Central University of Haryana
ODD Semester Term End Examination April 2022
B.Tech. Programmes
Branch: CSE (Reappear)
Course Code: MAT111A   Max Time: 3 hours
Course Title: Mathematics- 1   Max Marks: 70

Instructions:

Question Number one (PART-I) is compulsory and carries total 14 marks (Each sub

Question carries two Marks).

Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q 1.   (2X7=14)
a)   Explain algebraic and geometrical multiplicity of eigenvalues with suitable examples.

b)   Show that the transformation $u = 2x + y + z$; $v = x + y + 2z$; $w = x - 2z$ is regular.
       Write down the inverse transformation.

c)   Show that the sum of the eigenvalues of a matrix is the sum of the elements of the
       principal diagonal.

d)   Evaluate

$$\int_0^{\pi/2} \sqrt{\tan\theta}\, d\theta \times \int_0^{\pi/2} \frac{1}{\sqrt{\tan\theta}} d\theta$$

e)   Test the subset $W = \{(x,y)|2x - 3y = 0; x,y \in R\}$ of vector space R^2 for subspace.

f)   Test the vectors $(3,0,2,2), (-1,7,4,9), (7,-7,0,-5)$ in R^4 are linear dependence or
       independence. In case of linearly dependent, find the relation between them.

g)   If $T: R^2 \to R^3$ is defined by $T(a,b,c) = (2a - b, 3a + 4b, a)$ is a linear transformation,
       then find the matrix of T in the standard bases.

PART –II

Q. No.2 (a) Find the non-singular matrices P and Q such that PAQ is in normal form
and hence find rank of A.

$$A = \begin{bmatrix} 1 & 3 & 1 & 0 & 1 & 1 \\ 2 & 2 & 1 & 0 & 0 & 1 \\ 0 & 2 & 1 & 4 & 1 & 3 \end{bmatrix}$$

(b) Determine the values of a and b for which the system

$$x + y + z = 6$$

$$x + 2y + 3z = 10$$

$$x + 2y + az = b$$

has (i) no solution; (ii) unique solution; (iii) many solutions.

OR

Q. No.2 (a) Test for consistency of the following equations and solve them if consistent

$$x - 2y + 3t = 2$$
$$2x + y + z + t = -4$$
$$4x - 3y + z + 7t = 8$$

(b) Find the solution sets of the homogeneous systems of linear equations with coefficient matrices given by:

$$\begin{bmatrix} 1 & 2 & 1 & 7 & 0 \\ 3 & 6 & 4 & 24 & 3 \\ 1 & 4 & 4 & 12 & 3 \end{bmatrix}$$

Q. No.3(a) Find the matrix P which transforms the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to the diagonal form.

(b) Find an orthonormal basis of the inner product space $R^3(R)$ with the standard inner product, given the basis $\{(1,1,0),(1,-1,1),(-1,1,2)\}$ using Gram-Schmidt process.

OR

Q. No 3(a) Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and hence

compute A^{-1}. Also find the matrix represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$

(b) Find the characteristic polynomial, eigenvalues, and eigenvectors of the matrix

$$A = \begin{bmatrix} 0 & 0 & 1 & 1 \\ -1 & 2 & 0 & 1 \\ -1 & 0 & 2 & 1 \\ 1 & 0 & -1 & 0 \end{bmatrix}$$

Q. No.4 (a) Find the volume generated when the area bounded by the parabolas $y^2 = 4 - x$ and $y^2 = 4 - 4x$ revolves about the common axis of the two curves.

(b) Find the asymptodes of the curve $x^3 + 3x^2y - 4y^3 - x + y + 3 = 0$.

OR

Q. No.4(a) Using the fact $\frac{d}{dx}(sin^{-1}x) = (1 - x^2)^{-1/2}$ and the binomial series, obtain the first four non-zero terms of the Taylor's series for $sin^{-1}x$ and hence obtain the first five non-zero terms of the Taylor's series for $cos^{-1}x$.

(b) Verify Maclaurin's theorem for
$$f(x) = (1 - x)^{5/2}$$
with Lagrange's remainder up to 3 terms when $x = 1$.

Q.No.5(a) Show that the vectors $a = (1,0,-1), b = (1,2,1), c = (0,-3,2)$ form a basis for R3. Express each of the basis vectors as a linear combination of a, b, c.

(b) State rank-nullity theorem and illustrate it on a transformation matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 1 & 1 & 3 \end{bmatrix}$..

OR

Q.No.5(a)   Find   the   dimension   of   the   subspace   spanned   by $(1,1,2,4), (2,-1,-5,2), (1,-1,-4,0)$ and $(2,1,1,6)$ in R^4.

(b) If $T: V \to W$ is a linear transformation over F and if V is a finite dimensional, then prove that
$$nullity(T) + rank(T) = dim\ V$$

Central University of Haryana
ODD Semester Term End Examination April 2022
B.Tech. Program
Branch: B. Tech. (Computer Science and Engineering)
Course Code: BT CS 403   **Max Time: 3 Hours**
Course Title: Discrete Structures   **Max Marks: 70**

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks, attempt all seven sub-parts. (Each sub part carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each.

