FE / Sem-II (CBSGS) / Applied Mathematics - II / May '16

QP Code : 28611

(3 hours) Total Marks: 80

N.B. (1) Question No.1 is compulsory.
(2) Attempt any three questions out of the remaining five questions.
(3) Figures to right indicate full marks.

Q.1

(a) Prove that $\int_0^1 \frac{dx}{\sqrt{-\log x}} = \sqrt{\pi}$ [3]

(b) Solve $\frac{d^3y}{dx^3} - 5\frac{d^2y}{dx^2} + 8\frac{dy}{dx} - 4y = 0$ [3]

(c) Prove that $\Delta\nabla = \nabla\Delta$ [3]

(d) Solve $[xy\sin(xy) + \cos(xy)]y\,dx + [xy\sin(xy) - \cos(xy)]x\,dy = 0$ [3]

(e) Change to polar coordinates and evaluate $\int_0^1 \int_x^{\sqrt{2x-x^2}} (x^2 + y^2)\,dx\,dy$ [4]

(f) Evaluate $\int_0^1 \int_0^x (x^2 + y^2)\,x\,dy\,dx$ [4]

Q.2

(a) Solve $(1+y^2)\,dx = \left(e^{\tan^{-1}y} - x\right)dy$ [6]

(b) Change the order of integration and evaluate

$$\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{e^y}{(e^y+1)\sqrt{1-x^2-y^2}}\,dy\,dx$$ [6]

(c) Prove that $\int_0^\infty \frac{e^{-x} - e^{-ax}}{x\sec x}\,dx = \frac{1}{2}\log\left(\frac{a^2+1}{2}\right)$ [8]

Q.3

(a) Evaluate $\int_1^e \int_1^{\log y} \int_1^{e^x} \log z\,dz\,dy\,dx$ [6]

(b) Find the total area of the curve $r = a\sin 2\theta$ [6]

(c) Solve $x^2\frac{d^3y}{dx^3} + 3x\frac{d^2y}{dx^2} + \frac{dy}{dx} = x^2\log x$ [8]

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FW-Con. 9032-16.

Q.4 (a) Show that the length of the arc of the curve $a\,y^2 = x^3$ from the origin to the point whose abscissa is b is $\frac{8a}{27}\left[\left(1+\frac{9b}{4a}\right)^{3/2} - 1\right]$ [6]

(b) Solve $\left(D^2 - D - 2\right)y = 2\log x + \frac{1}{x} + \frac{1}{x^2}$ [6]

(c) Apply Runge-kutta Method of fourth order to find an approximate value of y for $\frac{dy}{dx} = x\,y$ with $x_0 = 1, y_0 = 1$ at $x = 1.2$ taking $h = 0.1$ [8]

Q.5 (a) Solve $\left(x^2y - 2xy^2\right)dx - \left(x^3 - 3x^2y\right)dy = 0$ [6]

(b) Using Taylor series Method obtain the solution of following differential equation $\frac{dy}{dx} = 2y + 3e^x$ with $y_0 = 0$ when $x_0 = 0$ for $x = 0.1, 0.2$ [6]

(c) Find the approximate value of $\int_0^4 e^x\,dx$ [8]

by i) Trapezoidal Rule , ii) Simpson's 1/3rd Rule

Q.6 (a) 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]

(b) Evaluate $\iint_R \frac{dx\,dy}{\left(1+x^2+y^2\right)^2}$ over one loop of the lemniscate $\left(x^2+y^2\right)^2 = x^2 - y^2$ [6]

(c) Find the volume bounded by the cylinder $x^2 + y^2 = 4$ and the planes $z = 0$ and $y + z = 4$ [8]

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E/Sem-II (CBSGS)/Applied Physics-II/ May-2016.

QP Code : 28617

(2 Hours) [Total Marks : 60

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **three** questions from the remaining questions.
(3) Assume suitable **data** and **symbols** if **required**.
(4) **Figures** to the **right** indicate **full** marks.

1. Attempt any **five**. 15
   (a) Why does an excessively thin film appear to be perfectly dark when illuminated by white light?
   (b) A grating has 620 rulings/mm & is 5.05 mm wide. What is the smallest wavelength-interval that can be resolved in the third order at $\lambda = 481$ nm?
   (c) Why would you recommend use of optical fibre in communication system?
   (d) An electron is bound in a one dimensional potential well of width 2 A^0 but of infinite height. Find its energy values in the ground state and first excited state?
   (e) Explain measurement of frequency of AC signal using Cathode Ray Oscilloscope?
   (f) Explain the term Stimulated emission & Population inversion?
   (g) Define superconductivity, critical temperature & critical magnetic field.

