FE Sem II
Applied Maths - II

Con. 5544-10.

GT-7845

(3 Hours)

[Total Marks : 100

N.B. i) Question no. 1 is compulsory.

ii) Attempt any four out of remaining six questions.

iii) Figures to the right indicate full marks.

iv) Answers to the individual questions must be grouped and written

together.

1. (a) Prove that $\int_0^\infty \frac{x^{m-1}}{(a+bx)^{m+n}} dxdy = \frac{B(m,n)}{a^n b^m}$ (5)

(b) Evaluate by changing to polar co-ordinates $\int_0^1 \int_0^x (x+y)dxdy$ (5)

(c) Use differentiation under integral sign to prove that

$\int_0^\infty \frac{\log(1+ax^2)}{x^2} dx = \pi\sqrt{a}$, (a>0) (5)

(d) Solve $\frac{dy}{dx} = \frac{y+1}{(y+2)e^y - x}$ (5)

2. (a) Evaluate $\int_0^a \int_0^x \frac{e^y}{\sqrt{(a-x)(x-y)}} dxdy$ (6)

(b) Change the order of integration $\int_0^2 \int_{\sqrt{4-x^2}}^{4-x} f(x,y)dxdy$ (7)

(c) Show that the length of an arc of that part of cardioids r=a(1+cosθ)

which lies on the side of the line 4r=3asecθ remote from the pole is

equal to 4a. (7)

3. (a) Solve (1+siny)$\frac{dx}{dy} = [2ycosy - x(secy + tany)]$ (6)

(b) Solve $(2xy^4 e^y + 2xy^3 + y)dx + (x^2 y^4 e^y - x^2 y^2 - 3x)dy = 0$. (7)

(c) Find the area common to the circles r=a and r=2acosθ . (7)

[TURN OVER

4. (a)Use method of variation of parameters to solve the equation

$$\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^{-2x}sec^2x(1 + 2tanx)$$　　　　　　(6)

(b)Solve $(3x+2)^2\frac{d^2y}{dx^2} + 3(3x + 2)\frac{dy}{dx} - 36y = 3x^2 + 4x + 1$　　　(7)

(c)A triangular prism is formed by the planes whose equations are

　　ay= bx, y=0, x=a ,obtain the volume of this prism between the

　　planes z=0 and the surface z=c + xy .　　　　　　　　(7)

5. (a) Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x + y + z)dxdydz$　　　　　　　(6)

(b)Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^2 + e^x + cos2x$　　　　　　(7)

(c)Solve $\frac{d^3y}{dx^3} - 3\frac{dy}{dx} + 2y = 2e^xcos\left(\frac{x}{2}\right)$　　　　　　(7)

6. (a) Using Euler's method, find the approximate value of y, when x=1.5 in five

　　steps, taking h=0.1　Given $\frac{dy}{dx} = \frac{y-x}{\sqrt{xy}}$ and y(1)=2 .　　　(6)

(b)Find the mass of the lamina bounded by the curve $y^2 = ax, x^2 = ay$ where

　　the mass per unit area varies as the square of the distance from the origin. (7)

(c) Evaluate $\iint \sqrt{xy(1 - x - y)}dxdy$ over the region $x \geq 0, y \geq 0, x + y \leq 1$ (7)

7. (a) Using Taylor's series method solve the equation　$\frac{dy}{dx} = 2y + 3e^x$,

　　given $x_0 = 0, y_0 = 1$ at x=0.1 and x=0.2 .　　　　　　(6)

(b)In case of an elastic string which has one end fixed and a particle of

　　mass, m attached to other end, the equation of motion is,

　　$m\frac{d^2s}{dt^2} = -\frac{mg}{e}(s - l)$, where l is the natural length of the string

　　and e, elongation due to weight mg. Find s such that s=s₀ , v=0 at t=0.　　(7)

Con. 6118–10.

FE/ Sem II / All branches.

Communication Skills

(2 Hours)

GT–7866

21/12/10

[Total Marks : 75

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

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

    (3) Answers to **all** the sub-questions should be attempted and **grouped together**.

    (4) Numbers on **right** indicate **maximum** marks for the question.