PART -I

Q. No.1   **(2 X 7 = 14)**

(a) Find the conjunction of the propositions p and q where p is the proposition "Rebecca's PC has more than 16 GB free hard disk space" and q is the proposition "The processor in Rebecca's PC runs faster than 1 GHz."

(b) What type of sentence is 5+x =9? For what value of x it will become a true statement.

(c) Show that the inclusion relation $\subseteq$ is a partial ordering on the power set of a set S.

(d) Let P (x) denote the statement "x > 3." What are the truth values of P (4) and P (2)?

(e) How many ways are there to arrange the eight letters in the word CALCUTTA?

(f) Define the term Semigroup

(g) Define tree and its properties.

PART –II

Q. No.2
(i) Define the reflexive, symmetric, and transitive closure of a relation. Let R = {(1,2), (2,3), (3,1)} and A = {1, 2, 3}, find the reflexive, symmetric, and transitive closure of R.   (7)

(ii) Design the compatible total ordering for the poset ({1, 2, 4, 5, 12, 20}, /).   (7)

OR

Q. No. 2
(i) Solve the recurrence relation $a_{n+2} - a_{n+1} - 2a_n = n^2$.   (7)

(ii) Solve the recurrence relation $a_n - 4a_{n-1} + 4a_{n-2} = 1, \forall n \geq 2 \ with \ a_0 = 0, a_1 = 1$.   (7)

Q. No.3
(i) Construct the truth table of the compound proposition $(p \vee \sim q) \rightarrow (p \wedge q)$.   (4)

(ii) Define the contrapositive of the conditional statements. Prove the theorem, "If n is an integer, then n is odd if and only if n^2 is odd.   (6)

(iii) Show that if n is a positive integer, then $1 + 3 + \cdots + (2n - 1) = n^2$ (4)

OR

Q. No 3

(i) A committee of 5 is to be formed out of 6 males and 4 females. In how many ways this can be done when (i) at least 2 females are included (ii) at most 2 females are included. (4)

(ii) What is the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades, A, B, C, D, and F? (5)

(iii) How many poker hands of five cards can be dealt from a standard deck of 52 cards? Also, how many ways are there to select 47 cards from a standard deck of 52 cards? (5)

Q. No.4

(i) Show that set of all non-zero real numbers is a group with respect to multiplication. (6)

(ii) Ex. Let $(Z, *)$ be an algebraic structure, where Z is the set of integers and the operation $*$ is defined by $n * m = maximum\ of\ (n, m)$.

    I) Show that $(Z, *)$ is a semi group. (4)

    II) Is $(Z, *)$ a monoid?. Justify your answer. (4)

OR

Q. No .4

(i) Show that the set of all strings 'S' is a monoid under the operation 'concatenation of strings'. Is S a group w.r.t the above operation? Justify your answer. (7)

(ii) Let R be a group of all real numbers under addition and R^+ be a group of all positive real numbers under multiplication. Show that the mapping $f : R^+ \longrightarrow R$ defined by $f(x) = \log_{10} x$ for all $x \in R$ is an isomorphism. (7)

Q. No.5

(i) Prove that the maximum number of vertices on level n of a binary tree is 2^n where $n \geq 0$. (4)

(ii) Define the terms (10)

    1. Spanning tree

    2. Connected and strongly connected graph

    3. In-degree and out-degree

    4. Subgraph

    5. Path

OR

Q. No.5

(i) Prove that a graph is bipartite if and only if all its circuits are of even length. (7)

(ii) A tree has two vertices of degree 2, one vertex of degree 3 and three vertices of degree 4. How many vertices of degree 1 does it have? (7)

Central University of Haryana
ODD Semester Term End Examination April 2022
B.Tech. Program
Branch: Computer Science and Engineering

Course Code: BT CS 622   **Max Time: 3 Hours**
Course Title: Unix and Linux Programming   **Max Marks: 70**

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks, attempt all seven sub-parts. (Each sub-part carries two Marks).

Question Numbers 2(two) to 5(five) carry fourteen marks each.

PART -I

Q. No.1
(a) Mention the functionality of the following commands: I) find II) ls

(b) What are shell responsibilities?

(c) Explain the following commands
 i) grep "Linux$" file1
 ii) grep "^Linux$" file1

(d) Explain any 3 network related commands.

(e) What is a pipe?

(h) What are the uses of fork() function?

(i) What is an orphan process?

PART –II

Q. No.2
(a) What is the difference between passwd and pwd?   (2)

(b) Differentiate between shell variables and environment variables and user defined variables. (6)

(c) Write a shell script to find the factorial of a number.   (6)

OR

Q. No.2
(a) With an example script explain the differences between 'while' and 'until' statements.   (7)

(b) List and explain the various meta characters available in shell programming.   (7)

Q. No.3
(a) Define grep. Write a grep command to display the lines which does not matches all the given pattern.   (6)

(b) Define the filters used in grep. Explain the following filters: i) look, ii) uniq iii) spell   (8)

OR

Q. No 3

(a) Explain the repetition operators with example.   (7)

(b) Explain the egrep with + command with example.   (7)

Q. No.4

    (a) Explain the different modes of operation of Vi editor. Write down the commands used in each mode. (7)