2. (a) How is Newton's ring experiment used to determine refractive index of liquid medium? 8
   The diameter of 5th dark ring in Newton's ring experiment was found to be 0.42 cm. Determine the diameter of 10th dark ring.
   (b) An optical fibre has core diameter of 6 μm and its core refractive index 1.45. The critical angle is 87°. Calculate - (i) refractive index of Cladding (ii) acceptance angle (iii) the number of modes propagating through fibre when wavelength of light is 1 μm. 7

3. (a) With neat energy level diagram, explain principle, construction & working of Nd -YAG laser? 8
   (b) Two plane rectangular pieces of glass are in contact at one edge & are separated at the other end 10 cm away by a wire to form a wedge shaped film. When the film was illuminated by light of wavelength 6000 A^0, 10 fringes were observed per cm. Determine the diameter of the wire. 7

4. (a) Explain the experimental method to determine the wavelength of spectral line using diffraction grating ? 5
   (b) Show that electron cannot pre-exist in free state in a nucleus,using uncertainty principle. 5
   (c) Distinguish between type I & type II superconductor? 5

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FW-Con. 10280-16.

5. (a) A diffraction grating used at normal incidence gives a yellow line (λ = 6000 A^0) in a certain spectral order superimposed on a blue line (λ = 4800 A^0) of next higher order if the angle of diffraction is $\sin^{-1}(3/4)$, calculate the grating element? 5

(b) Derive one dimensional time dependent Schrodinger's equation for matter waves? 5

(c) With neat diagram, explain construction & working of Atomic Force Microscope. 5

6. (a) Find the de Broglie wavelength of (i) an electron accelerated through a potential difference of 182 volts & (ii) 1 kg object moving with a speed of 1m/s. Comparing the results, explain why is the wave nature of matter not apparent in daily observations? 5

(b) Derive Bethe's law for electron refraction? 5

(c) What are Carbon Nano tubes? Explain properties of Nano tubes? 5

E/Sem-II (CBSGS)/ Applied Chemistry -II / May-2016.

Q.P. Code : 530101

(2 Hours) **[Total Marks : 60**

N.B. : (1) Question No. **1** is **Compulsory**.
(2) Attempt any **three** questions from remaining **five** questions.
(3) **All** questions carry **equal** marks.
(4) **Figures** to the **right** indicate **full** marks.
(5) Atomic weights : H = 1, C = 12, N = 14, O = 16, S = 32, Cl = 35.5, Ba = 137.3

1. Answer any **five** of the following :- **15**
   (a) What are plain carbon steels ? Mention any four drawbacks of plain carbon steels.
   (b) Define Octane number and Cetane number.
   (c) Define 'Corrosion' ? Explain how rate of corrosion of the following metals is influenced by atmospheric oxygen.
   (i) Molybdenum (ii) Tin
   (d) Give classification of composite materials.
   (e) Mention any three constituents of Paint and give their functions.
   (f) What is supercritical CO_2 ? Why is it considered a green solvent ? Give one application of supercritical CO_2.
   (g) A sample of coal has the following composition by mass :
   C = 70% H = 9% O = 4%
   S = 2% N = 1% and Ash = 14%
   Calculate gross calorific value of the fuel using Dulong's formula.

2. (a) How do the following factors affect the rate of corrosion ? **6**
   (i) Purity of metal
   (ii) Nature of corrosion products
   (iii) Overvoltage
   (b) What are propellants ? Give their classification with an example of each type. Mention any four characteristics of a good propellant. **5**
   (c) Calculate percentage atom economy for the following reaction with respect to benzanilide **4**

$$\underset{\text{aniline}}{C_6H_5NH_2} + \underset{\text{benzoyl chloride}}{C_6H_5COCl} \rightarrow \underset{\text{benzanilide}}{C_6H_5NHCOC_6H_5} + HCl$$

3. (a) A gaseous fuel has the following composition by volume. **6**
   CO = 40% H_2 = 42% C_3H_8 = 4%
   CH_4 = 4% N_2 = 4% and O_2 = 6%
   Calculate volume and weight of air required for complete combustion of 1 m^3 of fuel (Molecular wt. of air = 28.949)

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(b) Explain conventional & green synthesis of Indigo dye. Mention the green chemistry principle involved. 5

(c) Explain Intergranular corrosion with a suitable diagram and example. 4

4. (a) List composition, properties and uses of the following alloys : 6
   (i) Duralumin (ii) Gun metal