1. a) With the help of a diagram, describe the components and process of communication.   10

   b) List the major objectives of communication. Explain any one.   05

2. a) In anticipation of the Diwali season, Kamal Cloth Shop, Andheri,   10
Mumbai 400 056, placed a large order of cloth with the manufacturer
Arjun Mills, Kandivli, Mumbai 400 101 for deliveries in the month of
October. The goods, however, reached the shop in November. As the proprietor
of the shop, write a letter of complaint to the manufacturer seeking a
25%discount for the delay and loss occurred to you. **Use Modified Block Form**.

   b) Define :(any one), 1.Electric bulb   2.Thermometer   05

3.a) You want to renovate your office situated at Ram Mahal, M.G. Road, Fort,   10
Mumbai –400001.Write a letter of enquiry to Elegant Interior Decorators, Sita
Kunj, Cadell Road, Mumbai seeking information about the availability of
furniture, cost of renovation, work schedule, etc.**Use Full Block Form**.

3.b)   Give one word for: 05
    1.The way one sits or stands. **P** - - - - - -.
    2. Movements of the hand or head that convey meaning G - - - - - -.
    3. Communication by touch. H - - - - - -.
    4. The study of the sounds of a language. P - - - - - - - - - ·
    2.   Communication by the use of oral or written word. V - - - - -.

4. Write short notes on (any Three):   15
  1. Video conferencing.
  2. The necessity and importance of feedback
  3. The features of listening and hearing.
  4. Grapevine Communication.
  5. E- Mail Etiquette.

5a) Give instructions for: Using a Hack saw. 10

b) State whether following statements are **True or False**. 05
1) Acting is a form of communication
2) Body language is less important than verbal language.
3) In closed punctuation there are commas after the address.
4) The meaning of the message is not in the words
5) Extreme emotion enhances communication.

6.a) Read the following passage & answer the questions below:

After years of phenomenal growth, the computer has lost its upward trend. Profits of computer makers have been falling steadily, and sales of home computers are expected to fall further ten per cent this year. But help is on the way. On the horizon, within months or at the most a few years, are dozens of advances that will make computers super fast, super smart and super-friendly. These breakthroughs constitute a turning point – what numerous authorities call the "Next frontiers" of computer development. "We are entering a time that will be recalled as the birth of new and markedly different kinds of computers", says Arno Penzias, Vice-president for research at Bell Laboratories. "They will make today's best machine seem like an antique car. Consider: A typewriter without keyboard that converts speech into written text with near perfect accuracy. A car that won't budge if the driver has been drinking. A video screen that reads your lips, eyes and gestures, anticipating what you want and then providing it. These are just some developments on the way that are likely to make the computer even more pervasive than it is today. Foremost among technological breakthroughs is a dramatic increase in the speed and capacity of electronic chips, the tiny slivers of silicon that are the nerve cells of every computer. One-megabit chips, each containing a million transistors, now allow computer designers to fabricate machines with powerful analytical skills. These semi-conductors also permit the design of ultra fast machines that will lock and unlock doors with voice commands or store TV programmes and replay them with crystal clarity. Logic chips, which compute rather than store information, are also advancing quickly. A new Intel microprocessor runs 17 times faster than that used in IBM's first computer. The absolute limit? It's not even in sight. James Meindi, co-director of Stanford's Centre for Integrated Systems, insists that memory chips holding no fewer than a billion transistors will be available by the end of the century.

1)   What kind of growth has the computer seen? · 01
2)   Why is it said that the computer has lost its upward trend? 01
3)   What is on the horizon? 01
4)   Mention two developments that will make computers pervasive? 01
5)   What is the technological breakthrough referred to? 01
6)   What work do logic chips do? 01
7)   Describe electronic chips? 02
8)   Who is Arno Penzias? What does he say? 02

6 b) Summarize the above passage 05

7a) Identify the Barriers in the following situations: 05

(1) A student unable to speak in front of the class even though well prepared
    with a speech. (Semantic barrier, psychological barrier, physical barrier).

