucible covered with a vented lid at a temperature of $950 \pm 20^\circ$ for exactly 7 min. After cooling the weight of residue was found to be 1.78 g. The residue was then ignited at 700-750°C to a constant weight of 0.2469 g. Calculate the percentage of fixed carbon in the sample. 6

(b) Define corrosion. Explain the effect of the following factors on the rate of corrosion. 5

- Position of metal in Galvanic series.
- Relative area of the anodic and cathodic part.

(c) What is compacting ? Explain the powder injection moulding method. 4

3. (a) Write notes on (any two) :—

6

- Indergranular corrosion *intergranular*
- Stress corrosion
- Metal cladding.

(b) What is bio-diesel ? Explain the 'trans-esterification' method used for its production. 5
Give its advantages.

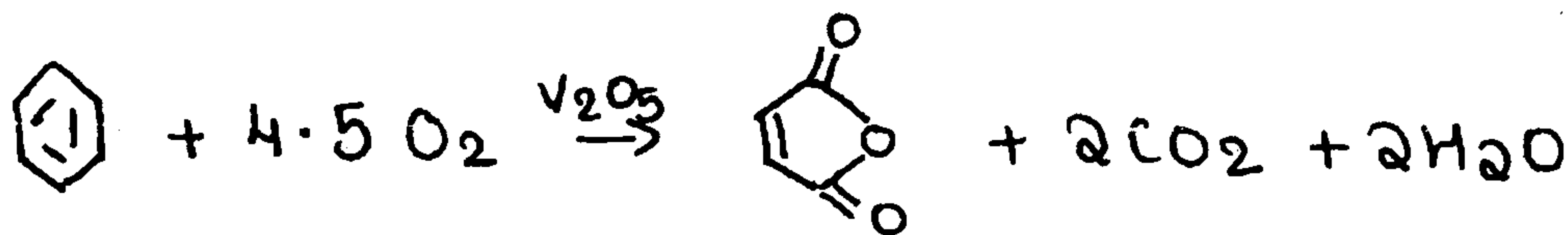
(c) What is powder metallurgy ? How are metal powders prepared ? (any 3 methods). 4

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4. (a) Calculate the weight and volume of air required for complete combustion of 5kg coal with the following compositions : C = 85%, H = 10%, O = 5%. 6
- (b) Define composite materials. Write a note on fibre reinforced composites. 5
- (c) Calculate the percentage economy for the following reaction. Synthesis of Maleic Anhydride by oxidation of benzene :— 4



5. (a) Define Catalyst. What are the types of Catalyst ? Discuss the characteristics of an ideal catalyst (any three). 6
- (b) Define paints. Discuss the functions and examples of the constituents of paints (any two). 5
- (c) Write a note on non-oxide powder, Silicon Carbide. 4
6. (a) Give the conventional ^{and} Green chemistry route for production of Adipic acid. Highlight the green chemistry principle addressed in this case. 6
- (b) What is Catalysis ? Give the various types with appropriate examples. 5
- (c) What is cathodic Protection ? Discuss the sacrificial anodic protection method. 4
7. (a) Explain the adsorption theory of heterogenous catalysis. 6
- (b) Define cracking. What are the types of cracking methods used ? Differentiate between the two. 5
- (c) Write a note on structural composites. 4
-

Computer programming - II
FE - Sem II (old) 07/12/2013.

P3-upq-Oct13-2ndHalfoc13 D-3

Con. 5526-13.

(OLD COURSE)

LJ-10211

(3 Hours)

[Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.

(2) Attempt any **four** questions from remaining **six** questions.

(3) **All** programs should be written in **Java** only.

1. (a) Explain the term Robustness and portability in Java. 4
(b) Explain Bitwise and logical operators with example. 4
(c) Explain System.arraycopy () used in Java programming. 4
(d) Explain the thread methods : isAlive (), join (), sleep () 4
(e) Create an applet that displays human face. 4
 2. (a) WAP in Java to interchange the values of two numbers using command line argument. 5
(b) What is vector ? Explain any five methods of vector. 5
(c) Explain Multi level inheritance with suitable example. 5
(d) Write steps of creating applet. 5
 3. (a) WAP in Java to check whether entered character is lower case, uppercase, numeric using if-else. 5
(b) Explain how to access protected members of super class in subclass. 5
(c) Explain what are Abstract Class and Abstract Methods. 5
(d) Explain how user defined packages are created and accessed in Java. 5
 4. (a) Explain method overloading and constructor overloading with example. 10
(b) Explain interface. How to implement an interface ? Explain with example 5
(c) Explain java.util package. 5
 5. (a) WAP to check whether entered member is Armstrong or not. 5
(b) Explain Java Exception handling Mechanism. 5
(c) Explain Thread Life Cycle. 5
(d) WAP to demonstrate parameter passing to Applet. 5
 6. (a) WAP to find roots of a quadratic equation. 5
(b) WAP to count frequency of a word in a sentence. 5
(c) WAP to create user defined exception. 5
(d) What is Synchronization ? When do we use it. 5
 7. (a) WAP to demonstrate method overriding. 5
(b) Explain the advantages of Vector over Array. 5
(c) Explain static members. 5
(d) How to achieve multiple inheritance in Java. 5
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(OLD COURSE)

