FE/SEM II/Applied Mathematics-II/CBSGS 11/05/2016

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]

[TURN OVER

-1-

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 $\left(x^2 y - 2xy^2\right)dx - \left(x^3 - 3x^2 y\right)dy = 0$ [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 $\int_0^4 e^x\,dx$ by i) Trapezoidal Rule , ii) Simpson's 1/3rd Rule [8]

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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FE|SEM II|CBSGS|Applied physics-II

17/05/2016

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**

[TURN OVER

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

FE|sem II| CBSGS|Applied Chemistry -II

23/05/2016

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 $1m^3$ of fuel (Molecular wt. of air = 28.949)

[TURN OVER

(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**

FE sem II (CBSGS) All Branches 27/05/16

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 **10**
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 .

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 All branches Communication skills

02/6/16

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]

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]

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

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]

FE sem II (CBSGS) All Engineering Drawing 8/6/16

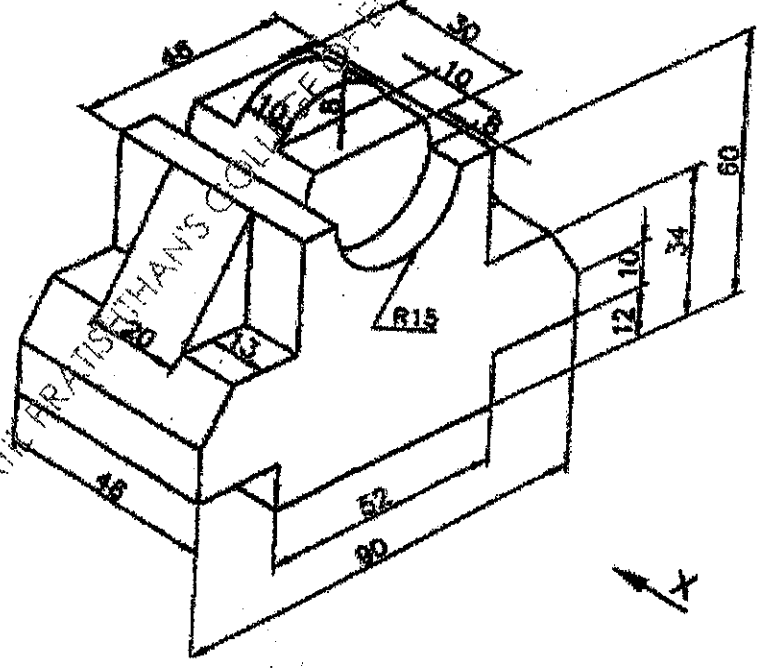
Q.P. Code : 530405

(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**



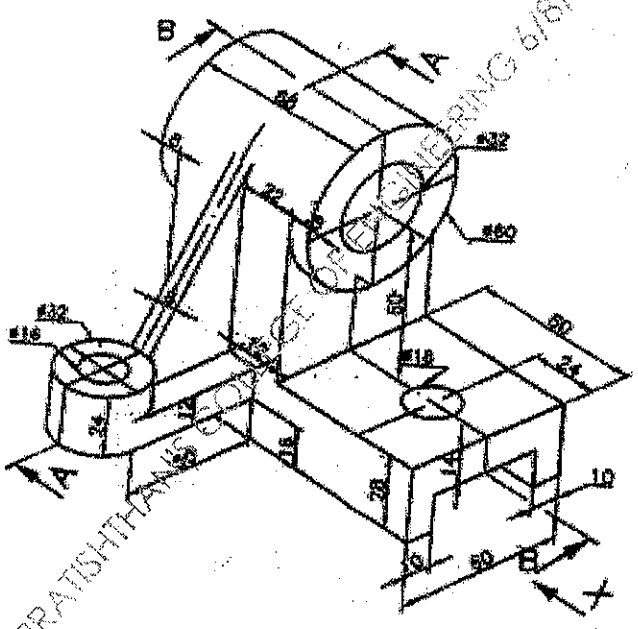
All dimensions are in mm
Figure no. 1

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**

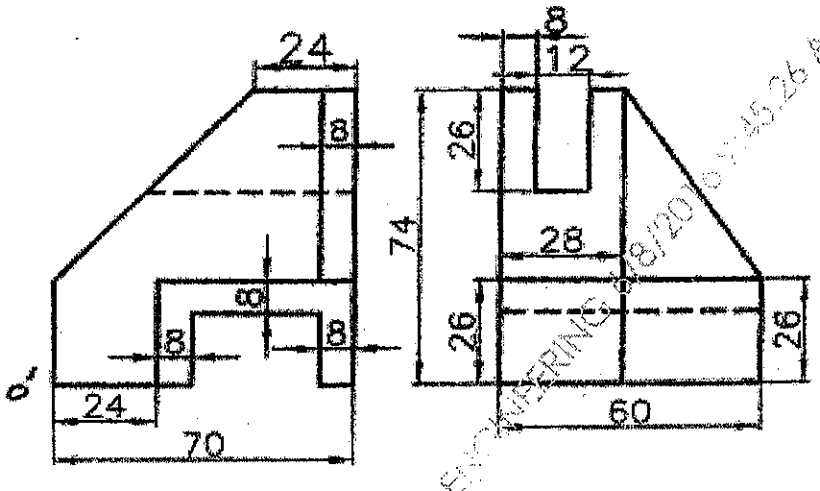


All dimensions are in mm
Figure 2

TURN OVER

4. (a) The distance between the end projectors of a line AB is 60mm. The end A is 25mm above H.P. and 45mm in front of V.P., while the other end B is 60mm above H.P. and 15mm in front of V.P. Draw projections and find the true length and also inclination of the line with H.P. and V.P. 9

   (b) Figure 3 shows two views of an object. Draw isometric view of the object. 6



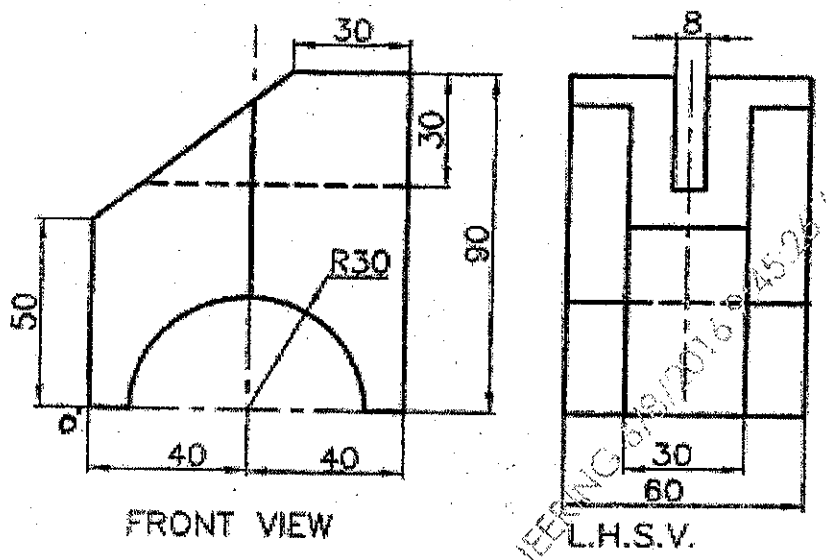
All dimensions are in mm

Figure 3

5. A square pyramid of base side 25mm and altitude 50mm rests on its base on the HP with two sides of the base parallel to VP. It is cut by a plane bisecting the axis and inclined at 30° to the base. Draw front view, sectional top view and true shape of the section. Also draw the development of the lower part of the pyramid. 15

6. (a) A cylinder with 50mm diameter of its base and axis measuring 70mm has its axis inclined at 30° to VP. Draw the projections of the cylinder when the solid is resting on one of the points of the circumference of the base on VP. 6

(b) Draw isometric projection using natural scale. Refer Figure No.4. 9



All dimensions are in mm

Figure 4

FE/SEM II/Applied Mathematics-II/Old 11/05/2016

EXTRA

QP CODE : 528704

(OLD COURSE)

(3 Hours) [Total Marks : 100

N.B. (i) Question no. ONE is compulsory.

(ii) Attempt any FOUR questions from remaining six questions.

(iii) Figures to right indicate full marks.

Q. 1 (a) Prove that 3

$$\int_0^\infty \frac{x^6\left(1-x^{10}\right)}{(1+x)^{24}}dx = 0$$

(b) Solve 3

$$\frac{d^3y}{dx^3}+4\frac{d^2y}{dx^2}+\frac{dy}{dx}-6y=0$$

(c) Evaluate 3

$$\int_0^2\int_1^2\int_0^{yz} xyz\,dx\,dy\,dz$$

(d) Evaluate 3

$$\int_0^1\int_0^{x^2} e^{y/x}\,dy\,dx$$

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

(f) Using Euler's method find the approximate value of y where 4

$\frac{dy}{dx}=xy$, $y(0)=2$ taking $h=0.2$ at $x=1$

Q.2 (a) Evaluate 6

$$\int_0^1\int_0^{\sqrt{1-y^2}}\left(x^2+y^2\right)dx\,dy$$

(b) Evaluate $\iiint\left(x^2+y^2+z^2\right)dx\,dy\,dz$ over the first octant of the sphere 6

$x^2+y^2+z^2=a^2$

(c) Evaluate 8

$$\int_0^\infty \frac{e^{-x}}{x}\left(1-e^{-ax}\right)dx,\quad a>-1$$ Hence evaluate $$\int_0^\infty \frac{e^{-x}}{x}\left(1-e^{-7x}\right)dx$$

Q.3 (a) Solve $y(x+y)\,dx-x(y-x)\,dy=0$ 6

[TURN OVER

(b) Find by double integration the area bounded by 6

$y^2 = 4ax$ and $x^2 = 4by$

(c) Solve 8

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = \left(x^2 e^x\right)^2$$

Q.4 (a) Solve 6

$$\frac{dy}{dx} + \frac{2x}{\left(x^2+1\right)}\ y = \frac{4x^2}{\left(x^2+1\right)}$$