(2) Inability of a rural audience in India to understand the speech of The President
    of America on T.V. (cross-cultural barrier, barrier of information overload,
    physical barrier)

(3) A worker not understanding the manager's instructions in spite of listening.
    (cultural barrier, psychological barrier, status barrier)

(4) A Russian not being able to carry on a dialogue with an Australian who is on
    a visit to Russia. (physical barrier, semantic barrier, psychological barrier)

(5) A successful businessman not accepting the ideas of a salesman who comes to him
    with a new product. (semantic barrier, socio-cultural barrier, psychological barrier)

7. b) Explain the process of: Making a metallic box in the workshop.   10

108 : 2nd Half-Exam-10-DD (A).

Con. 6119-10.   Computer programming-II. **GT-7827**

(3 Hours) [**Total Marks** : 100

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Make **suitable** assumptions if **needed**.

1. (a) Explain how Java is platform-independent. 5
   (b) Explain any two methods of Thread class. 5
   (c) What is command line argument ? Write a program to find the largest of the 5
       three integers accepted from command line.
   (d) Explain the difference between default and public access specifier in Java. 5

2. (a) Create an applet which displays "All the Best". 10
   (b) Write a program that reads a 4 digit integer and breaks it in a sequence of individual 10
       digits e.g. 1691 should be displayed as 1 6 9 1.

3. (a) Write a program to display the following pattern :— 10

       1
       0 1
       1 0 1
       0 1 0 1
       1 0 1 0 1

   (b) Write a program to find out number of upper case, lower case and blank spaces 10
       from the string.

4. (a) Explain exception handling feature of Java with suitable example. 10
   (b) Write a program to determine the sum of the series : 10

   $$1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \ldots \frac{1}{n}$$

   Take value of n from the user.

5. (a) Explain different types of inheritance with example. 10
   (b) Write a program that uses Vector class to add 5 names of students initially. Display 10
       a menu :—
       (i) Add new name
       (ii) Delete name
       (iii) Display name
       Based on the choice entered by the user take appropriate action.

6. (a) Write a program to display the area of square and triangle using the concept of 10
       abstract class.
   (b) Write a program to create multiple threads. (One thread may display alphabets 10
       and another thread may display numbers).

7. Write short notes on any **four** of the following :— 20
   (a) Packages   (d) Static members
   (b) Interfaces   (e) String class methods
   (c) Thread synchronization

Lab

87-p3-upg-Con No. File

Con. 5628-10.

GT-7818

(2 Hours)

[Total Marks : 75

N.B. : (1) Question No. 1 is **compulsory**.
  (2) Attempt any **four** out of remaining six questions.
  (3) Assume **suitable** data wherever **necessary**.
  (4) **Figures** to the **right** indicate **full** marks.

Q.No.1 Attempt any five :   5 x 3 = 15
  a. Differentiate between stimulated emission and spontaneous 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 particular spectra would be absent, when the width of the opacity is double than that of the transparency in a grating?
  e. Explain Pirani gauge.
  f. Differentiate between soft and hard magnetic materials.
  g. What is the wave length of a beam of neutron having whose energy is 0.025 ev and mass 1.676×10^{-27} kg.

Q.No.2   9 + 6
  a. Describe the origin of color on thin film, with the derivation of constructive and Destructive condition.
  b. Light incident on a grating of 0.5 cm wide with 3000 lines. Find angular separation in 2nd order of two sodium lines 5893 A^0 & 5896 A^0. Check whether those two lines are resolved in 2nd order or not?

Q.No.3   9 + 6
  a. Differentiate between step index fiber & graded index fiber. Derive the expression for N.A for both.
  b. A plane wave of monochromatic light falls normally on a uniform thin film of oil, which covers a glass plate. The wave length of the source can be varied continuously. Complete destructive interference is obtained only for wave lengths 5000 A^0 & 7000 A^0. Find the thickness of the oil layer. Given that R.I. of oil = 1.3 & R.I. of glass = 1.5.

Q.No.4   9 + 6
  a. Explain Metastable state, Pumping, Population Inversion & Laser action .Describe how those are takes place in He-Ne laser.
  b. The position & momentum of 1 kev electron are simultaneously measured. If its position is located within 10 nm, then what is the percentage of uncertainty in its momentum?