(2 Hours)

[Total Marks : 75

- N.B.:** (1) Question No. 1 is compulsory.
 (2) Attempt any **four** from the remaining **six** questions.
 (3) Figures to the **right** indicate marks.
 (4) Answers to **all** sub questions should be attempted and grouped **together**.

Q.1.A) Explain the importance of feedback in the process of communication. (2M)

B) Identify the barriers in the following communication situations: (4M)

- i) The speaker uses jargon. in his speech on the Nanotechnology. The common man fails to understand.
- ii) The music was so loud the students could hardly study.
- iii) Inability of the villagers of a rural area to understand the speech of the nobel prize winner on TV
- iv) "Do not trust him again, all men are the same."

C) What are the different techniques to improve reading? (3M)

D) Match the following: (3M)

A

B

i. Sending price of goods

Reference No

ii. Yours sincerely

Warning

iii. PKVS/ 28/1968/13

Complete block

iv. Voltmeter

Complimentary Close

v. Left aligned

Quotation

vi. Beware of dogs

Instrument

E) Give a set of instructions on soldering. (3M)

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

B) What is non verbal communication? Explain any three types of non verbal communication. (5M)

C) You are planning to open a shop of electronics items in Mumbai. Write an inquiry letter to a company (8M) regarding the products, variety, prices, pamphlets, etc. Choose a suitable format.

Q. 3. A) What are the different types of linguistic barriers? Explain any two. (4M)

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B) Explain the importance of horizontal communication (3M)

C) The Office Manager of a Hi Tech company has asked you to replace the 10 computers he bought from you ten days ago after analyzing the damages. Draft a suitable reply. (Modified Block) (3M)

Q. 4.A) Define the process of communication with the help of diagram. (3M)

B) Write the advantages of oral communication (3M)

C) Describe any one of the following: (5M)

i) Thermometer ii) chisel iii) Electric fan

D) Write a technical description of the process (any one) (4M)

i) Using a fax machine ii) Photocopying

Q. 5.A) Write a brief note on any two: (6M)

i) Significance of haptics ii) Grape vine communication iii) Upward and Downward communication iv) Code, Encode and Decode

B) Explain 5 C's of communication. (6M)

C)i) State the difference between description and instructions. (1M)

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

iii) What is the difference between connotation and denotation ? (1M)

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

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

B) Describe emphathetic listening with examples. (5M)

c) Explain the process of Filling air in a bicycle tyre. (5M)

D) Fill in the blanks: (2M)

i) Listening only to what you want to listen is _____ listening.

ii) A signature block consists of _____ and _____.

Q.7. Read the following passage and answer the questions below:

First AOL and Time Warner announced their intention to combine. Then came Time Warner/EMI and Tribune/ Times Mirror. Even more significant, however, has been the speculation that these mergers have caused: If these transactions are consummated, a large number of additional media mergers are expected. There is even the

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possibility of a nightmare scenario—a wave of media mergers so large that within a decade most of our information will be supplied by perhaps six of these huge conglomerates and a fringe of much smaller firms.

It's time to ask two critical questions. Is this kind of media oligopoly what we, as a society, want? And if not, can the antitrust laws effectively prevent the threatened merger wave? The answer to the first question is clear. We do not want a media oligopoly. The answer to the second question, however, is far less certain. We should distrust a media oligopoly because it would give undue control to a small number of individuals. This need not manifest itself in a price rise for the daily newspaper or AOL's monthly fee. Rather, it could consist of a change in editorial viewpoints, a shift in the relative prominence of links to certain websites or a decision not to cover certain topics, because they are not "newsworthy". These problems could exist without any improper intent on the part of the media barons. Even if they try to be fair and objective, they will necessarily bring their own worldview to the job. And in time some of these conglomerates may be controlled by people who are not fair or objective.