(b) Change the order of integration and evaluate 6

$$\int_0^5 \int_{2-x}^{2+x} dy\,dx$$

(c) Using Taylor's series method solve 8

$\frac{dy}{dx} = x^2 - y$, with $x_0 = 0, y_0 = 1$. Find y when $x = 0.1$

Q.5 (a) Find the length of the cardioide $r = a(1+\cos\theta)$ which lies outside the circle $r + a\cos\theta = 0$ 6

(b) Find the volume of the solid that lies under the plane $3x+2y+z=12$ and above the rectangle $R = \{(x, y) \mid 0 \le x \le 1, -2 \le y \le 3\}$ 6

(c) Solve numerically (using Runge - Kutta Method of Fourth order) the differential equation $\frac{dy}{dx} = xy$ with initial conditions $y(1) = 2$ and find y at $x = 1.2,\ 1.4$ 8

Q.6 (a) Evaluate 6

$$\int_0^1 x^6 \left(1-x^2\right)^{1/2} dx$$

(b) Evaluate 6

$\iint_R \sqrt{xy - y^2}\ dx\,dy$ where R is a triangle whose vertices are $(0, 0)$, $(10, 1)$ *and* $(1, 1)$

[TURN OVER

(c) Solve $\left(D^2-1\right)y=\frac{2}{\sqrt{1-e^{-2x}}}$ 8

Q.7 (a) Evaluate 6

$$\int_0^4 \sqrt{x}\,(4-x)^{3/2}\,dx$$

(b) Evaluate 6

$\iint r\,e^{-r2/a2}\cos\theta\sin\theta\,d\theta\,dr$ over the upper half of the circle $r=2a\cos\theta$

(c) The charge q on the plate of a condenser of 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 $q=0$ at $t=0$, show that $q=CV\left(1-e^{-t/RC}\right)$. Find also the current flowing into the plate. 8

FE/SEM II/ Old / Applied physics-II

17/05/2016

QP Code : **28544**

(2 Hours) [Total Marks :75

N.B. : (1) Question no. 1 is **compulsory.**
(2) Attempt any **four** questions from the remaining.
(3) Assume suitable **data** and symbol-if required.
(4) **Figures** to the **right** indicate **full** marks.
(5) **Illustrate** your answer with **sketches** wherever **necessary.**

1. Solve any **five** from the following:- 15
   (a) What is Rayleigh's criterion for resolution'? Write an expression for the resolving power of a grating?
   (b) Newton's rings are observed in reflected light of wavelength 5×10^{-5} cm. The diameter of 10^{th} dark ring is 0.5 cm. Calculate the radius of curvature R and thickness of the film t at the ring.
   (c) Differentiate between stimulated and spontaneous emission.
   (d) Why electron microscope is considered better than optical microscope.
   (e) Calculate the numerical aperture and hence the acceptance angle for an optical fibre whose core R.I. 1.48 and a cladding R.I. of 1.39.
   (f) Calculate de Broglie wavelength of proton with a velocity equal to $1/20^{th}$ velocity of light. Given: $m_p = 1.6 \times 10^{-27}$ kg and $h = 6.63 \times 10^{-34}$ J.sec
   (g) Write the relation between relative permeability and susceptibility.

2. (a) Show that in Newton's ring, diameter of the bright ring is proportional to the square root of the odd natural number. Find out similarities and dissimilarities between Newton's rings and Wedge shaped film. 8
   (b) Consider an air cored torroid with 500 turns with cross sectional area of 6 cm^2, mean radius of 15 cm and coil current of 4 Amp, Now calculate MMF(NI), Reluctance (R), Magnetic flux, Magnetic flux density, Magnetic flux intensity. 7

3. (a) What is de Broglie's concept of matter waves? Derive one dimensional time dependent Schrodinger wave equation for matter waves. 8
   (b) White light is incident on a soap film at an angle $\sin^{-1}(4/5)$ and the reflected light observed with a spectroscope. It is found that two consecutive dark bands correspond to wavelengths 6.1×10^{-5} and 6.0×10^{-5} cm. If the refractive index of the film be 4/3, calculate the thickness. 7

4. (a) What is monomode, multimode fibre? Differentiate between step index and graded index fibre. 5
   (b) Explain with the diagram, the construction and working of semiconductor diode laser. 5
   (c) An electron is confined in a box of length 10^{-8}m. Calculate minimum uncertainty in its velocity. 5

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5. (a) In a plane transmission grating with 5000 lines/cm and for a wavelength of 6000 Å, if the width of opaque spaces are exactly twice that of transparent spaces, which order of spectra will be absent? 5

(b) In Newton's ring experiment, if the n^{th} dark ring due to wavelength λ_1 coincides with $(n+2)^{th}$ dark ring due to wavelength λ_2 , prove that the radius of n^{th} dark ring due to λ_1 is $(2\lambda_1\lambda_2 R/\lambda_1 - \lambda_2)^{1/2}$ 5

(c) Derive the condition of fringes of equal width in a wedge shaped film and explain. 5

6. (a) A diffraction grating which has 4000 lines in 1cm is used at normal incidence Calculate the dispersive power of the grating in the third order spectrum in the wavelength region 5000 Å. 5

(b) Discuss the Weiss's theory of ferromagnetism and derive Curie-Weiss's law, 5

(c) Explain the working of SEM with a neat diagram. 5

7. Write short notes on any **three.** 15

(a) Holography as an application of laser.

(b) Diffusion pump.

(c) Antireflection coating.

(d) Optical fibre communication system.

FE|sem I|old|BEE

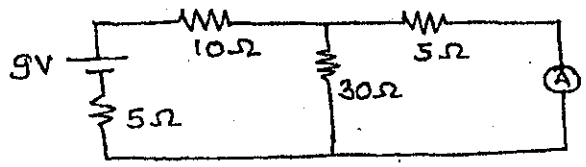
20|05|2016.

QP Code : 28518

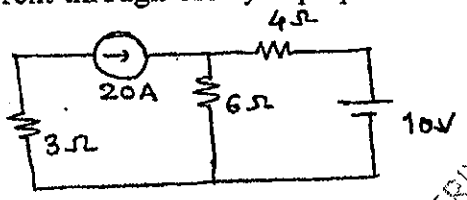
(3 Hours) **[Total Marks : 100**

N. B. : (1) Question No. 1 is **compulsory.**
(2) Attempt any **four** out of the remaining.

1. (a) Determine current drawn by the ammeter shown in figure 3



(b) Find current through 6Ω by superposition theorem 3



(c) A voltage of v 200 Sin(314t + 20°) is being applied to pure inductor of value 50mH. Find instantaneous wave equation of current through the circuit. 2

(d) A series resonant circuit has an impedance of 500Ω at resonant frequency. The cut off frequencies are 10KHz & 100Hz. Find inductance of the circuit. 3

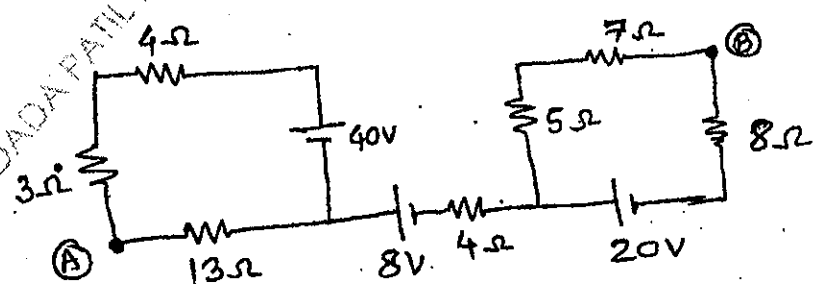
(e) Write voltage & current relationship between phase & line quantities in three phase star circuit 2

(f) What are the losses in transformer. Explain any one type of loss. 3

(g) A three phase IM has 4 poles & runs at 1460 rpm. If frequency is 50Hz. Find slip. 2

(h) Define rectification efficiency. 2

2. (a) 6



Find voltage across point A & B.

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(b) A resistor of 20Ω is in series with a capacitor of 50μF. A voltage of 200∠ 20°V is being applied to it. Find impedance of circuit, current and power in the circuit. 6

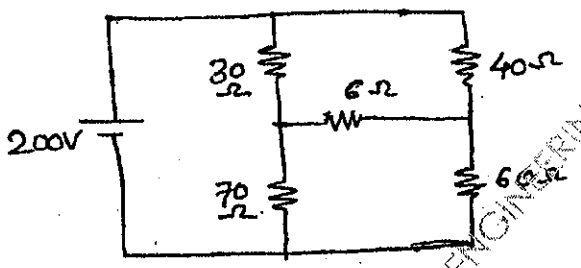
(c) Draw the phasor diagram of a transformer leading pf load. 8

3. (a) Three identical impedances are connected in star to a 400V, 50Hz supply. Each impedance has a resistance of 20Ω & inductance of 20mH in series. Find phase impedance, line & phase current & total power absorbed by the circuit. 8

(b) Explain short circuit test to find equivalent circuit parameters of a transformer. 4

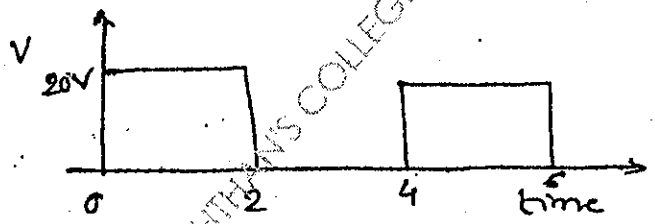
(c) Explain double field revolving theory in single phase induction motor. 8

4. (a) 7



Find current in 6Ω by thevenin's theorem.