    (b) Write a c program that accepts two small numbers as arguments and then sums the two numbers in a child process. The sum should be returned by child to the parent as its exit status and the parent should print the sum? (7)

OR

Q. No .4

    (a) Design the static and dynamic library in Unix. Differentiate between the static and dynamic library. (5+5)

    (b) Write the syntax of the following system calls and explain with an example code.
    a.) rmdir b) mkdir (4)

Q. No.5

    (a) What are process identifiers? Mention the commands for getting different IDs of calling process. (6)

    (b) What is the difference between foreground process and background process? Explain with an example. (8)

OR

Q. No.5

    (a) Write an awk script to find the largest of 10 integers. (8)

    (b) What is the difference between cron job and batch job? (6)

Central University of Haryana
ODD Semester Term End Examination April 2022
B.Tech. Programmes
Branch: CSE
Course Code: MAT111B/A
Course Title: Mathematics- 1

Max Time: 3 hours
Max Marks: 70

Instructions:

Question Number one (PART-I) is compulsory and carries total 14 marks (Each sub
Question carries two Marks).

Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q 1. (2X7=14)

a) If $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & a \\ 2 & 1 & b \\ 2 & -2 & c \end{bmatrix}$ is orthogonal, find a, b, c and A^{-1}.

b) Show that the transformation $u = 2x + y + z;\ v = x + y + 2z;\ w = x - 2z$ is regular. Write down the inverse transformation.

c) Find the asymptotes of the curve $y^3 - 2xy^2 - x^2y + 2x^3 + 3y^2 - 7xy + 2y^2 + 2y + 2x + 1 = 0$.

d) Evaluate

$$\int_0^1 \frac{x^2}{\sqrt{1-x^4}}dx \times \int_0^1 \frac{dx}{\sqrt{1+x^4}}dx$$

e) Test the subset $W = \{(x,y)|2x - 3y = 0; x, y \in R\}$ of vector space R^2 for subspace.

f) Test the vectors $(3,0,2,2), (-1,7,4,9), (7,-7,0,-5)$ in R^4 are linear dependence or independence. In case of linearly dependent, find the relation between them.

g) If $T: R^2 \to R^2$ is defined by $T(a, b) = (a + 2, b + 3)$ is a linear transformation, then find the matrix of T in the basis $\{(1,0), (0,1)\}$.

PART –II

Q. No.2 (a) Find the non-singular matrices P and Q such that the normal form of A is PAQ where

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}.$$ Hence find its rank.

(b) Determine the values of a and b for which the system

$$x + y + z = 6$$

$$x + 2y + 3z = 10$$

$$x + 2y + az = b$$

has (i) no solution; (ii) unique solution; (iii) many solutions.

OR

Q. No.2 (a) Test for consistency of the following equations and solve them if consistent

$$x - 2y + 3t = 2$$

$$2x + y + z + t = -4$$

$$4x - 3y + z + 7t = 8$$

(b) Find the values of k for which the system of equations

$$(3k - 8)x + 3y + 3z = 0$$

$$3x + (3k - 8)y + 3z = 0$$

$$3x + 3y + (3k - 8)z = 0$$

has a non-trivial solution.

Q. No.3(a) Find a matrix P which transforms the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to its diagonal form. Hence calculate A^3.

(b) Using Gram- Schmidt process to construct an orthogonal set of basis vectors for the given vectors

$$\begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix}, \begin{bmatrix} 2 \\ -1 \\ -2 \end{bmatrix}, \begin{bmatrix} 1 \\ -1 \\ -2 \end{bmatrix}$$

OR

Q. No 3(a) Using Cayley-Hamilton theorem, find the inverse of the matrix

$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$. Express $B = A^8 - 11A^7 - 4A^6 + A^5 + A^4 - 11A^3 - 2A^2 + 2A + I$ as a quadratic polynomial in A.

(b) Find the characteristic polynomial, eigenvalues, and eigenvectors of the matrix

$$A = \begin{bmatrix} 0 & 0 & 1 & 1 \\ -1 & 2 & 0 & 1 \\ -1 & 0 & 2 & 1 \\ 1 & 0 & -1 & 0 \end{bmatrix}$$

Q. No.4 (a) Prove that the radius of curvature at any point of the asteroid $x^{2/3} + y^{2/3} = a^{2/3}$, is three times the length of the perpendicular from the origin to the tangent at that point.

(b) Find the asymptodes of the curve $x^3 + 3x^2y - 4y^3 - x + y + 3 = 0$.

OR

Q. No.4 (a) Show that

$$\Gamma(m)\Gamma\left(m + \frac{1}{2}\right) = \frac{\sqrt{\pi}}{2^{2m-1}}\Gamma(2m)$$

(b) Verify Maclaurin's theorem for

$$f(x) = (1 - x)^{5/2}$$

with Lagrange's remainder up to 3 terms when $x = 1$.

Q.No.5(a) Show that the vectors $a = (1,0,-1), b = (1,2,1), c = (0,-3,2)$ form a basis for R^3. Express each of the basis vectors as a linear combination of a, b, c.