At first it might appear that the antitrust laws can be of little help in grappling with the issues presented by large media mergers. The anti-merger laws are commonly understood as protecting price competition, and a relatively small number of firms—to greatly oversimplify, let's say at most half a dozen—are normally thought to be enough to keep a market price-competitive. In industry after industry firms merge until there is only a handful left, and the antitrust enforcers are normally unable to do anything to prevent this. (In former years mergers were governed by an "incipiency" standard that prevented mergers and merger waves well before they would have led to very large or likely anti-competitive problems.) Even if a handful of firms are enough to insure effective competition in most industries, would six conglomerate media firms be sufficient for the diversity of viewpoints necessary to democracy? Would we be reassured if they could somehow guarantee that they would sell their magazines and Internet advertisements at competitive prices?

I am hopeful that the antitrust laws, if correctly and vigorously interpreted, are adaptable enough to meet this challenge. This is because antitrust is not exclusively about price. It is essentially about choice—about giving consumers a competitive range of options in the marketplace so that they can make their own, effective selection from the market's offerings. Consumers should be able to make their choices along any dimension important to them—including price, variety and editorial viewpoint.

Communications media compete in part by offering independent editorial viewpoints and an independent gatekeeper function. Six media firms cannot effectively respond to the demand for choice or diversity competition by extending their product lines, because new media products will inevitably bear, to some degree, the perspective of their corporate parent. For these reasons competition in terms of editorial viewpoint or gate-keeping can be guaranteed only by insuring that a media market contains a significantly larger number of firms than is required for price competition in other, more conventional markets.

It is unclear, however, whether this interpretation of the anti-trust laws will be applied by the enforcement agencies and the courts. What is needed, therefore, is a much more careful look at the challenges that will be raised by future media mergers.

This could best be accomplished if Congress created a Temporary Committee to Study Media Mergers and Media Convergence. This committee could include members of Congress; the heads of the Federal Trade Commission, the Federal Communications Commission and the Justice Department's antitrust division; CEOs of media companies; and representatives of consumer groups. The committee would identify problems that may be caused by large media mergers and by media convergence. If the committee concludes that existing antitrust laws are inadequate, it should recommend to Congress that new anti-merger legislation be enacted. This may be the only way to prevent the nightmare scenario of a media oligopoly.

1. A wave of media mergers could (1M)

1. be a threat to democracy
2. result in limiting editorial viewpoints
3. result in misuse of certain laws
4. both (1) and (2)
5. none of the above

2. According to the passage, what could be the most significant outcome of media oligopoly? (2M)

1. An increase in the cost of newspapers
2. The fact that in the long run, there will be a shift of power to people who might not be balanced and fair in the way they deal with the media
3. Certain websites may get more prominence than others
4. There will be no competition among the newspapers
5. There will soon exist only six media conglomerates

3. Which of the following statements, according to the author, are true (1M)

- a. Half a dozen firms are enough to keep the market price - competitive
- b. Half a dozen companies are not enough to provide a democratic media
- c. Enforcement agencies may not interpret the anti-trust laws correctly
- d. Half a dozen companies will be inadequate to meet the consumer demand for product diversity

1. a, b
2. a, b, c
3. a, b, c, d
4. b, c, d
5. a, c, d

4. The current anti-trust laws (2M)

1. are not sufficient to deal with issues relating to large scale media mergers
2. can prevent mergers from happening
3. will be effective if properly interpreted
4. favour a particular company or group of companies
5. none of the above

5. To get a clear picture of the challenges posed by media mergers, the author recommends: (2M)

1. creation of strict laws
2. strengthening the enforcement agencies
3. creation of a study committee by the congress
4. none of the above
5. all of the above