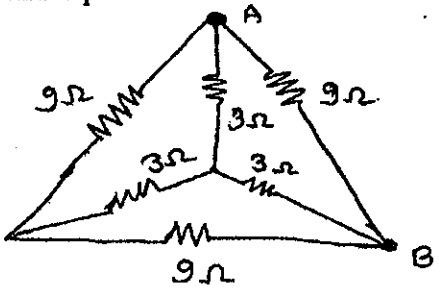
(b) Find average value of following waveform 4



(c) Comment on how readings of two wattmeter changes with change in power factor angle e.g. 0°, 60° to 90°, 90°, where wattmeter are connected to measure three phase power in a three phase circuit. 4

(d) Explain working of half wave rectifier 5

5. (a) Find equivalent resistance between A & B 7



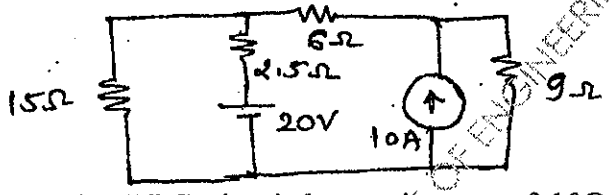
(b) In a RLC series circuit voltage across resistor, voltage across inductor & voltage across capacitor are 1V, 15V, 10V respectively. Find magnitude of supply voltage. 5

(c) A 10kVA, 450V/120V, 50 Hz, single phase transformer gave following results. 8

OC test	120V	4.2A	80w (HV open)
SC test	9.65V	22.2A	120w (LV shorted)

Find equivalent circuit constants referred to primary.

6. (a) Calculate power dissipated in 9Ω by superposition theorem. 7



(b) A series RLC circuit has resistance of 10Ω, inductance of 20mH & capacitance of 50μF. Find resonant frequency, quality factor and bandwidth. 7

(c) Prove that two wattmeter method can measure power in three phase star connected circuit. 6

7. (a) For $v = 200 \sin(314t - 20°)$. Find amplitude, frequency & phase angle of the wave. 2

(b) An impedance contains a resistance of 10Ω & inductance of 20mH in series. Find admittance & its components of circuit. 3

(c) Find all day efficiency of a 500 kVA transformer having full load cu loss is 4.5kw & iron loss is 3.5 kw. It s loaded during 24 hours as follows. 5

400kw	0.8pf	6 hours
300kw	0.75pf	10 hours
100kw	0.8pf	4 hours
0kw	-	4 hours

(d) Derive an expression for emf induced in DC motor 5

(e) Describe experimental setup to obtain input & output characteristics of CE configuration of BJT. 5

FE|sem II| old / Applied chemistry - II

23/05/2016

QP Code : 28551

(2 Hours) [Total Marks : 75

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of the remaining **six**.
(3) **Figures** to the **right** indicate **full** marks.
(4) Atomic weights : C = 12, H = 1, N = 14, O = 16, Na = 23, Mg = 24, S = 32, Cl = 35.5, Ca = 40, Ba = 137.5.

1. Answer any **five** from the following :- **15**
   (a) A coal sample was subjected to ultimate analysis, 0.4gm of coal on combustion in a Bomb carlorimeter produces 0.03 gm $BaSO_4$. Calculate the percentage of sulphur in coal sample.
   (b) Write a short note on super critical CO_2 as a green solvent.
   (c) Write the difference between galvanizing and tinning.
   (d) Write the classification of composite materials.
   (e) Write a short note on zeolite as a catalyst.
   (f) Write the composition, properties and uses of Duralumin.

2. (a) What is cracking ? Explain fluid bed catalytic cracking with the help of neat diagram. **6**
   (b) Define corrosion. Explain stress corrosion with appropriate diagram and example. **5**
   (c) Calculate the percentage atom economy of the following reaction with respect to allyl chloride. **4**

$$CH_3-CH=CH_2 + Cl_2 \longrightarrow Cl-CH_2-CH=CH_2 + HCl$$

Allyl chloride

3. (a) Calculate the weight and volume of air required for complete combustion of 1 kg of coal containing :- C = 62%, H = 4%, O = 6%, N = 2% and remaining being ash. (Mol. wt. of air = 28.949) **6**
   (b) Explain particles reinforced composite materials. **5**
   (c) How these factors influence the rate of corrosion.
   (i) Overvoltage (ii) pH of the medium. **4**

4. (a) What is catalysis ? Explain the adsorption theory of catalysis. **6**
   (b) Explain the sacrificial anodic protection method of corrosion control **5**
   (c) Write the manufacture and properties of Al_2O_3 ceremics. **4**

[TURN OVER

5. (a) Explain the production of adipic acid with conventional and green route. 6
   (b) A sample of coal has the following composition by mass C = 78%, H = 5%, O = 9%, S = 0.6% and remaining being nitrogen. Calculate H.C.V. and L.C.V. of coal using Dulong's formula. 5
   (c) Explain the powder injection moulding method for compacting in powder metallurgy. 4

6. (a) Write the contituents of paint with examples and explain their functions. 6
   (b) Write any five purposes of making alloys. 5
   (c) What is knocking ? Explain the reason of petrol knocking. 4

7. (a) Write the transestrification reation of production of bio-diesel. What are the advantages of bio-diesel. 6
   (b) Define and explain activation energy. 5
   (c) Give the functions of matrix phase in composite material with their properties. 4

FE sem II (old) All Branches 27/05/16

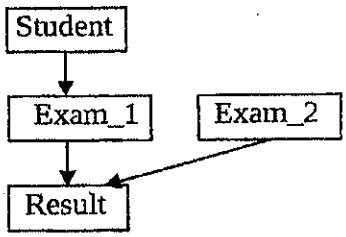
Q. P. Code : 529004

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

N.B.: (1) Question No. 1 is compulsory.
(2) Attempt any four questions out of remaining six questions.

1. (a) Explain how Java is platform independent. 10
   (b) What is command line argument? Write a program in java to find largest of three numbers accepted from command line. 10

2. (a) Explain the different types of inheritances supported in Java. 10
   (b) Write a program using interfaces for the given hierarchy 10



3. (a) Explain exception handling in java with example. 10
   (b) What is vector? How it is different from an array? 10

4. (a) Explain life cycle of a thread. 10
   (b) Write a program in java to find factorial of a given number. 10

5. (a) Explain the concept of thread synchronization. 10
   (b) Write an applet to display the following 10

6. (a) What are constructors? Explain different types of constructors with example. 10
   (b) Write a program in Java to check whether the given string is palindrome or not. 10

7. Write short note on (any two) 20
   a. Call by value and call by reference
   b. Wrapper class
   c. Access protection in Java
   d. Life cycle of an applet

—— X ——

FE Sem II (old) All Engg. Drawing 08/06/16

QP Code : 28570

Time: 3 Hrs OLD COURSE **Max Marks : 75**

N.B. (1) Question *No. 1* is compulsory
(2) Attempt any ***Four*** questions from remaining *Six* questions
(3) Use drawing sheets for answering
(4) Figures to the right indicates ***full marks***
(5) All dimensions in figure are in ***mm***
(6) Use your own judgment for any unspecified dimensions
(7) Use only ***First Angle Method of Projection***

1. Fig 1 shows pictorial view of an object, Draw following views (i) Sectional Front View along AA, (ii) Top View and (iii) LHSV (15)

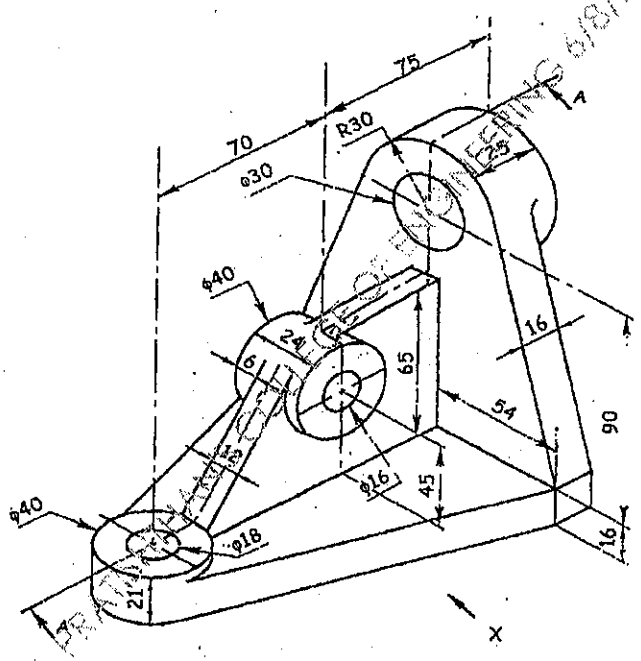


Fig 1

2. A pentagonal pyramid has a height of 60mm and side of base 30mm. The pyramid is resting with one side of the base on HP such that triangular face containing that side is perpendicular to HP and inclined to VP at 30^0. Draw the projections. (15)

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3. A cylinder 60mm diameter and 80mm long resting on its circular base on the HP. A section plane perpendicular to V.P. and inclined at 60^0 to HP cuts the axis at a point 20mm from its top end. Draw the sectional top view, sectional side view and true shape of the section. (15)

4. (a) A semi cone of base diameter 80 and axis length 90mm is resting on its semi circular base on HP such that the triangular face of the semi cone is parallel to VP and away from the observer. It is cut by a section plane perpendicular to VP and inclined at 45^0 to HP passing through the midpoint of the axis of the cone. Draw the development of the remaining part of the cone. (10)

(b) Draw free hand sketches of the following (Two Views) (5)

(i) Hexagonal headed bolt
(ii) Wing Nut

5. (a) The plan of a 75mm long line PQ measures 65mm, while the length of its elevations is 50mm. Its one end P is in the HP and 12mm in front of the VP. Draw its projections of PQ and find its inclinations with HP and VP.

(b) A circle of 50mm diameter rolls along a straight line without slipping. Draw the curve traced out by a point P on the circumference for one complete revolution of the circle. Name the curve. Draw also tangent and normal.