Q.No.5   9 + 6
  a. By using Time Independent Schrödinger wave equation, prove that, the energy levels of a particle in one dimensional box are quantized, where as for free particle energy is continuous.
  b. Relative R.I. of a fiber is 0.055, when core R.I. is 1.48. Find N.A. , cladding R.I., acceptance angle , normalized frequency (V) & the number of guided modes , when wave length of light propagated is 1 μm and radius of the core is 50 μm.

Q.No.6   9 + 6
  a. Discuss Weiss' Theory of Ferromagnetism and derive Curie-Weiss's Law, $\chi = C/(T-\theta)$
  b. Consider an air core toroid with 500 turns, with a cross section of 6 cm^2, mean radius of 15 cm and coil current of 4 amp. Now calculate m.m.f (NI_0),Reluctance (R), M-flux (ψ), M-flux density (B), M-field intensity (H).

Q.No.7 Write short notes on any three :   3 x 5 = 15

  a. Rotary pump   b. STM   c. Properties of Nano materials   d. Holography
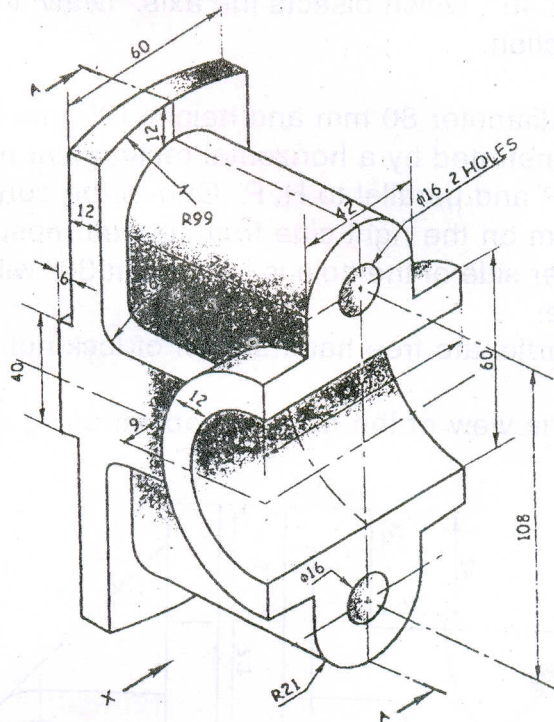
Lab

FE/Sem II/All Branches.
Engineering Drawing.

165 : 2nd half-Exam.10-Mina (a)

28/12/10

Con. 6470-10.

GT-7839

(3 Hours)　　　　　　　　　　　　　　　　　[**Total Marks : 75**

N.B. (1) Question No. **1** is **compulsory**.
　　　(2) Attempt any **four** questions out of remaining **six** questions.
　　　(3) Use **drawing** sheets only for **answering**.
　　　(4) **All** dimensions in **figure** are in **mm**.
　　　(5) Use your **own** judgement for any **unspecified** dimension.
　　　(6) Use only **first** angle method of **projections**.
　　　(7) Use scale **1 : 1** only.

1. **Figure** shows the pictorial view of a machine part.
　　Draw the following views :—
　　　　(a) Sectional F. V. along Section A-A　　　　　　　　　　4
　　　　(b) Right hand side view　　　　　　　　　　　　　　　5
　　　　(c) Top view.　　　　　　　　　　　　　　　　　　　4
　　Insert at least ten major dimensions.　　　　　　　　　　　　2