(b) State rank-nullity theorem and illustrate it on a transformation matrix

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 1 & 1 & 3 \end{bmatrix}$$

OR

Q. No.5(a) Find the dimension of Null space, row space and column space of the following matrix of Linear transformation

$$\begin{bmatrix} 2 & 2 & -1 & 0 & 1 \\ -1 & -1 & 2 & -3 & 1 \\ 1 & 1 & -2 & 0 & -1 \\ 0 & 0 & 1 & 1 & 1 \end{bmatrix}$$

(b) Let $W = \{(1,1,1), (1,2,3)\}$ be a subset of R^3. Extend the basis of W to a basis of the whole space R^3.

Central University of Haryana
Semester Term End Examination April 2022
B.Tech. Programmes
Branch: Civil/Electrical/printing packaging
Course Code: BTAUD308A
Course Title: Environmental Studies

Max Time: 3 Hrs
Max Marks: 70

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1

(a) Give the details account of Hot Spot of Biodiversity?
(b) What is desert ecosystem discussed in details?
(c) What is rain water harvesting discussed in detail?
(d) Give the details account about environment ethics: issues and possible solutions?
(e) Define the nuclear accident with an example?
(f) Define is nitrogen cycle in environment with proper sketch?
(g) How can you move from unsustainable to sustainable development?

PART –II

Q. No.2 Define the water pollution discuss in the details with source, effect and control measure?
OR
Q. No.2 Give the details about thermal water pollution? Discuss the issues of ground water pollution with sources, effect and control measure?

Q. No.3 Define the air pollution? Give the detailed account about source, effect and control of air pollution?
OR
Q. No 3 What is the land Resources, land degradation, land slide soil erosion and desertification? Discuss the environmental factor and effects on ecosystem?

Q. No.4 What are forest resources? Give the details account about the use and over overexploitation, deforestation, how can we conserve the forest?
OR
Q. No .4 What is the minerals resources? Use and exploitation, environmental affects of mining?

Q. No.5 What is the ecosystem? Structure and functions of ecosystem? Define the energy flow in ecosystem with a model and ecological pyramid?
OR
Q. No.5 What is the food resources? Discussed the world food problems? How affect food issue to the environment and ecosystem?

Branch: Civil Engineering
Course Code: BTAUD308A   Max Time: 3 Hrs
Course Title: Environmental Studies   Max Marks: 70

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PART –II

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Branch: Civil Engineering
Course Code: BTAUD308A
Course Title: Environmental Studies

Max Time: 3 Hrs
Max Marks: 70

Instructions:
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Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

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(e)Define the nuclear accident with an example?

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Q. No.5 What is the ecosystem? Structure and functions of ecosystem? Define the energy flow in ecosystem with a model and ecological pyramid?

OR

Q. No.5 What is the food resources? Discussed the world food problems? How affect food issue to the environment and ecosystem?

Programme: BTech Civil Engineering
Semester: I
Course Title: Mechanics
Course Code: BT PHY 113 A

Max. Time: 3 Hours
Max. Marks: 70

Instructions:

1. Question Number one (PART-I) is compulsory and carries total 14 marks (Each sub Question carries two Marks).

2. Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q 1.

  a. Determine the change in acceleration due to gravity of earth at latitude 60°, if the earth stops rotating. Radius of earth is 6370 km.

  b. Define Coriolis force. How the Coriolis force affect the weather. Find the displacement due to effect of Coriolis force on a body falling vertically downward on the earth.

  c. What are the laws of mechanics? State and explain them.

  d. The Potential Energy of a body is given by: $U=(40+6x^2-7xy+8y^2+32z)$ joule. Where x,y,z are in meter. Find the force when the body is at (-2,0,5).

  e. What is rigid body. Deduce Euler equation for the motion of a rigid body.

  f. Discuss a damped simple harmonic oscillator. Derive the expression for displacement as function of time for the low, critical and over damped conditions. Draw with graphs.

  g. Explain the procedure to find forces in members of truss by using method of joints.

PART -II

Q 2. What are rectangular cartesian and spherical polar coordinates. Derive the relation between coordinates of a points in these two systems. Convert the following equation written in Cartesian coordinates into an equation in Spherical coordinates. $x^2+y^2=4x+z-2$

OR

Q 2. State Newton's law of motions. A uniform ladder of weight 800N and of length 7 m rests on a horizontal ground and leans against a smooth vertical wall. The angle made by the ladder with the horizontal is 600. When a man of weight 600N stands on the ladder at a distance 4m from the top of the ladder, the ladder is at the point of sliding. Determine the coefficient of friction between the ladder and the floor.

Q 3. Describe the transformation of displacement, velocity and acceleration vector under rotation. What do you understand by conservative and nonconservative forces. Give examples. Find whether the force $F = x^2 i + y^2 j + z^2 k$ is conservative or not.

OR

Q 3. Explain Central Forces. When a particle moves under the action of central force prove that-(i) Its motion takes place in a plane. (ii) Its angular momentum is constant. If the average distance of Mars from the Sun is 1.524 times the distance from the Earth to Sum, then determine the time period of Mars moving round the Sun.