6. (a) Fig 2 Draw isometric view by using true scale (11)

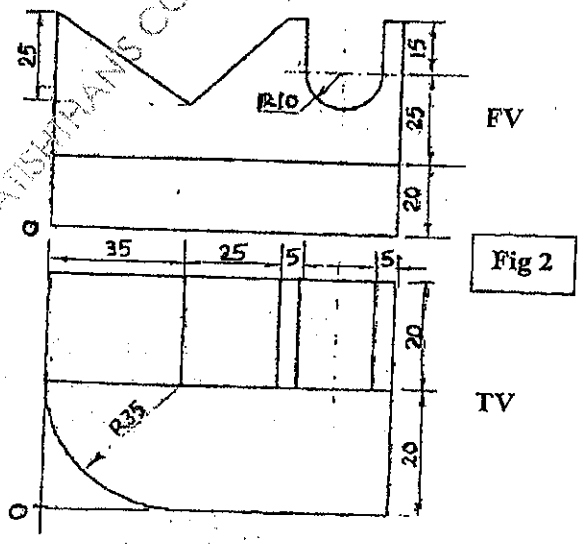

Fig 2

(b) Draw free hand sketches of the following (Two Views) (4)

(i) Square Nut
(ii) Eye Foundation Bolt

7. **Fig 3** Draw sectional Front view, Top view and Left hand side view (15)

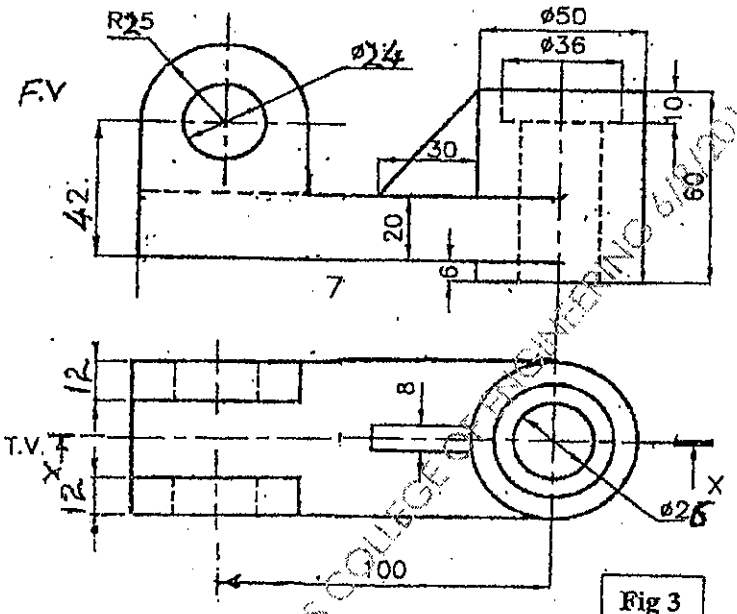

Fig 3

FE/SEM I/Applied Mathematics I (CBSGS) 10/05/2016

Library

QP Code : 28579

REVISED COURSE

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory.**
(2) Attempt any **three** questions from question No. 2 to question no. 6.
(3) **Figures** to the **right** indicate **full** marks.

1. (a) Solve the equation $7\cosh x+8\sinh x = 1$ for real values of x 3

(b) If $z(x+y)=(x-y)$ find $\left(\frac{\partial z}{\partial x}-\frac{\partial z}{\partial y}\right)^2$ 3

(c) If $u = r^2\cos 2\theta$, $v = r^2 \sin 2\theta$ find $\frac{\partial(u,v)}{\partial(r,\theta)}$ 3

(d) Prove that $\text{Sec}^2 x = 1+x^2+\frac{2x^4}{3}+\ldots\ldots$ 3

(e) Find the rank of the Matrix by reducing it to normal form. 4

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & -1 \\ 3 & 1 & 1 \end{bmatrix}$$

(f) Find n^{th} derivatives of $\frac{x}{(x-1)(x-2)(x-3)}$ 4

2. (a) If α, β are the roots of the equation $x^2-2\sqrt{3}\cdot x+4=0$ find the value of $\alpha^3+\beta^3$ 6

(b) Examine whether the vecotrs 6

$$X_1=[3 \quad 1 \quad 1],\ X_2=[2 \quad 0 \quad -1]$$
$$X_3=[4 \quad 2 \quad 1]$$

are linearly independent.

(c) (i) State and prove Euler's theorem for a Homogeneous function in two variables. 4

(ii) If $y = x\cos u$ find the value of $x^2u_{xx}+2xy\,u_{xy}+y^2u_{yy}$ 4

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FW-Con. 8276-16.

3. (a) Is the following system has trivial or non trivial solution ? Obtain the non trival solution if exist. 6

$3x_1 + 4x_2 - x_3 - 9x_4 = 0$
$2x_1 + 3x_2 + 2x_3 - 3x_4 = 0$
$2x_1 + x_2 - 14x_3 - 12x_4 = 0$
$x_1 + 3x_2 + 13x_3 + 3x_4 = 0$

(b) Discuss the stationary points for Maxima and Mininima of 6
$x^3 + xy^2 - 12x^2 - 2y^2 + 21x + 10$

(c) (i) If $\tan(x+iy) = a + ib$ prove that $\tanh 2y = \frac{2b}{1+a^2+b^2}$ 4

(ii) Separate into real and imaginary parts of $\text{Log}(3+4i)$ 4

4. (a) If $x = u\cos v$, $y = u \sin v$ 6

Prove that $\frac{\partial(u,v)}{\partial(x,y)} \cdot \frac{\partial(x,y)}{\partial(u,v)} = 1$

(b) Show that $\log\left[e^{i\alpha} + e^{i\beta}\right] = \log\left[2\cos\left(\frac{\alpha-\beta}{2}\right)\right] + i\left(\frac{\alpha+\beta}{2}\right)$ 6

(c) (i) Solve the system of equation by Gauss Jordan Method 4
$x + 2y + 6z = 22$, $3x + 4y + z = 26$, $6x - y - z = 19$

(ii) Solve the system of equation by Gauss Siedel Method. 4
Correct upto three decimal.
$2x - 4y + 49z = 49$
$43x + 2y + 25z = 23$
$3x + 53y + 3z = 91$

5. (a) Prove that $\text{Cos}^6\theta + \text{Sin}^6\theta = \frac{1}{8}[3\cos 4\theta + 5]$ 6

(b) Find the value of a and b 6

if $\lim_{x \to 0} \frac{x(1+a\cos x) - b\sin x}{x^3} = 1$

(c) (i) If $y = e^x \cos 2x \cos x$ find y_n 4

(ii) If $y = e^{\tan^{-1}x}$ prove that $(1+x^2)y_{n+2} + [2(n+1)x - 1]y_{n+1} + n(n+1)y_n = 0$ 4

[TURN OVER

6. (a) Find non-Singular Matrices P & Q such that, 6

$$A=\begin{bmatrix}1 & 2 & 3 & 4\\ 2 & 1 & 4 & 3\\ 3 & 0 & 5 & -10\end{bmatrix}$$ is redued to normal form. Also find rank.

(b) If $u = f(e^{y-z}, e^{z-x}, e^{x-y})$ find $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}$ 6

(c) (i) Fit a straight line to the following data : 4

Year x :	1951	1961	1971	1981	1991
Production y :	10	12	8	10	15

(ii) Fit a second degree parabolic curve to the following data : 4

x :	1	2	3	4	5	6	7	8	9
y :	2	6	7	8	10	11	11	10	9

FE/SEM I/ Engineering Mechanics/ CBSGS

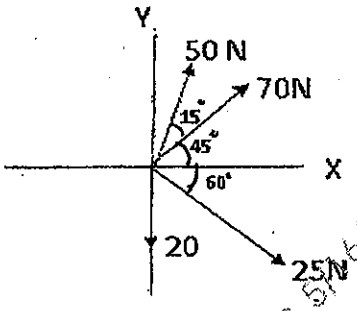
16/05/2016

QP Code : 28584

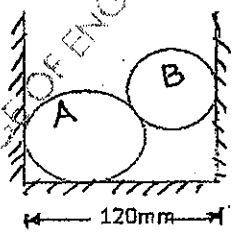
(3 Hours) [Total Marks 80

N.B.: (1) Question No. 1 is compulsory.
(2)Attempt any three questions from remaining five questions.
(3)Assume suitable data if necessary and mention the same clearly.
(4)Take g=9.81 m/s^2

Q.1 a. Determine the resultant of the forces acting as given in figure below. Find the angle which the resultant makes with the positive x-axis. [4]



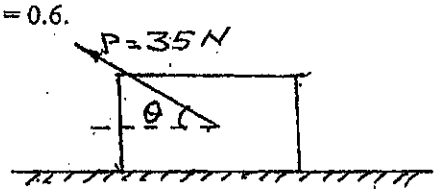
b. Two spheres A and B are kept in a horizontal channel. Determine the reactions coming from all the contact surfaces. Consider the radius of A and B are 40mm and30mm respectively. Take W_A =500 N and W_B = 200N. [4]



c. Define Angle of Friction and Angle of Repose [4]

d. Car A starts from rest & accelerates uniformly on a straight road. Another car B starts from the same place 5 seconds later with initial velocity zero & it accelerates uniformly at 5 m/sec^2. If both the cars overtake at 500 m from the starting place, find the acceleration of car A. [4]

e. Find the angle the force P makes with horizontal such that the block of mass 4 kg has an acceleration of 10m/sec^2, when it is subjected to a force of 35 N. $\mu s = 0.7$, $\mu k = 0.6$. [4]