(b) What are metallic coatings ? Explain the following methods of coating. 5
   (i) Metal cladding
   (ii) Cementation coating (Sherardizing)

(c) What are glass fibre reinforced composites ? Outline their properties, application and limitations. 4

5. (a) With neat diagram, explain any one method of catalytic cracking. Mention any four advantages of catalytic cracking over thermal cracking. 6

(b) What is 'compaction' in powder metallurgy ? Explain Powder Injection moulding method of compaction with a suitable diagram. 5

(c) Define matrix phase of composite material. State functions of matrix phase. 4

6. (a) What is Electrochemical corrosion ? With suitable diagram and electrode reactions explain electrochemical mechanism of rusting of iron in neutral, aqueous medium. 5

(b) 1.5 g of a coal sample was analysed for nitrogen content by Kjeldahl's method. The liberated ammonia required 14ml of 0.1N H_2SO_4 solution for neutralization. In a separate experiment using Bomb Calorimeter, 1.5g of the same sample gave 0.3 g of $BaSO_4$. Calculate percentage nitrogen and sulphur in the sample. 5

(c) (i) Explain any two purposes of alloying with suitable examples. 2
   (ii) Explain manufacture of high purity alumina ceramic powder. 3

E / Sem- II (CBSGS) / Engineering Drawing / May-16.

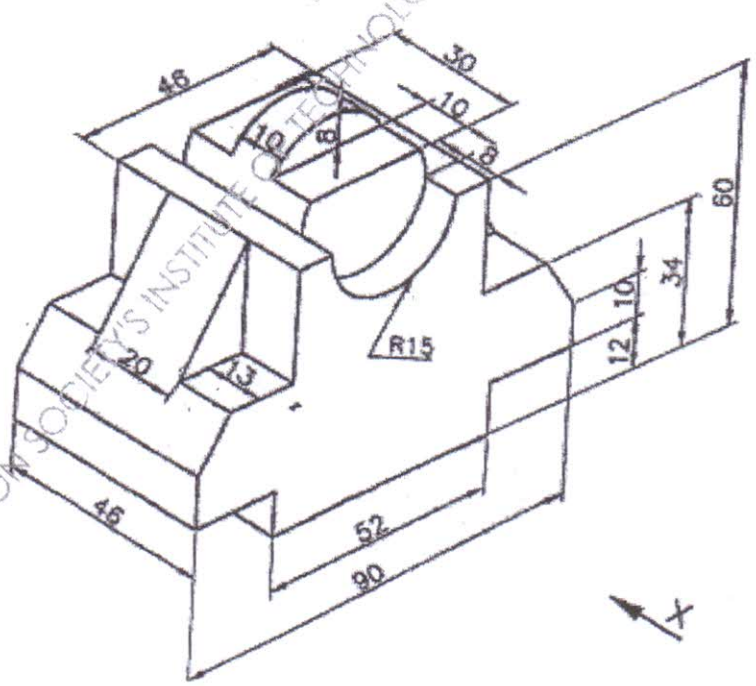
Q.P. Code : 530405

(3 Hours) **[Total Marks : 60**

N.B.: (1) Question **No.1** is **compulsory**. Solve **any Three** out of remaining **Five** questions.
(2) Use your own **judgment** for **any unspecified dimension**.
(3) Use **first angle** method only.
(4) Retain **all construction lines**.
(5) **Figures** to the **right** indicate **full marks**.

1. (a) A circle of 60mm diameter rolls on a straight line without slipping. Draw the locus of a point 'P' for complete revolution of the circle. The point 'P' is 38mm above the straight line and towards the right of vertical centre line of the circle. **6**

(b) Figure 1 shows pictorial view of an object. Draw :
(i) Front view **4**
(ii) Top view **4**
(iii) Dimension the views **1**