Q 4. Discuss a damped simple harmonic oscillator. Derive the expression for displacement as function of time for the low, critical and over damped conditions and draw graph. When a body of mass 100gm is suspended from a spring it stretches the spring by 2cm. If relaxation time for the spring is 1 second, then determine the time period of damped oscillator.

OR

Q 4. State and prove the theorem of parallel axis for moment of inertia. Determine the moment of inertia of a solid cylinder about (i) an axis perpendicular to the length of the cylinder and passing through its Centre of mass and perpendicular to its length (ii) a diameter of the end face.

Q 5. State laws of friction. Define the following: (a) Limiting Force of Friction (b) Kinetic Friction (c) Co-efficient of Friction (d) Angle of Friction (e) Angle of Repose. Tania of mass 40 Kg is slipping on the frost. If the coefficient of friction acting is 0.45. Find the frictional force acting between her and frost layer?

OR

Q 5. What is a cantilever truss? How will you find out its reactions? State the assumptions made in the analysis of pin jointed trusses. How method of joint differs from the method of section in the analysis of pin jointed trusses? What is meant by perfect frame? What are the types of vibrations?

Programme: B.Tech Civil Engineering
Semester: First   **Max. Time: 3 Hours**
Course Title: Mechanics   **Max. Marks: 70**
Course Code: BT PHY 113 A

Instructions:

1. **Question Number one (PART-I) is compulsory and carries total 14 marks (Each sub Question carries two Marks).**

2. **Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.**

PART -I

Q 1.

a. Determine the change in acceleration due to gravity of earth at latitude 60°, if the earth stops rotating. Radius of earth is 6370 km.

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d. The Potential Energy of a body is given by: $U=(40+6x^2-7xy+8y^2+32z)$ joule. Where x,y,z are in meter. Find the force when the body is at (-2,0,5).

e. What is rigid body. Deduce Euler equation for the motion of a rigid body.

f. Discuss a damped simple harmonic oscillator. Derive the expression for displacement as function of time for the low, critical and over damped conditions. Draw with graphs.

g. Explain the procedure to find forces in members of truss by using method of joints.

PART -II

Q 2. What are rectangular cartesian and spherical polar coordinates. Derive the relation between coordinates of a points in these two systems. Convert the following equation written in Cartesian coordinates into an equation in Spherical coordinates. $x^2+y^2=4x+z-2$

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Q 2. State Newton's law of motions. A uniform ladder of weight 800N and of length 7 m rests on a horizontal ground and leans against a smooth vertical wall. The angle made by the ladder with the horizontal is 600. When a man of weight 600N stands on the ladder at a distance 4m from the top of the ladder, the ladder is at the point of sliding. Determine the coefficient of friction between the ladder and the floor.

Q 3. Describe the transformation of displacement, velocity and acceleration vector under rotation. What do you understand by conservative and nonconservative forces. Give examples. Find whether the force $F=x^2i+y^2j+z^2k$ is conservative or not.

OR

Q 3. Explain Central Forces. When a particle moves under the action of central force prove that-(i) Its motion takes place in a plane. (ii) Its angular momentum is constant. If the average distance of Mars from the Sun is 1.524 times the distance from the Earth to Sum, then determine the time period of Mars moving round the Sun.

Q 4. Discuss a damped simple harmonic oscillator. Derive the expression for displacement as function of time for the low, critical and over damped conditions and draw graph. When a body of mass 100gm is suspended from a spring it stretches the spring by 2cm. If relaxation time for the spring is 1 second, then determine the time period of damped oscillator.

OR

Q 4. State and prove the theorem of parallel axis for moment of inertia. Determine the moment of inertia of a solid cylinder about (i) an axis perpendicular to the length of the cylinder and passing through its Centre of mass and perpendicular to its length (ii) a diameter of the end face.

Q 5. State laws of friction. Define the following: (a) Limiting Force of Friction (b) Kinetic Friction (c) Co-efficient of Friction (d) Angle of Friction (e) Angle of Repose. Tania of mass 40 Kg is slipping on the frost. If the coefficient of friction acting is 0.45. Find the frictional force acting between her and frost layer?

OR

Q 5. What is a cantilever truss? How will you find out its reactions? State the assumptions made in the analysis of pin jointed trusses. How method of joint differs from the method of section in the analysis of pin jointed trusses? What is meant by perfect frame? What are the types of vibrations?

Course Code: BT HUM 101B/A   **Max Time:**
Course Title: ENGLISH LANGUAGE SKILLS   **Max Marks:**