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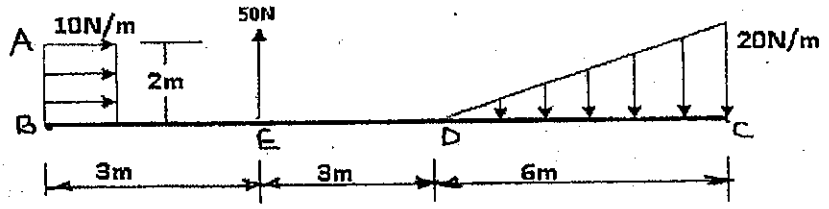
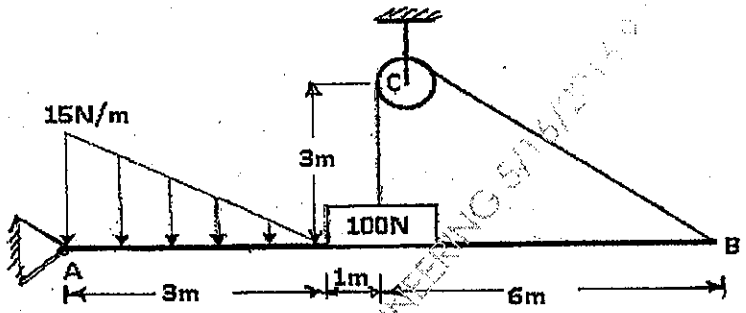
Q.2 a. Replace the force system by a single force w. r. to point C [6]

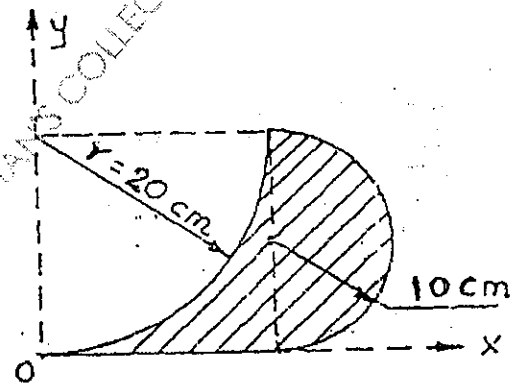


b. A uniform beam AB hinged at A is kept horizontal by supporting & setting a 100 N weight by using a string tied at B & passing over a smooth pulley at C The beam also loaded as shown in figure below. Find the reactions at A & C. [8]



c. Prove that for a perfectly elastic body, two equal masses participating in collision exchange their velocities. [6]

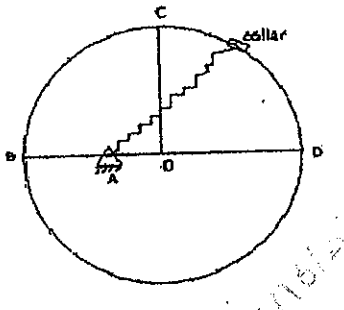
Q.3 a. Find Centroid of shaded area with reference to X and Y axes. [8]



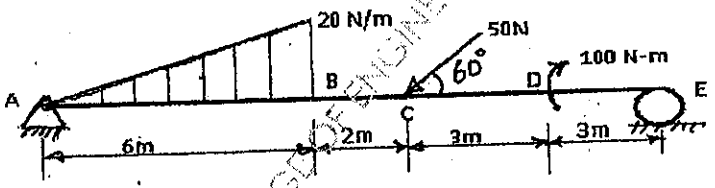
b. Find the resultant of the spatial concurrent force system concurrent at A(1,0,0) and passing through points B(-1,3,5), C(3,5,7), D(0,4,0). Magnitude of forces F_{AB}= 100N, F_{AC} =150N, F_{AD}=200N. [6]

[TURN OVER

c. A collar of mass 1 kg is attached to a spring ad slides without friction along a circular rod which lies in a horizontal plane. The spring is undeformed when the collar is at B. knowing that the collar is passing through the point D with a speed of 1.8 m/s, determine the speed of the collar when it passes through point C and B. Take Stiffness of the spring, k= 250 N/m, Radius of the circular path = 300 mm and distance OA = 125 mm. [6]

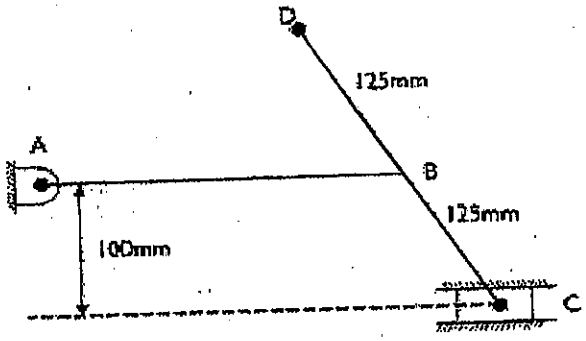


Q.4 a. Find the reactions at supports A and E for the beam loaded as shown in the figure below. [8]



b. A fighter Plane Moving horizontally with a constant velocity of 200 m/seconds releases a bomb from an altitude of 400 m. Find the velocity and direction of the bomb just before it strikes the ground. Also determine the distance travelled by the plane before the bomb just strikes the ground. [6]

c. Find velocity of C and point D at the instant shown ω_{AB} = 3 rad /sec clockwise. AB =400mm. [6]



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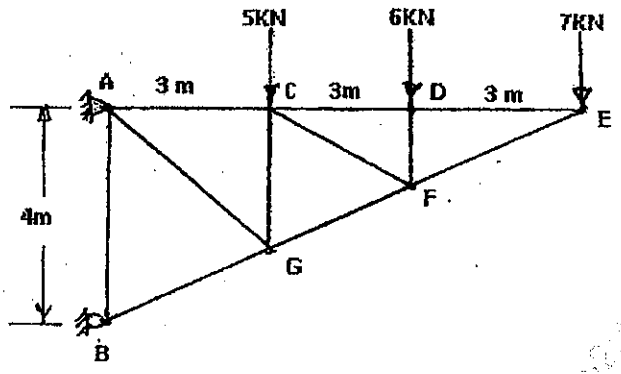
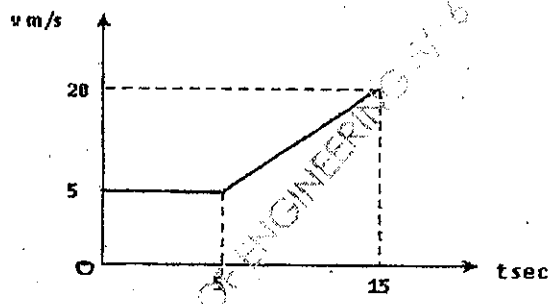
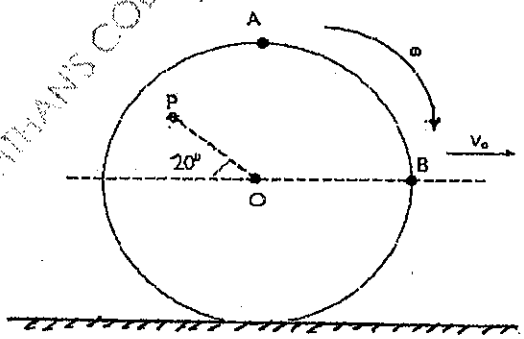
Q.5 a. Find the forces in CF and CD by method of section and the remaining by Method of Joints. [8]



b. For a vehicle moving along a straight line, v-t diagram is as shown in figure below. Plot a-t & s-t diagrams for the given time period. [6]



c. A wheel is rolling along a straight path without slipping. Determine velocity of points A,B and P. OP = 600mm , ω = 4 rad/sec, Vo = 4m/s [6]



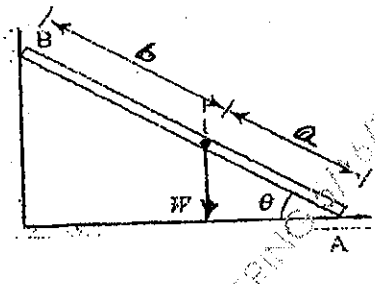
Q.6 a. A force of magnitude 500N is acting from A(2,3,6) and passes through a point B(6,2, 6). Compute its moment about point C(4, 6, 3). [4]

[TURN OVER

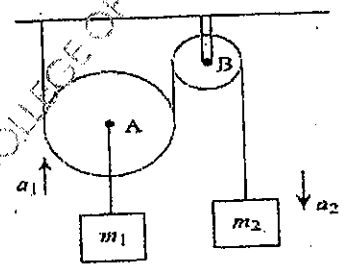
b A stone is thrown with a velocity (u) m/sec at an angle of 20^0 with horizontal from a point 2 m above the ground. The stone strikes the ground 5 m away from the original position. The motion of stone is subjected to gravitational acceleration & wind resistance of 0.82 m/sec^2 , opposing the horizontal motion. Determine the time of flight of the stone. [4]

c. A heavy metal bar AB rests with its lower end A on a rough horizontal floor having coefficient of friction μ_F & the other end B on a rough vertical wall having coefficient of friction μ_W. If the centre of gravity of the bar is at distances a & b from the ends A & B respectively, show that at impending motion, the inclination of the bar with the horizontal will be: [4]

$$\theta = \tan^{-1}\left(\frac{1}{\mu_F}\frac{a - b\mu_F\mu_W}{a + b}\right)$$



d. Two masses are interconnected with the pulley system Neglecting inertial & frictional effect of pulleys & cord, determine the acceleration of the mass m_2. [4]
Take $m_1 = 50$ kg & $m_2 = 40$ kg



FE|sem I|CBSGS|BEE

20|05|2016

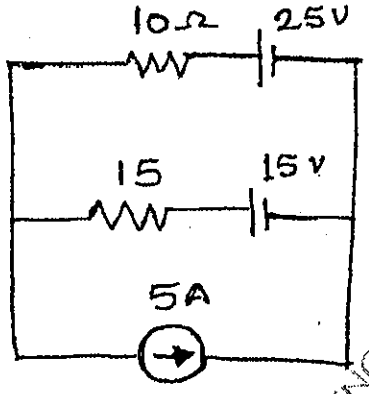
QP Code : 28587

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

N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **three** questions from the remaining questions.