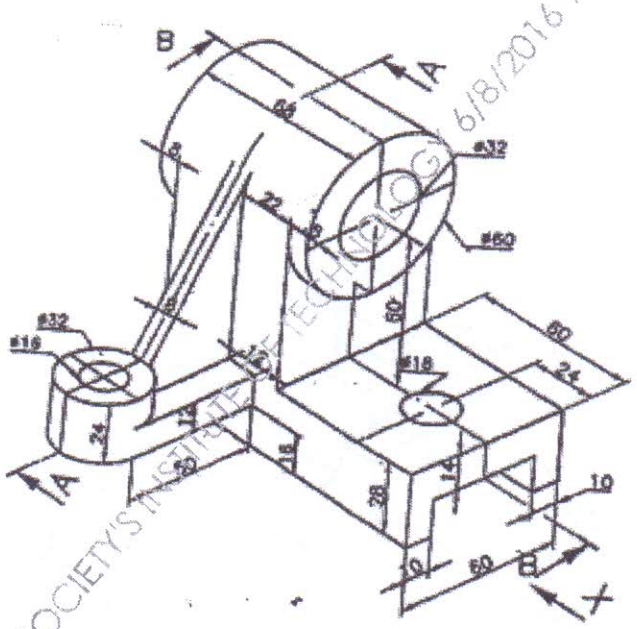


All dimensions are in mm
Figure no. 1

TURN OVER

2. A pentagonal pyramid of 28mm. edge of base and 60 mm length of axis has a 28mm. edge on the H.P. The axis is inclined at 35° to H.P. and 45° to V.P. Draw the projections. 15

3. Figure 2 shows pictorial view of an object. Draw :
   (i) Sectional Front View along A - A. 5
   (ii) Sectional Left hand side view along B - B. 5
   (iii) Top View 4
   Dimension the views (**any four**) 1



All dimensions are in mm
Figure 2

FE / SEM-II (CBSGS) / Structured Programming Approach /
MAY-16

Q.P. Code : 530201

(3 Hours) **[Total Marks : 80**

N.B. : 1. Q1 is compulsory.
2. Attempt any three questions from remaining five questions.
3. Figures to right indicate full marks.
4. Assume suitable data if necessary, but justify the same

1. (a) What do you mean by algorithm? Which points you should consider while developing the algorithm. **4**
(b) What is a relation between ARRAYS and pointers ? Explain with example **4**
(c) Explain ?: operator in C. Write a program to determine maximum of 3 numbers using it. **4**
(d) What do you mean by extern and static storage class. Explain with example. **4**
(e) Difference between break and continue along with example. **4**

2 (a) Write a program in C to accept an ARRAY A with n elements and Separate it into two different arrays B and C in such a way that B contains Odd numbers and C contains Even numbers . i.e. if ARRAY A contains A= { 3,2,4,2,5,7,8} then B={ 3,5,7} , and C={2,4,2,8} **10**
2. (b) Write a program to generate Pascal triangle upto n rows. **10**

3. (a) What do you mean by Recursion ? write a program to reverse a number using recursion. **10**
3. (b) Write a program to calculate compound interest and amount Using formulae $A = P (1 + R/100)^n$ where P = Principal Amt , R is Rate of interest , n = number of Years . Your program should make use of user defined function to calculate power. Program should accept P , R and n ,Display interest earned for each year . **10**

4. (a) Explain structures in C ? What do you mean by nested structure ? A company needs to maintain data about their employees. Details to be maintained are Employee name , Department , Date of joining , Salary. Write a program which will store these details and list the employees whose salary is greater than Rs. 50000.00 **10**

TURN OVER

4. (b) Write a program to perform matrix multiplication using user defined functions Assume first matrix is of size M x N , second matrix of size N x P and third matrix (Result matrix) is of size M x P **10**

Program should include following user defined functions

i. read_matrix ii. Display_matrix iii. Multiply_matrix

5. (a) Write a program to generate following patterns. **10**

i.
```
    A
  C B
F E D
J I H G
O N M L K
```

ii.
```
1
2 1
1 2 3
4 3 2 1
1 2 3 4 5
```

5. (b) Write a program to calculate summation of series. **10**

$1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - \ldots$ upto n terms

6. (a) Write user defined functions to implement following string operations **10**

i. strcat ii. strlen

6. (b) What do you mean by FILE ? Write a program to copy text from one file to other after converting Lower case letters to Upper case and vice versa. Keep other characters as it is **10**

FE/Sem-II (CBSGS)/Communication Skills/May-2016.

Q.P.No. **28636**

(2 Hours) [**Total Marks : 40**

N.B. : (1) First question is compulsory.
(2) Any three of the remaining five.
(3) All sub-questions to be answered and grouped together.

Q1 a) Communication is primarily a social activity. Justify. [2]

b) Identify the barrier: [3]

(i) A young girl shouts at her mother, "You just don't understand."

(ii) A young father is unable to work on his report because of the baby's crying loudly.

(iii) In a social gathering the men are having a discussion on why women cannot drive properly.

c) With the help of an example explain appreciative listening. [2]

d) Give a diagrammatic representation of a letter in semi-block format. [2]

e) 'Use a good quality detergent for better output' is an example of _____ [1]

10

Q2 a) Explain how no feedback is also a feedback. [2]

b) Which communication method would you use in the following situations and why: [2]

10

i) Reprimanding a junior because he has not completed an important report on time.