6. Summarise the passage with a suitable title

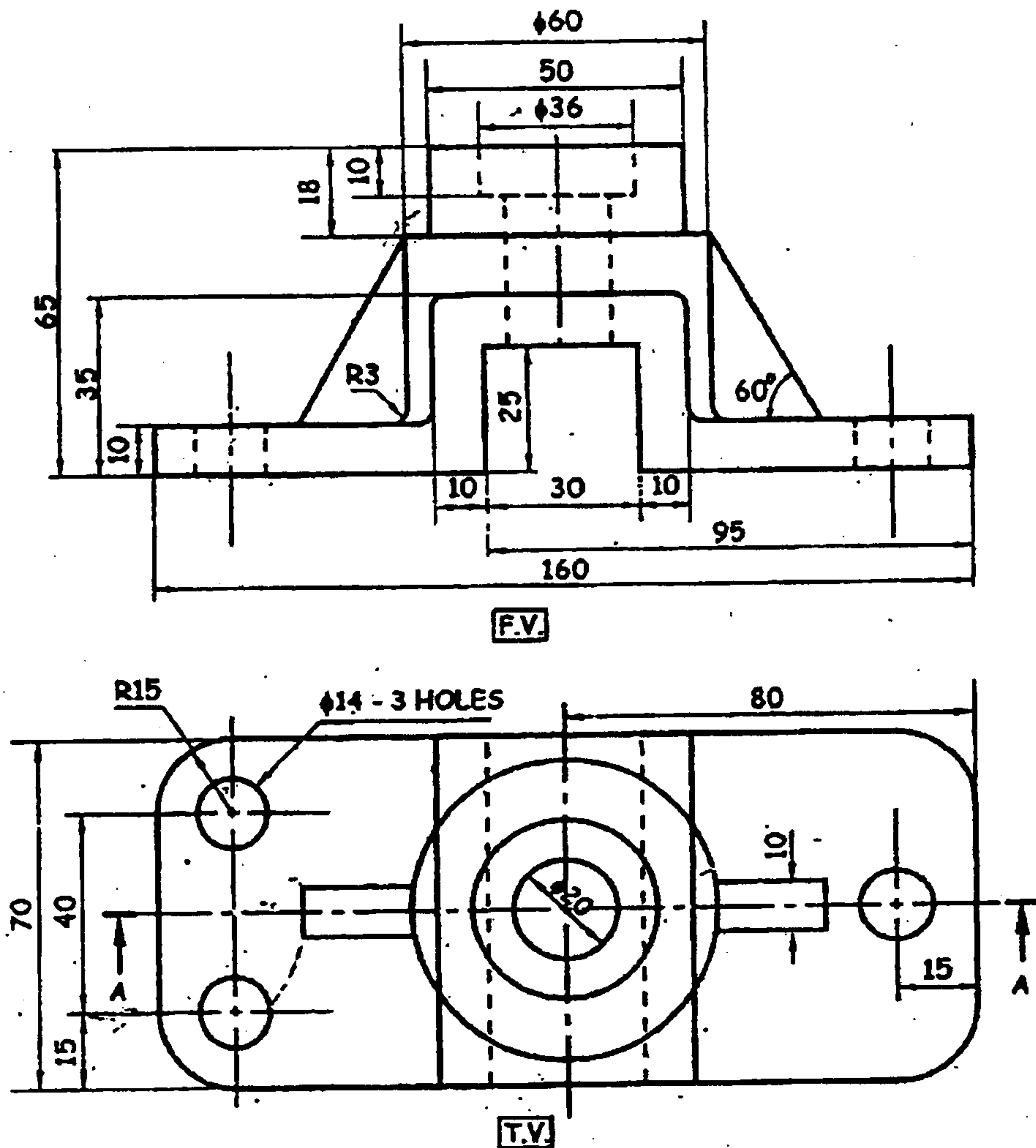
(7M)

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **four** questions out of remaining **six** questions.
 (3) Use your judgement for any **unspecified** dimension.
 (4) Use **first angle** method of projection **only**.
 (5) Retain **all** construction line.
 (6) **Figures** to the **right** indicate **full marks**.

1. Figure shows two views of an object. Draw :—

- | | |
|--|---|
| (a) Sectional front view along section A-A | 6 |
| (b) Right hand side view | 4 |
| (c) Top view. | 3 |

Insert atleast 8 major dimensions. 2



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2. (a) A straight line segment, 100 mm long, measures 80 mm in the plan and 70 mm in elevation. The mid point M is situated 36 mm above HP and 46 mm in front of the VP. Draw top view and front view of a line. 8
- (b) A square prism with a 110 mm long axis is resting on its base on the HP. The edges of the base are equally inclined to VP. The prism is cut by an Auxilliary inclined plane passing through the midpoint of the axis in such a way that the true shape of the section is rhombus having diagonals of 100 mm and 50 mm. Draw the three views showing section and auxilliary view revealing the true shape of the section. 7
3. (a) A cone of base diameter 40 mm and slant height 60 mm is kept on the ground on its base. An Auxilliary inclined plane inclined at 45° to the HP cuts the cone through the mid point of the axis. Draw the development. 10
- (b) Draw neat, proportionate free hand sketches of the following :— 5
- (i) Acme thread profile
- (ii) Conventional representation of internal thread.
4. **Figure 2** shows a pictorial view of pedestal bearing. Draw following views :—
- (i) Sectional front view along A-A 5
- (ii) Left hand side view 4
- (iii) Top view. 4
- Insert atleast 10 major dimensions. 2