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1
        (a) Complete the following passages with the most appropriate choices.
Before outsiders first visited their land they knew nothing about the (i) ---- of others or the government or the modern life. However, in the 1980s miners found gold in the region and soon thousands of miners rushed into the area which resulted in the (ii) ---- of the Yanomamis' homeland. During that time 20 % of them died due to many reasons.
i) A) existence B) effrontery C) submissiveness
ii) A) extolment B) palatability C) exploitation
        (b) Read the following sentences carefully and edit them:
(i) Communication which is one of the essential conditions of social interaction are a way of reaching others with facts, ideas, thoughts, and values.
(ii) The main objectives of horizontal communication is developing teamwork, and promoting group coordination within an organisation.
        (c) Complete the following hypothetical statements by using the appropriate forms of verbs given in brackets:
(i) When a simple coil of wire (rotate) in a magnetic field or when a magnetic field through a coil (change), the coil acts as though it had an e.m.f source in it.
        (d)Differentiate between the given pairs of words by using them in your sentences
i) principal, principle   ii) stair, stare
        (e) Make sentences on following patterns:
i) Subject +Verb + Direct Object + Indirect Object
ii) Subject + Verb+ Preposition + Prepositional Phrase
        (f) Construct the following phrasal verbs in your own sentences
i) called off   ii) well off
        (g) Read the following paragraph and write an appropriate topic sentence for it.
The image on the retina is not permanent but fades away after 1/20th of a second and overlaps the next image. This gives the impression of continuity. There is of course no film in the eye that records the images permanently as a photo film does. More importantly, the focal length of the eye lens is changed when its attached cilial muscles change their tension. When they are relaxed, the lens is thin and distant objects can be seen clearly. While looking at nearby-objects, the muscles compress the lens so as to the brain through the optic nerves. The brain interprets these signals as the sense of light

PART –II

Q. No.2 (i) Define Negotiation. Explain the qualities of a negotiator? Explain BATNA and WATNA with an example.

OR

Q. No.2 (ii) Write an essay in 500 words on "Online Education--- Boon or Bane" with a proper division of the entire essay into Introduction, Main Body 1..... 2...... 3.... And Conclusion.

Q. No.3 (i) Read the following paragraph and fill in the blanks with appropriate sentence linkers to complete it.

It is a well-known fact that when an object is dropped near the surface of the earth, it increases its speed as it falls. —1—------, freely falling objects must be accelerated toward the center of the earth. By rolling balls down inclined planes, Galileo discovered that this acceleration, which is called the acceleration due to gravity, is the same for all bodies, independent of their mass. This may be illustrated by simultaneously dropping a book of many pages and single sheet of paper, made into a compact ball, from the same height; they both hit the ground at the same instant. —2—-------, the speed, density, and shape of the object may affect this result because of air resistance and buoyancy. —3—-------, objects falling freely may eventually reach a constant velocity called the terminal velocity. —4—------, a parachutist does not accelerate continually. Once the parachute is open the drag of the air eventually balances the force of gravity and the acceleration becomes zero, producing a constant terminal velocity. The magnitude 9 of the acceleration due to gravity is approximately 9.81 m/sec. or 32.2 ft/sec. at the surface of the earth. —5—---- the acceleration due to gravity changes with the distance from the centre of the earth, it is usually considered to be constant for small changes in height near the earth's surface. —6—--------, the equations of uniformly accelerated motion may be used for objects falling through distances, which are small compared with the radius of the earth. ---7----- the effect of acceleration due to gravity cannot be felt in vacuum.

OR

Q. No 3(ii) Briefly explain seven important characteristics of Report Writing.

Q. No.4 (i) What does Lala Har Dayal mean by five circles in his book "Hints for Self Culture".

OR

Q. No .4 (ii)Discuss the magnanimous quality of Mother Teresa that compelled everyone to accept her as a saint as described in the Chapter Mother Teresa by Khushwant Singh?

Q. No.5 (i) Write a Cover Letter with a detailed **RESUME** for the given advertisement:

We are a reputed IT company looking for software professionals for our development centre at Mumbai. As a Software Engineer you must have 1 to 4 years of experience in IT organisations. MCA/Engineering graduates with extensive exposure to design, development, and testing will be preferred. Proven expertise in any one of the following is essential:

Web Technologies

Java, EJB, J2EE, JSP, Web services, SOAP, CORBA, XML, J2ME, MQ Series, Websphere, Weblogic, Netscape server.

Microsoft Technologies

VB, ASP, IIS, MTS, Crystal Reports, VC++, NET, PL/SQL, Oracle 8I/9I, SQL Server, Windows C/C++.

Multimedia

Photoshop, Illustrator, Flash, 3D Max, Premiere, Director, After Effects, Elastic Reality, Sound Forge, Dreamweaver, HTML

Please mail your résumé within ten days, stating Role and Technology in the subject line, to: career@wisetechsolutions.com.

OR

Q. No.5 (ii) Assume that you are Anil Saxena, the Purchase Manager of Alpha Engineering Company, Salt Lake City, Calcutta. Your company sent an order for 15 HP scanners (Model: Scan Jet 3200C) to

National Systems Limited, Electronics City, Hosur Road, Bangalore-560 100 on July 3, 2016, but you received only 12 scanners. Write a letter to Suresh Gautam, the GM (Sales and Marketing) of NSL making a complaint and asking him to send the remaining 3 scanners.

Central University of Haryana
ODD Semester Term End Examination April 2022
B.Tech. Programmes
Branch: B.Tech Electrical Engineering/Printing and Packaging Technology
Course Code: Programming for Problem Solving   **Max Time:3 Hrs.**
Course Title: BT CSE 104A   **Max Marks:70**

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1

   a. What do you mean by Software? Also specify the types of Software.
   b. Differentiate between Linker and Loader.

   c. What is a Token in C?

   d. Describe applications of Recursion.

   e. Discuss about Call by Reference.

   f. Write a program to find Multiplication of any two integer numbers.

   g. What do you mean by Dynamic Memory Allocation?