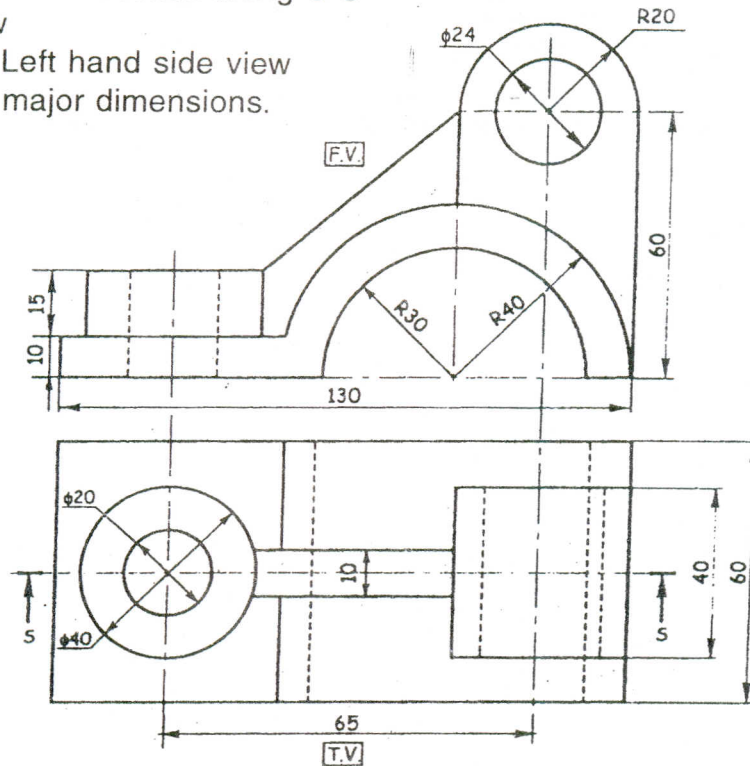2. **Figure** shows the F. V. and T. V. of an object. Draw the following views :—
   (a) Sectional F. V. section along S-S   4
   (b) Top view   4
   (c) Missing Left hand side view   5
   Insert atleast six major dimensions.   2

F.V.

φ24   R20   60

R30   R40   15   10   130

T.V.

φ20   φ40   5   10   65   40   60   S   S

[TURN OVER

3. (a) A circle of 50 mm diameter rolls along a straight line without slipping, draw the   6
        curve traced by apoint 'P' on the circumference of the circle for one complete
        revolution.

   (b) The end A of straight line AB 90 mm long is in the second quadrant and 15   9
        mm from both H. P. and V. P. End B is in the thrid quadrant. The line is inclined
        at 30° with the H. P. and the distance between the end projectors measured
        paralled to the XY line is 60 mm. Draw the projections of line, find its inclination
        with V. P. and locate its traces.

4. A Pentagonal pyramid has a height of 60 mm and the side of base 30 mm. The   15
   pyramid rests with one of the sides of a base on the H. P. Such that the triangular
   face containing that side is perpendicular to H. P. and makes an angle 30° with V. P.
   Draw its projections.

5. A cylinder base, 45 mm diameter, axis height 75 mm long is lying on the H. P. with   15
   the axis parallel to both the H. P. and V. P.   It is cut by an auxiliary vertical plan
   inclined to the V. P. at 45°, which bisects the axis. Draw its sectional F. V., T. V. and
   true shape of the section.

6. (a) A cone of base diameter 80 mm and height 100 mm is resting on its base on   12
        the H. P. It is penetrated by a horizontal rectangular hole such that the axis of
        hole is $\perp^{er}$ to V. P. and parallel to H. P. One of the corner of the hole is 25 mm
        above and 20 mm on the right side from the left most point at the base of the
        cone. The smaller side of the hole is inclined at 30° with H. P. Draw the D. L. S.
        of cone with hole.

   (b) Draw neat proportionate free hand sketch of lock nut (Two views).   3

7. (a) Draw an isometric view of the following object using natural scale :   12
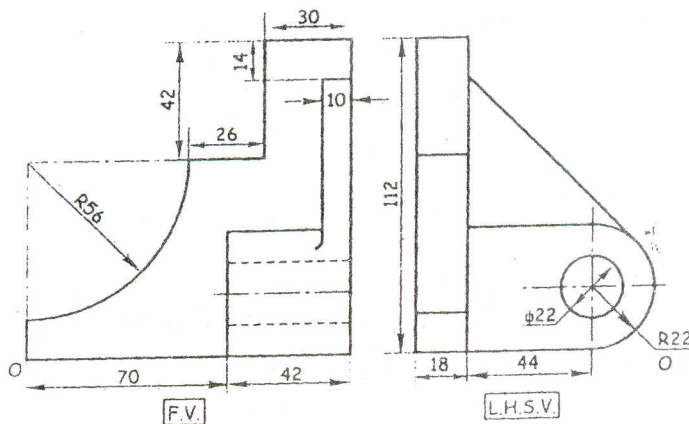
   (b) Draw neat proportionate free hand sketch of Eye foundation bolt (one view only).   3

FE / Sem II / All Branches.
Applied chemistry — II

10/12/10

Con. 6116-10.