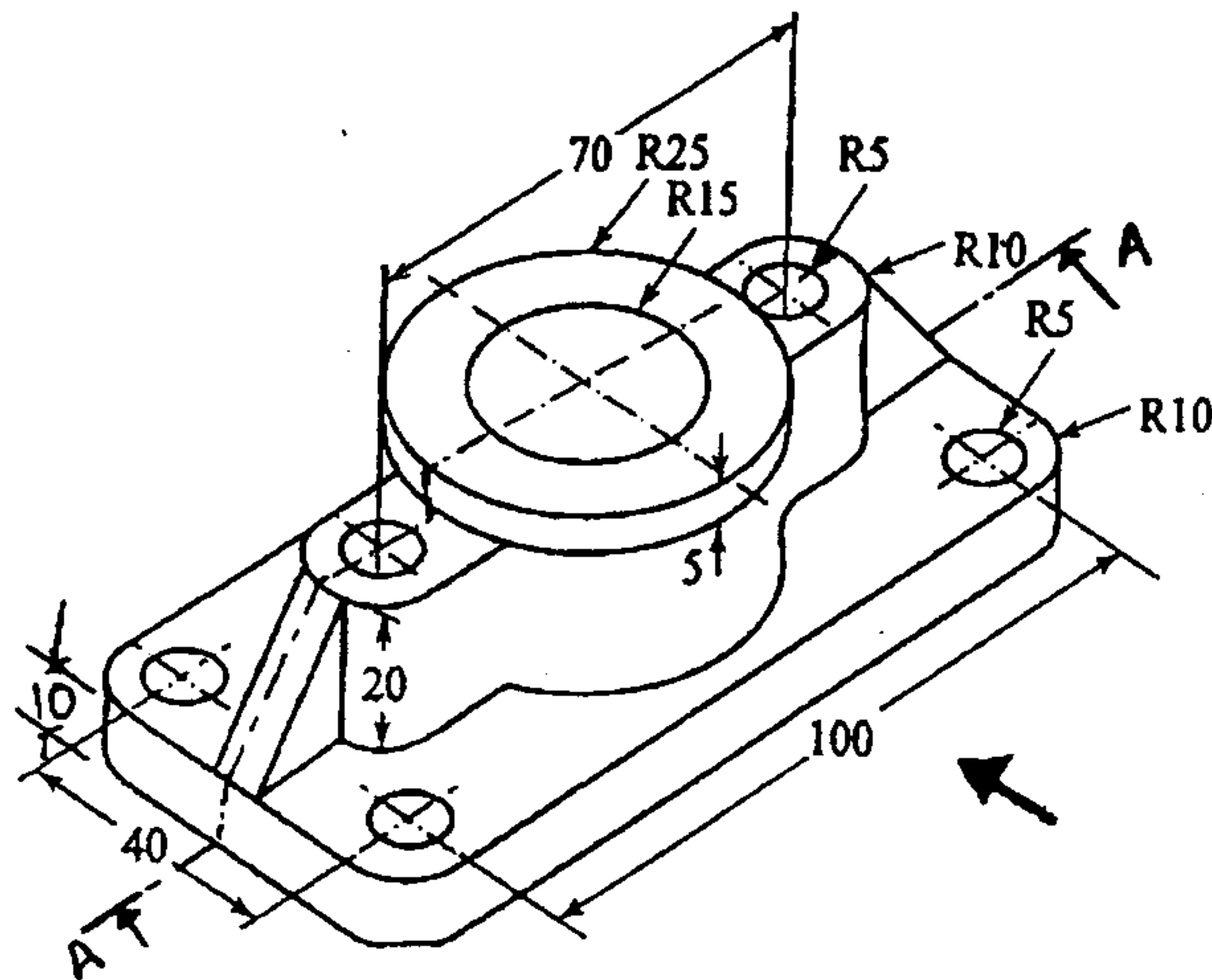


Figure 2

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3

5. A pentagonal prism, base 20 mm side and axis 50 mm long is standing on a corner of the base on the ground with the longer edge containing that corner inclined at 45° to the HP and 30° to the VP. Another end of the edge is 25 mm from the VP. Draw its projections. **15**
6. (a) Draw the path of the end of 140 mm long thread when it wound on a half hexagon of side 25 mm. Name the curve. **10**
- (b) Draw neat, proportionate sketches of the following :—
- (i) Square headed bolt **3**
- (ii) Hexagonal headed bolt. **2**
7. (a) Draw an isometric view of the following using natural scale, ref fig. 3. **10**