1. (a) A resistor of 5Ω is connected in series with a parallel combinationof a number of resistors each of 5Ω. If the total resistance of the combination is 6Ω find the no. of resistors connected in parallel. **3**

(b) Use mesh analysis to find current through 10Ω in the ckt. shown **3**



(c) An alternating voltage is represented by ?? = 141.4 sin 377 t find (i) max-value (ii) frequency (iii) time period **3**

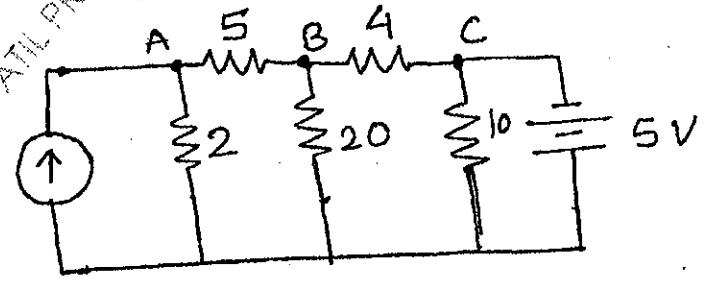
(d) What is the necessary condition for resonance in series circuit. Derive expression for resonance frequency. **3**

(e) What is the relationship between line and phase values in star and delta connected load. **2**

(f) Draw and explain the phasor diagram of 1-ϕ transformer on No load. **4**

(g) Define rectifier and state diff. types of it. **2**

2. (a) Find mode voltages. **6**



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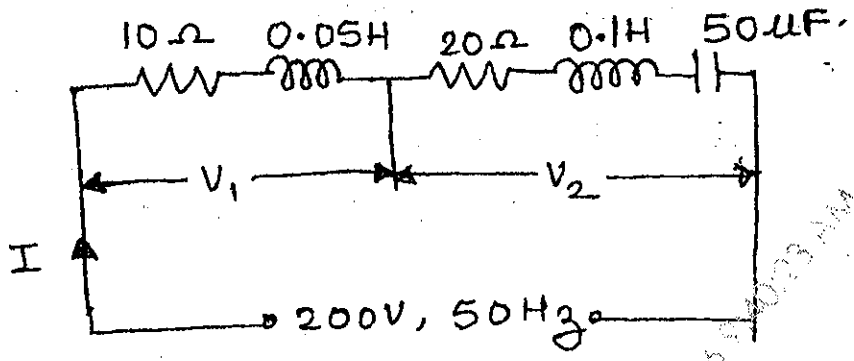
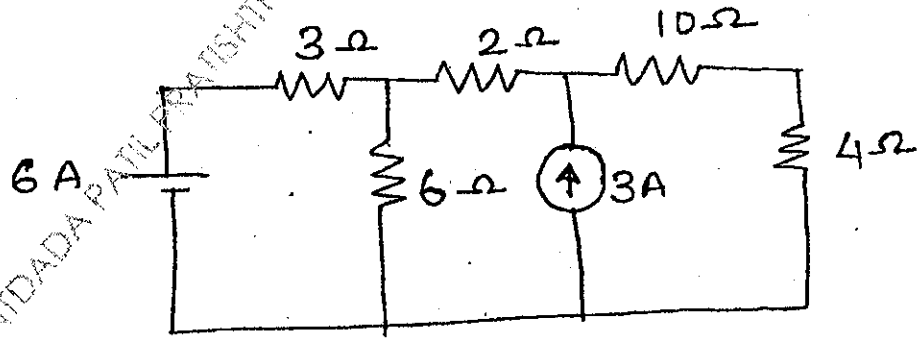
(b) In the circuit shown find 8
(i) the current I (ii) V_1 and V_2 (iii) Pf. Draw the phasor diagram.



(c) A 150 KVA transformer has iron loss of 1.4 kW and full-load copper loss of 1.6 kW. Det. (i) the KVA load at maximum efficiency (ii) max. efficiency at 0.8 lagging Pf and (iii) efficiency at half load and 0.8 lagging Pf. 6

3. (a) A balanced three-phase load connected in delta, draws a power of 10kW at 440 V at a Pf of 0.6 lead, find the values of circuit elements and reactive volt-ampers drawn. 8
(b) The wattmeter reads iron losses in OC test and reads copper losses in SC test of a transformer. Justify. 6
(c) What is meant by filter. 2
(d) Draw and explain O/P characteristic of transistor in CE configuration. 4

4. (a) Using source transformation tech. calculate voltage across 4Ω 7



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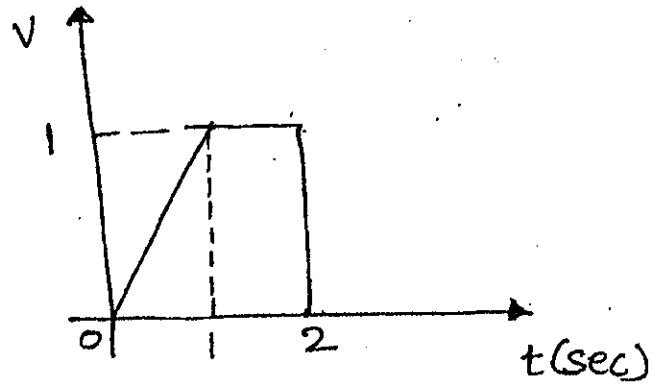
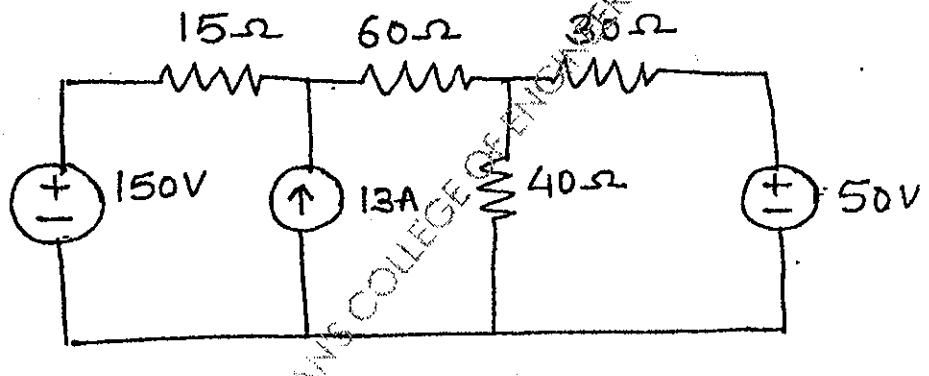
(b) Find the average and rms value of the waveform. 5



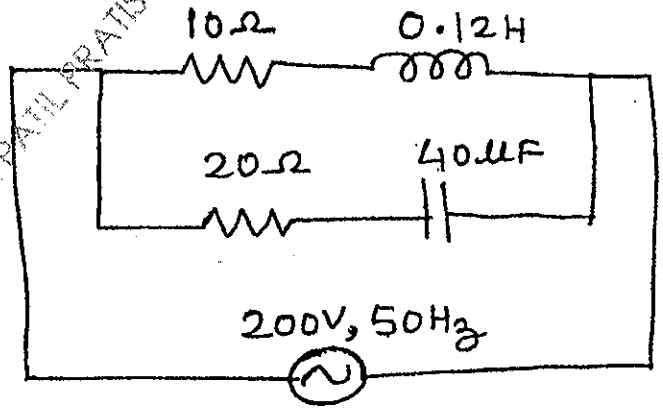
(c) The power in a 3-ϕ ckt is measured by two wattmeters. If the total power is 50kW and Pf is 0.6 lagging, find the reading of each wattmeter. 4

(d) Explain the working of centre tapped full wave rectifier. 4

5. (a) Find current through 30Ω using theveninis theorem 8



(b) For the shown ckt, find supply current, current in each branch and total Pf. 4



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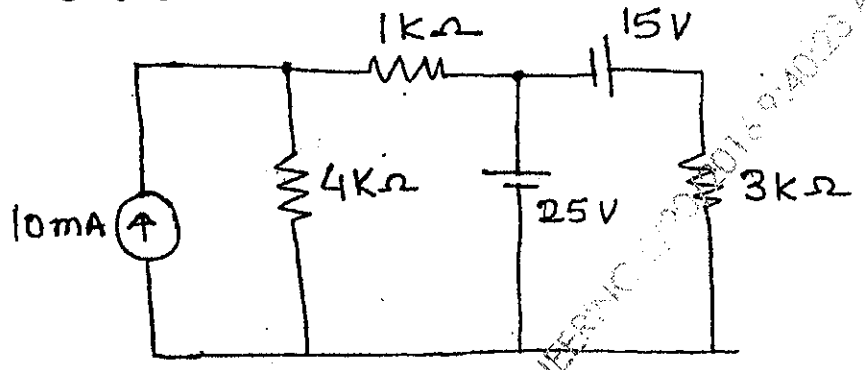
(c) A 1000/200 V, 50Hz, 1–phase transformer gave the following test results 8

OC test (hv side) :	1000V	0.24 A	90 W
SC test (hv side) :	50V	5A	110W

Draw equivalent ckt of transformer reffered to primary and secondary side.

6. (a) Using superposition theorem, find the voltage across 4KΩ 7



(b) A series R-L-C circuit consists of R = 1000 Ω, L = 100 mH and C = 10μF. The applied voltage across the circuit is 100 V. 7

(i) Find the resonance freq of the ckt.
(ii) Find Q of the ckt at resonant freq.
(iii) At what angular freq. do the half power points occur.
(iv) Calculate the bandwidth of the ckt.

(c) Show that the total power and Pf. in a 3-ϕ balanced system can be determined using two wattmeter method. 6

FE Sem I (CBSGS) Applied Chemistry I 26/05/1

Q.P. Code : 28592

(2. Hours) | Total Marks : 60

N.B. : (1) Question No. 1 is compulsory.
(2) Answer any three questions from remaining five questions.
(3) Figure to the right indicates full marks.
(4) Atomic weights : Ca = 40, Mg = 24, Cl = 35.5, S = 32, H = 1, C = 12. O = 16.