GT-7857

(2 Hours)   [Total Marks : 75

N.B. : (1) Question No. **1** is **compulsory**.
       (2) Attempt any **four** questions from remaining **six**.
       (3) **Figures** to the **right** indicate **full** marks.
       (4) **All** questions carry **equal** marks.

1. Attempt the following any **five** —   **15**
    (a) Define Octane number and Cetane number. Give their significance.
    (b) Define corrosion. Explain the basic reason of metallic corrosion.
    (c) Give the composition, properties and uses of German Sliver.
    (d) Give classification of composite materials.
    (e) Define catalysis. Explain different types of Catalysis with one example each.
    (f) Write a note on 'Green Solvents'.
    (g) A current of 0.5 A was passed through a Solution of $CuSO_4$ for 1 hour. Calculate
         the amount of copper deposited at cathod.

2. (a) What is cracking ? Describe fixed bed catalytic cracking in detail.   5
    (b) 3.2 gms of coal in Kjeldahl's experiment evolved NH_3 which was absorbed in 40ml   5
         of 0.5 N H_2SO_4. After absorption, the excess acid required 16 ml of 0.5 N KOH for
         complete neutralization. 2.5 gms of coal sample in quantitative analysis gave 0.42 gm
         $BaSO_4$. Calculate the % of N and S in the sample.
    (c) Explain 'Wet Corrosion' in neutral medium with schematic diagram and mechanism.   5

3. (a) Explain adsorption theory of heterogeneous catalysis.   5
    (b) Write a notes on the following —   5
             (i) Atom Economy
             (ii) Compacting and Sintering.

4. (a) Explain concentration cell corrosion with the help of a suitable example.   5
    (b) Write a note on structural composites.   5
    (c) A gas has following composition by volume   5
         H_2 = 20%, CH_4 = 6%, CO = 22%, CO_2 = 4%,
         O_2 = 4% and N_2 = 44%, find the volume of air actually required per m^3 for complete
         combustion of this gas.

[**TURN OVER**

5. (a) Describe the adsorption and catalytic properties of zeolite.   5
    (b) Write a note on the following ceramic materials.   5
         (i) Alumina
         (ii) Silicon carbide.
    (c) What are composite materials ? Describe fibre reinforced composites.   5

6. (a) Explain conventional and green route of manufacturing of Adipic acid. By this reaction   5
         which principle of green chemistry is shown ?
    (b) What is cathodic protection ? Describe impressed current method of corrosion control.   5
    (c) A coal sample has the following composition by weight $C = 85\%$, $H = 5\%$, $S = 2\%$,   5
         $O = 5\%$, and Ash $= 3\%$. Calculate the minimum quantity of air required both by
         weight and volume for the complete combustion of 2 kgs of coal.

7. (a) Discuss the effect of the following factors on the rate of corrosion.   6
         (i) Nature of corrosion product
         (ii) Overpotential / overvoltage
         (iii) Relative area of Anode & Cathode.
    (b) Calculate the gross and net calorific value of coal having following composition.   4
         $C = 80\%$, $H = 7\%$, $O = 3\%$, $S = 3.5\%$
         $N = 2.1\%$ and ash $= 4.4\%$.
    (c) An electric current is passed through two cells arranged in series containing $AgNO_3$ 5
         and $ZnSO_4$ solutions with platinum electrodes. If 2.16×10^{-4} kg of silver is deposited
         in $AgNO_3$ / pt cell, calculate the amount of Zn deposited in $ZnSO_4$ / pt cell. (At. wt.
         of Ag $= 108$, Zn $= 65$).