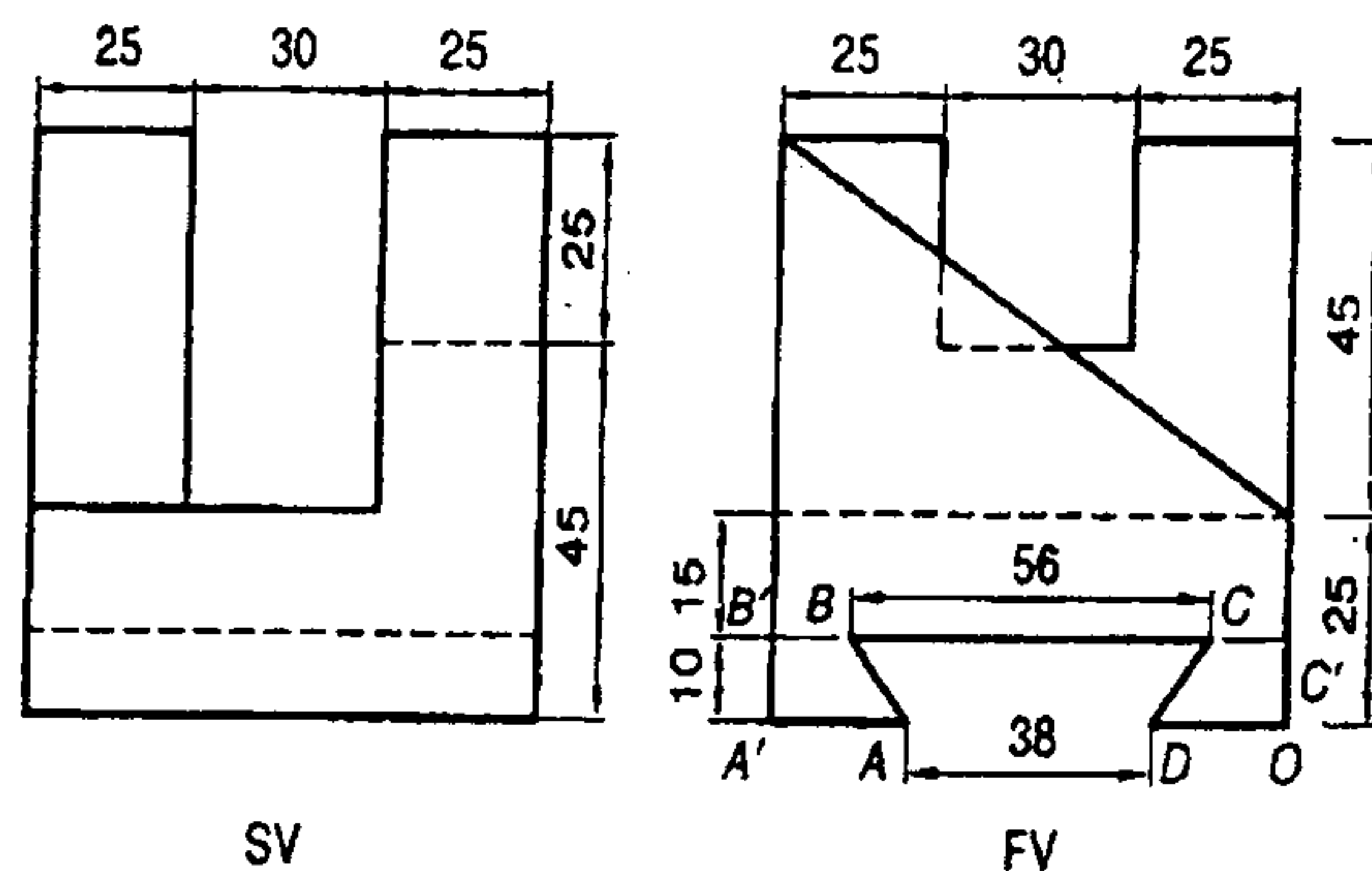


Figure 3

- (b) Draw neat proportional free hand sketch of following :—
- (i) Eye foundation bolt **3**
- (ii) Cylindrical headed bolt. **2**