10

ii) Giving a set of instructions to colleagues to complete a project.

c) As NSS student leader, your task was to arrange for midday meal for 250 students of a school in a nearby village. You had ordered lunch packets from 'The Perfect Meal' caterers. However, on the day of delivery you found that the quality of food was sub-standard and the packaging too was of inferior quality. Draft a suitable complaint cum claim letter asking for appropriate compensation. Use the modified block format . [6]

(TURN OVER)

Q3 a) Nothing is so simple that it cannot be misunderstood. In the light of this statement name the different types of barriers and explain any two them briefly. [3]

b) What do the following non-verbal cues communicate: [1]

i) Hands on hip ii) A lopsided grin

c) As the Cultural Secretary of your college you have been given the responsibility of ordering trophies and other prize items for the cultural festival of your college. Write a letter of enquiry to 'Aryan Gift Shop' stating your requirements, cost estimate etc. Use the complete block format. [6]

Q4 a) Identify the components of communication in terms of sender, receiver, medium and message: [2]

(i) A commuter argues with the rickshaw driver about the meter-reading.

(ii) A teacher shouting at students who have come late for submission.

b) Hand gestures are used for emphasis and give meaning to our words. Write a short note to support this statement. [2]

c) Describe the process of welding. [4]

d) In the following list select the statements that you think are important while writing instructions. Justify your selection: [2]

- Adding some jokes to your instructions
- Writing instructions in the right order
- Giving a detail description of what the calculator looks like
- Making your writing clear and easy to understand

Q5 a) Which are the two most important objectives of communication in an organization according to you? Justify your answer. [3]

b) Explain the statement that oral communication is more vibrant than written communication. [3]

c) Identify the principle of business communication **not followed** in the following statements. Also re-write them in accordance with those principles: [2]

(TURN OVER)

i) We cannot accept your claim as it is not valid.

ii) In majority of instances such mistakes do not occur but this time it happened by the reason of the fact that there was a sudden technical problem.

d) Differentiate between caution and warning. [2]

Q6. A Read the following passage carefully and answer the questions given:

The whole point of technical advance is that it enables man to manipulate its environment to live in the sort of conditions he wants. So you ask, "What will man's everyday surroundings be like in forty years?" Other animals will get the environment they deserve; man will get the one he wants.

And will man be so very different in forty years? I do not think so. Healthier, yes, I imagine we shall have mastered the viruses and the problem of cancer in the young and I am sure we shall know enough to be able to avoid passing on hereditary abnormalities to our children; but I suspect that the illnesses and hurts of old age will still be with us, because I doubt whether we shall have overcome the necessity of growing old.

And shall we be more sensible? No, certainly not, the recorded history of several thousand years shows us that all the logical absurdities of man have always been with us; what we have not outgrown in four thousand years we shall not outgrow in another forty.

Food is already becoming increasingly hygienic, quick frozen, packaged and pre-packaged in impregnable plastic containers, increasingly free from all taint of decay- forgetting the fact that many of the flavors which we price highly are due to the early stages of decay of one sort or another. Already the production of organic food is becoming increasingly mechanized. One obvious step remains, and that is to produce all our food- the proteins, carbohydrates, fats, vitamins, roughage, and what have you entirely synthetically.

And how shall we communicate? We shall still talk to each other. Shall we write? Not, I think, in the way we do today. Even today, handwriting is dying out.

(TURN OVER)

Typing will last longer, but the time will come when the manual typewriter in its turn become obsolete, and will be relegated to status of a toy, like a child's printing set. For already computer's are beginning to tackle the problem of recognition of ordinary written text, and already a simple computer exists which will obey verbal instructions. Put these ideas together, and you will see that even today we are within sight of the possibility of a machine that will take dictation, and will then automatically printout the dictated text.

Do you find this sort of prospect worrying, depressing, even frightening? I have envisaged nothing that will not be technically possible in forty years if we really want it. For it is what we want now that will decide that what we will get in future.

1) What is the meaning of 'technical advance'? [1]
2) Why does the author say that we will be healthier in the next forty years? [1]
3) What is the advantage of early decay of food? [1]
4) What kind of writing -machine does the author envisage for the future? [1]
5) Give the synonym of: i) obsolete ii) prospect [1]

b) Describe any ONE of the following objects giving definition, diagram, components & working of Digital Camera or Laptop computer . [5]