PART –II

Q. No.2 Write a short note on-

   i.   Disks

   ii. Processor

   iii. Memory

   iv. Operating System

OR

Q. No.2   What is Flowchart Diagram in C? Explain with the help of example.

Q. No.3   Explain various kind of Arithmetic operations available in C. Also discuss about their precedence with example.

OR

Q. No 3   Write a short note on –

   i.   Array (1-D and 2-D)

   ii. String and Character Datatypes

   iii. Functions with parameter passing in C

Q. No.4   Discuss about Pointers in C by taking an example.

<div align="center">OR</div>

Q. No .4   What is Recursion? Discuss its advantages, limitations and applications.

Q. No.5   Discuss about Dynamic Memory Allocation. Also describe calloc, malloc and realloc functions with the help of suitable example.

<div align="center">OR</div>

Q. No.5   Explain File handling in detail. Also discuss its high level functions with description.

Course Code: BT CH 102A
Course Title: Chemistry

Max Time: 3h
Max Marks: 70

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1
a. Define absolute configuration for following compounds.

b. Calculate the wavenumber in cm^{-1} for IR radiation of 10 μm.
c. What is the physical significance of wave function and square of the wave function?
d. What is meant by "Doping"?
e. Give a balanced chemical reaction for aspirin synthesis.
f. How you will differentiate between aniline and anilinium ion via λ_{max} value in UV spectroscopy?
g. What is alkalinity of water?   (7×2=14)

PART –II

Q. No.2
a. What is radial probability distribution? Express this for 1s, 2s and 2p electrons.
b. Define the followings and explain their trends in a period and a group:
   (i) Electron affinity, (ii) Electronegativity and (iii) Atomic radius
c. The basic equation which describes the standing motion of a stretched string is $\Psi = \frac{A \sin 2\pi x}{\lambda}$ in one of the direction (x-asis). Formulate wave equation from this.   (5,5,4)

OR

Q. No.2
a. What is meant by "Effective nuclear charge"? Calculate Z_{eff} experienced by a 2p electron in oxygen atom?
b. Construct the Pi-molecular orbitals in benzene.
c. Explain crystal field splitting of d-orbitals in $[FeF_6]^{3-}$ complex.   (5,4,5)

Q. No.3
a. Differentiate between Enantiomers & Diastereomers with examples.
b. Explain following reactions with two examples from each one:
   i) Reduction ii) Elimination
c. Give the pictorial presentation of conformational analysis in butane?   (5,6,3)

OR

Q. No 3
a. What is optical activity? Differentiate between optically active and inactive compounds.
b. Describe stereoisomerism in tartaric acid.
c. Discuss substitution reaction in tert-Butyl chloride with mechanistic details.   (5,4,5)

Q. No.4

a. Calculate the electrode potential of a copper wire dipped in 0.1 M CuSO$_4$ solution at 25 °C. The standard electrode potential of copper is 0.34 V.

b. Explain the use of free energy considerations in metallurgy through Ellingham diagram?

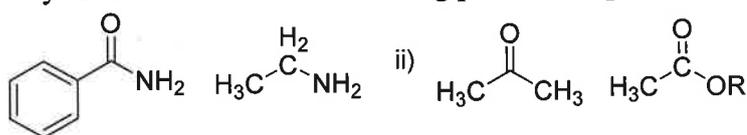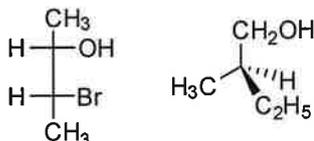c. What do you mean by "Dry and Wet corrosion"? Explain with examples.   (4,5,5)

OR

Q. No .4

a. What is the equation of state for real gas? How do you derive a real gas equation?

b. The standard emf of a cell has been found to be 0.215 V. The cell reaction involves transfer of 2 moles of electron. Calculate the standard free energy change?

c. What is Nernst Equation? Describe the application and effect of temperature on Nernst equation.   (5,4,5)

Q. No.5

a. How you will differentiate following pair of compounds from their IR spectra?

b. Draw the finer NMR spectrum (with splitting) for following compounds.

c. What is the application of UV-visible spectroscopy? Assign the λ_{max} and Epsilon (ε) values for benzene and butadiene.   (5,5,4)

OR

Q. No.5

a. What is surface characterization? Explain one technique for surface characterization. Why it is important?

b. What is IR spectroscopy? List three factors that influence the intensity of an IR absorption band?

c. Explain the principle for NMR spectroscopy. What do you understand by the term anisotropy? Explain with example?   (5,4,5)

Course Code: BT CH 102A   Max Time: 3h
Course Title: Chemistry   Max Marks: 70

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
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b. Calculate the wavenumber in cm^{-1} for IR radiation of 10 μm.
c. What is the physical significance of wave function and square of the wave function?
d. What is meant by "Doping"?
e. Give a balanced chemical reaction for aspirin synthesis.
f. How you will differentiate between aniline and anilinium ion via λ_{max} value in UV spectroscopy?
g. What is alkalinity of water?   (7×2=14)