1. Attempt any **five** from the following : 15
   (a) Write two balanced equations to describe the changes that occur when hard water is boiled.
   (b) Give reasons to explain why natural rubber needs vulcanization.
   (c) Give the preparation and uses of silica bricks.
   (d) Give the number of phases in the following system (any three) :
      (i) Saturated solution of NaCl
      (ii) Mixture of rhombic and monoclinic sulphur
      (iii) Mixture of O_2 and N_2
      (iv) Ice $\rightleftharpoons$ Water equilibrium
   (e) What is grease ? What are the conditions in which greases are used?
   (f) Thermosetting polymers cannot be reshaped and reused. Give reasons.
   (g) Calculate the COD of an effluent sample if 25c.c. of the effluent sample required 8.3 c.c. of 0.001M $K_2Cr_2O_7$ for oxidation.

2. (a) Calculate the quantity of lime and soda required for softening 50,000 L of water containing following salts per litre. 6
   $Ca(HCO_3)_2$ = 16.2mg; $Mg(HCO_3)_2$ = 7.5mg;
   $CaSO_4$ = 13.6mg; $MgSO_4$ = 24.0mg,
   $MgCl_2$ = 19.0mg.

   (b) Explain the following terms : 5
   (i) Condensed Phase rule
   (ii) Triple point

   (c) What are carbon nanotubes ? Describe the laser method of preparation of CNT. 4

3. (a) (i) Discuss the mechanism of Extreme pressure lubrication.
(ii) Name any four additives in blended oil and give two examples of each. 6
(b) Describe a moulding method suitable for thermoplastic resins.
(c) Discuss the limitations of phase rule. 5
4

4. (a) Give the preparation, properties and uses of (any two) :
(i) PMMA (ii) Silicone rubber (iii) BunaS. 6
(b) Write brief notes on any two methods of disinfecting municipal water with reactions. 5
(c) 1.5g of an oil was saponified with 50ml of 0.1N KOH solution. After refluxing the mixture required 7.5ml of 0.1N HCl for neutralisation. Find the saponification value of oil. 4

5. (a) Draw a neat diagram of rotary kiln in the manufacture of portland cement and mention the reactions in each zone. 6
(b) What is glass transition temperature ? What are the factors affecting glass transition temperature ? What is its significance ? 5
(c) The hardness of 10,000 litres of a water sample was completely removed by passing it through a zeolite softener. The softener then required 400litres of sodium chloride solution containing 100g/L of NaCl for regeneration. Calculate the hardness of the water sample. 4

6. (a) (i) Discuss the softening and regeneration reactions in the Ion-exchange process.
(ii) Discuss the Reverse Osmosis method of purification of water. 6
(b) Explain the functions of the following constituents in the compounding of plastic (any two) : 5
(i) Plasticiser (ii) Lubricants (iii) Stabiliser.
(c) Define and explain the significance of the following properties of lubricants (any two) : 4
(i) Flash and Fire point
(ii) Acid value
(iii) Viscosity and viscosity Index.

FE Sem I (CBSGS) All Applied physics I 01/06/16

QP Code : 28603

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

N.B. : (1) Question no. **1** is **compulsory.**
(2) Attempt any **three** questions from Q.2. to Q. 6.
(3) Use suitable **data** wherever required.
(4) **Figures** to the **right** indicate **full** marks.

1.Attempt any **five** from the following:- **15**

(a) Draw (a) $(1\bar{1}2)$ (b) (0 4 0) (c) [0 4 0] with reference to a cubic unit cell.
(b) What is the probability of an electron being thermally promoted to the conduction band in diamond at 27°C, if the bandgap is 5.6 eV wide?
(c) Define drift current, diffusion current and mobility of charge carriers.
(d) What is dielectric polarization and dielectric susceptibility? Write the relation between them.
(e) State and explain Ohm's law in magnetic circuit.
(f) Write Sabine's formula and explain the terms used in it.
(g) Calculate the length of an iron rod which can be used to produce ultrasonic waves of 20kHz Given - $Y = 11.6\times10^{10}\,N/m^2$, $\rho = 7.23\times10^3\,kg/m^3$

2. (a) Explain formation of energy bands in solids and explain classification on the basis of energy band theory. **8**
(b) Zn has hcp structure. The nearest neighbour distance is 0.27nm. The atomic weight of Zn is 65.37. Calculate the volume of unit cell, density and atomic packing fraction of Zn. **7**

3. (a) What is hysteresis? Draw a hysteresis loop for ferromagnetic material and explain various important parameters. **8**

A magnetic material has a magnetization of 2300 A/m and produces a flux density of 0.00314 wb/m^2, Calculate magnetizing force and relative permeability of the material.

(b) Explain the statement "crystal act as three dimesional grating with X-rays". **7**

Monochromatic X-ray beam of wavelength $\lambda = 5.8189\ A^0$ is reflected strongly for a glancing angle of $\theta = 75.86^0$ in first order by certain planes of cubic of lattice constant $3A^0$. Determine Miller indices of the possible reflecting planes.

4. (a) Define Ligancy. Find the value of critical radius ratio for ligancy 4. **5**
(b) An impurity of 0.01 ppm is added to Si. The semiconductor has a resistivity of 0.25Ωm at 300K. Calculate the hole concentration and its mobility. Atomic weight of Si is 28.1, density of Si $= 2.4\times10^3\,kg/m^3$ **5**
(c) Explain the origin of electronic, ionic and orientational polarization and temperature dependence of respective polarizability. **5**

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FW-Con. 12035-16.

5. (a) The density of copper is 8980kg/m^3 and unit cell dimension is 3.61 A^0. Atomic weight of copper is 63.54. Determine type of crystal structure. Calculate atomic radius and interplanar spacing of (1 1 0) plane. 5
   (b) What is Hall effect? Derive expression for Hall voltage with neat labelled diagram. 5
   (c) Explain how the reverberation time is affected by (i) size (ii) nature of wall surface (iii) audience in an auditorium. 5

6. (a) Estimate the ratio of vacancies at (i) -119^{0}C (ii) 80^{0}C where average required to create vacancy is 1.8eV. 5
   (b) How a p-n junction diode is used to generate a potential difference in a photovoltaic solar cell? 5
   (c) Explain with neat labelled diagram the construction and working of a piezoelectric oscillator. 5

FE Sem I (CBSGS) All EVS 07/06/16

Q.P. Code : 28604

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

N.B. : (1) All questions are compulsory.
(2) Answer any three from Question No 2 to 6
(3) Draw neat diagrams wherever necessary

1. Attempt any five from the following: - **15**
   (a) Discuss the global environmental crisis.
   (b) Explain in brief the concept of socio-economical aspect of sustainable development.
   (c) Discuss coagulation and flocculation in water treatment.
   (d) Define the term "Noise Pollution" and explain its causes.
   (e) What are the general powers of the Central Government stated in Chapter-11 of the Environmental Protection Act 1986?
   (f) Which are the various renewable sources of energy?
   (g) What is the role of technology with respect to environment and health?

2. Answer the following:- **15**
   (a) How is environmental education important for sustainable development?
   (b) What are the constituents in the municipal solid waste?
   (c) What are the limitations of conventional sources of energy?

3. Answer the following: **15**
   (a) How ozone is getting depleted from the atmosphere? Explain with chemical reactions.
   (b) What are the important functions of Central Pollution Control Board?
   (c) Explain the main aspects of Disaster Management Technique in detail.

4. Answer the following:- **15**
   (a) Write a note on depleting nature of environmental resources-minerals.
   (b) What environmental clearances are required to set up an industrial unit?
   (c) Explain the working principle of generating electricity by using wind energy.

FW-Con.12290-16.

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5. Answer the following:- 15
   (a) What do you mean by "3R" with respect to sustainable development?
   (b) What do you understand by "Green House Effect"?
   (c) State the working of Photovoltaic Cell used for solar energy.

6. Answer the following:- 15
   (a) Discuss the importance of Environmental Study.
   (b) Draw a neat labelled diagram of "Venturi scrubber" and brief its working.
   (c) Explain the terms Tsunami and Earthquake.

FE/SEM I/Applied Mathematics I (Old) 10/05/2016

Q.P. Code : **28505**

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory.**
(2) Attempt any **four** out of remaining **six** questions.

1. (a) If $\sin\psi = i\tan\theta$, prove that $\cos\theta + i\sin\theta = \tan\left(\frac{\psi}{2} + \frac{\pi}{4}\right)$ 5

(b) If $u = \left(1 - 2xy + y^2\right)^{-1/2}$, prove that $x\frac{\partial u}{\partial x} - y\frac{\partial u}{\partial y} = y^2u^3$ 5

(c) Prove that $\nabla f(r) = f'(r)\frac{\bar{r}}{r}$ and hence find f(r) if $\nabla f(r) = 3r^5\bar{r}$ 5

(d) If f (x) and g(x) are respectively $\sqrt{x}$ and $\frac{1}{\sqrt{x}}$ then prove that c of Cauchy's Mean value Theorem is the Geometric mean between a and b, a > 0, b > 0. 5

2. (a) Show that $32\sin^4\theta\cos^2\theta = \cos6\theta - 2\cos4\theta - \cos2\theta + 2$. 6

(b) Find the directional derivative of $f(x,y,z) = 4e^{2x-y+z}$ at the point (1, 1, -1) in the direction toward the point (-3, 5, 6). 7

(c) If $u = A\,e^{-gx}\sin(nt - gx)$ satisfies the equation $\frac{\partial u}{\partial t} = \mu\frac{\partial^2 u}{\partial x^2}$; prove that $n = 2g^2\mu$ 7

3. (a) Find the equation whose roots are $2\cos\frac{\pi}{7}, 2\cos\frac{3\pi}{7}, 2\cos\frac{5\pi}{7}$ 6

(b) If $z = f_1(x+ct) + f_2(x-ct)$, prove that $\frac{\partial^2 z}{\partial t^2} = c^2\frac{\partial^2 z}{dx^2}$ 7

(c) If a vector field is given by $\bar{F} = \left(x^2 + xy^2\right)\bar{i} + \left(y^2 + x^2y\right)\bar{j}$. Show that $\bar{F}$ is irrotational and find its scalar potential. 7

4. (a) Test for convergence of the series $1 + \frac{2}{5}x + \frac{6}{9}x^2 + \frac{14}{17}x^2 + \ldots\ldots(x > 0)$ 6

(b) Find the values of a, b, c so that $\lim_{x\to 0}\frac{ae^x - b\cos x + ce^{-x}}{x\sin x} = 2$ 7

(c) If $y = \frac{\log x}{x}$ prove that $y_5 = \frac{5!}{x^6}\left[1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} - \log x\right]$ 7

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GE-Con. 8014-16.

5 (a) Find the stationary values of $3x^2 - y^2 + x^3$ 6

(b) If $\sin(\theta + i\phi) = \cos\alpha + i\sin\alpha$, prove that $\cos^4\theta = \sin^2\alpha = \sinh^4\phi$ 7

(c) Prove that $\frac{b-a}{\sqrt{1-a^2}} < \sin^{-1}b - \sin^{-1}a < \frac{b-a}{\sqrt{1-b^2}}$ 7

6. (a) Prove that $\cos\left[i\log\left(\frac{a-ib}{a+ib}\right)\right] = \frac{a^2-b^2}{a^2+b^2}$ 6

(b) Expand $\log(1+x+x^2+x^3)$ upto x^8 7

(c) If $x = \tan(\log y)$, prove that $(1+x^2)y_{n+1} + (2nx-1)y_n + n(n-1)y_{n-1} = 0$ 7

7. (a) If $i^{\alpha+i\beta} = \alpha + i\beta$, prove that $\alpha^2 + \beta^2 = e^{-(4n+1)\beta\pi}$ where n is any positive integer. 6

(b) If $u = \tan^{-1}\left[\frac{x^3+y^3}{2x+3y}\right]$, prove that 7

$$x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \sin 4u - \sin 2u$$

(c) If $y^{1/m} - y^{-1/m} = 2x$, prove that 7

$$y = 1 + mx + \frac{m^2}{2!}x^2 + \frac{m^2(m^2+1^2)}{3!}x^3 + \ldots\ldots$$

FE sem I (~~CBS~~ old) Applied chemistry I 26/5/16

QP Code : 28521

Total Marks : 75
Duration : 2 hrs

N.B. (1)Question no. I is compulsory.
(2)Attempt any four questions from remaining six.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.

(At.wt: Mg= 24, H=1, C=12, O=16, Ca=40, Cl=35.5, S=32, N=14, Na= 23, Al=27, Fe = 56).

1. **Attempt any 5.** **15**
   a) Explain condensation polymerization with an example.
   b) Define BOD and COD and give their significance.
   c) What are solid lubricants? Where are they used?
   d) Write a note on plain carbon steels.
   e) How are nanomaterials different from conventional materials?
   f) Differentiate between conventional and non conventional energy sources.
   g) Find the acid value of a used oil sample whose 7ml required 3.8ml of N/20 KOH during titration(Density of oil =0.88). State whether oil is proper for lubrication or not.

2. a)) Calculate lime (90%) and soda (80%) pure required for softening one million litres of water containing following impurities-
   i) $Mg(HCO_3)_2$= 14.6 mg/litre ii) $Mg(NO_3)_2$= 29.6mg/litre
   iii) $Ca(HCO_3)_2$= 8.1 mg/litre iv) HCl= 3.65 mg/litre
   v) Na_2SO_4= 4.5 mg/litre **6**

   b) What is compounding of plastics? Give the different additives of plastics with examples. **5**

   c) Write a note on solar flat plate collector. **4**

3. a) Give the preparation, properties and uses of PMMA and Buna-S. **6**

[TURN OVER

b) What are blended oils? With examples explain how they are superior to vegetable and mineral oils? 5

c) What are fullerenes? Explain their structure and applications. 4

4. a) What is the mechanism of lubrication applicable to a journal bearing? Explain with diagram and state the type of lubricant suitable for it. 6

b) What are special steels? Give the special properties imparted to steels by Cobalt, Manganese, Nickel. 5

c) 50ml of standard hard water (2gm $CaCO_3$/litre) requires 30ml of EDTA solution. 100ml of a water sample consumes 15ml EDTA. 100ml of boiled and filtered water sample consumes 8ml EDTA solution. Calculate temporary hardness of the given water sample. 4

5. a) Draw the phase diagram of a one component system and derive all possible degrees of freedom. 6

b) With the help of a flow chart explain activated sludge system of waste water treatment. 5

c) Explain the process of vulcanization of natural rubber. Compare the properties of the natural and vulcanized rubber. 4

6. a) What are the different methods of synthesizing carbon nanotubes? Explain any one. 6

b) Describe the demineralization process of water treatment with respect to the following: i) Principle ii) Diagram iii) Process iv) Advantages. 5

c) Explain the construction and working of photovoltaic cell. 4

7. a) Name the different fabrication techniques for moulding of polymers. Explain injection moulding with a neat diagram. 6

b) Write a note on **any one**: i)Reverse osmosis process ii) Permutit process 5

c) Define and give the significance of the following properties of lubricants: i) Viscosity index ii) Flash point and fire point. 4

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FE sem I (Old) All Applied physics I 1/6/2016

Q.P. Code : 28529

(OLD CORSE)
(2 Hours) **[Total Marks : 75**

Note:
1. Q.1 is compulsory.
2. Answer any FOUR from the Q. 2 to Q.7
3. Symbols have their usual meanings.
4. Assume suitable data wherever necessary.

Q.1 Attempt any FIVE of the following

a) Draw the following in cubic unit cell. [03]
1. (1 2 0) 2. $(1\bar{2}3)$ 3. [1 0 1]

b) Define continuous X-ray spectra and characteristic X-ray Spectra. [03]

c) Write the expression for Fermi level in n-type semiconductor and also mention the meaning of terms in it. [03]

d) Define Hall effect and list some of its applications. [03]

e) Define superconductivity, critical temperature and critical magnetic field. [03]

f) State Sabine's formula and explain terms involved in it. [03]

g) Define direct and inverse piezoelectric effect. [03]

Q.2 A Draw BCC crystal structure with proper diagram and calculate atomic radius, Coordination number, Atomic Packaging Factor and Void space. [08]

B A Copper specimen having length 1 meter, width 1 cm and thickness 1 mm is conducting 1 ampere current along its length and is applied with magnetic field of 1 tesla along its thickness. It experiences Hall effect and a Hall voltage of 0.074 micro Volts appear along its width. Calculate Hall coefficient and the mobility of electron in Copper. Conductivity of Copper is $\sigma = 5.8 \times 10^7 (\Omega m)^{-1}$. [07]

Q.3 A Define superconductivity. Explain Type – II superconductors. [08]

B Ni has FCC structure. Its lattice constant is 3.52 A.U., atomic weight is 58.71. Give Avogadro number is 6.023×10^{26} /Kg-mole. Calculate its radius, Atomic Packaging Factor and density. [07]

Q.4 A Define Packing efficiency. Calculate atomic packing efficiency for Diamond unit cell. [05]

B Draw the neat labelled energy band and Fermi level for intrinsic, n-type and p-type semiconductor. [05]

C A Hall of volume $6000m^3$ has a reverberation time 3 sec. if the absorbing surface of the hall has an area of $2000m^3$. Calculate the average coefficient of absorption. [05]

Q.5 A Silicon has the same structure as that of diamond. Its density is 2.3×10^3 Kg/m^3 and atomic weight 28.9.Calculate lattice constant and atomic radius of it. [05]

B How a depletion region is formed in P-N junction diode explain with neat diagram. [05]

C Explain construction and working of Magnetostriction oscillator with neat circuit diagram. [05]

Q.6 A The Bragg angle corresponding to the first order reflection from (111) planes of a crystal is 30°. Wavelength of X-ray is 1.75A. Determine inter-planer spacing and lattice constant of the crystal. [05]

B Describe Meissner effect. Show that superconductors are perfect diamagnetic below their critical temperature. [05]

C Find the depth of sea water from a ship on the sea surface if the time interval of 2 seconds is required to receive the signal back. Given the temperature of sea water is 20 °C and salinity is 10 gm/lit. [05]

Q.7 A Define liquid crystal and describe nematic phase. [05]

B Calculate the thickness of quartz plate which is used to produce ultrasonic waves of 2MHz. [05]

C Explain electrostatic focusing. [05]


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- 7 JUN 2016

FE Sem I (old) All Computer Programming I 7/6/16

(OLD COURSE) **QP Code : 28533**

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

Note: 1) Question no. is 1 compulsory.
2) Answer any four from remaining.

Q1) Answer any four. 20
a) Explain default constructor with example.
b) What is function declaration?
c) Explain destructor with example.
d) WAP in c++ to find sum and average of digits in a given number.
e) Explain the two features of OOP.

Q2a) WAP to generate output in following order. Use for loop. 10

```
    1
   121
  12321
 1234321
```

Q2b) Write a program in c++ to find roots of quadratic equation. Use switch statement. 10

Q3a) WAP in c++ to generate Fibonacci series using user defined function. 10
Q3b) Explain call by reference and call by value with example. 10

Q4a) Explain function overloading and write a program to perform sum of two integer, two float, two double. Using function overloading concept. 10
Q4b) Write a recursive program to find power of x^n. 10

Q5a) WAP in c++ to count number of characters, and space in a given string. 10
Q5b) Explain how to define functions inside and outside class with example. 10

Q6a) Explain multiple inheritance and write the program using concept of multiple inheritance. 10
Q6b) WAP to overload + operator to convert inches into feet and display total number of feet and inches. 10

Q7) write short note on (any four). 20
1) Friend function 2) static data member and member function 3) pure virtual function
4) copy constructor 5) multipath inheritance.