PART –II

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c. The basic equation which describes the standing motion of a stretched string is $\Psi = \frac{A \sin 2\pi x}{\lambda}$ in one of the direction (x-asis). Formulate wave equation from this.   (5,5,4)

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b. Explain following reactions with two examples from each one:
    i) Reduction ii) Elimination
c. Give the pictorial presentation of conformational analysis in butane?   (5,6,3)

OR

Q. No 3
a. What is optical activity? Differentiate between optically active and inactive compounds.
b. Describe stereoisomerism in tartaric acid.
c. Discuss substitution reaction in tert-Butyl chloride with mechanistic details.   (5,4,5)

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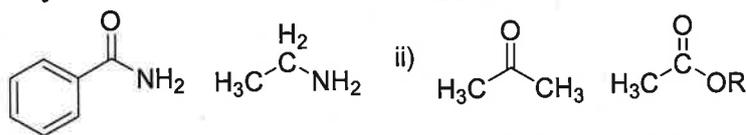c. What do you mean by "Dry and Wet corrosion"? Explain with examples.   (4,5,5)

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c. What is Nernst Equation? Describe the application and effect of temperature on Nernst equation.   (5,4,5)

Q. No.5

a. How you will differentiate following pair of compounds from their IR spectra?

b. Draw the finer NMR spectrum (with splitting) for following compounds.

c. What is the application of UV-visible spectroscopy? Assign the λ_{max} and Epsilon ($\mathcal{E}$) values for benzene and butadiene.   (5,5,4)

OR

Q. No.5

a. What is surface characterization? Explain one technique for surface characterization. Why it is important?

b. What is IR spectroscopy? List three factors that influence the intensity of an IR absorption band?

c. Explain the principle for NMR spectroscopy. What do you understand by the term anisotropy? Explain with example?   (5,4,5)

Course Code: BT PHY 117A

Max Time: 3 Hrs

Course Title: BT PHY 1st Year Semiconductor Physics

Instructions:

Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).

Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1

(a) Write a Fermi- Dirac Expression

(b) Difference between Fermi Surface and Fermi Energy

(c) What is Hall - Effect

(d) Write a Model which explain the transport properties of electrons in materials (especially metals)

(e) What is Intrinsic semiconductor

(f) What determines the colour of light

(g) What is Bloch's Theorem

PART –II

Q. No.2

Calculate the drift velocity of electrons in a metal wire of radius 10^{-4}m carrying a current of 2 Ampere. Take the concentration of electrons in the wire to be 10^{28} m^{-3}. Also calculate the value of average thermal speed of the electrons in this specimen at room temperature on the basis of kinetic theory of gases.

OR

Q. No.2

Describe the Drude and Sommerfield Model in detail.

Q. No.3

Explain in detailed the Density of States of 3D, 2D, 1D and OD materials

OR

Q. No 3

Describe Kronig-Penney Model and Energy Band Gaps in 1D Semiconductor Material

Q. No.4

What is Nanotechnology, Advantages, Disadvanatges & Applications

OR

Q. No .4 (a) Describe Spontaneous and Stimulated Emission (b) Describe Resistivity by Pour Probe method of thin – film uniform and non-uniform samples

Q. No.5

Given that the density of states related effective masses of electrons and holes in Si are approximately $1.08m_e$ and $0.60m_e$, respectively, and the electron and hole drift mobilities at room temperature are 1400 and 450 cm^2 V^{-1} s^{-1}, respectively, calculate the intrinsic concentration and intrinsic resistivity of Si.

OR

Q. No.5 (a) Describe P-N Junction. (b)An n-type Si semiconductor containing 10^{16} phosphorus (donor) atoms cm^{-3} has been doped with 10^{17} boron (acceptor) atoms cm^{-3}. Calculate the electron and hole concentrations in this semiconductor.

Course Code: BT MAT 112 B
Course Title: Mathematics-1

Max Time: 3 Hours
Max Marks: 70

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub-Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1:
(a) Apply Taylor's theorem for $f(x) = x^3 - 3x^2 + 2x$ in [0, 1/2] with Lagrange's remainder up to 2 terms.
(b) Determine the point on $f(x) = 4x - x^2$, where the curvature is maximum.
(c) Show that $\lim\limits_{x \to 0} \lim\limits_{y \to 0} f(x,y) \neq \lim\limits_{y \to 0} \lim\limits_{x \to 0} f(x,y)$, if $f(x,y) = \frac{x-y}{x+y}$.
(d) State Alternating series test. Give an example of alternating series.
(e) Find the asymptotes of the function $f(x,y) = \frac{x^2 + 3x + 2}{(x-5)^2}$

(f) Compute the value of $\frac{\Gamma(\frac{5}{2})}{\Gamma(\frac{1}{2})}$

(g) Determine the rank of the matrix $\begin{bmatrix} 1 & 5 & 4 \\ 0 & 3 & 2 \\ 2 & 3 & 10 \end{bmatrix}$

PART –II

Q. No.2: Determine the non-singular matrices P and Q such that P AQ is in the normal form for A. Hence find the rank of A, where $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$

OR

Q. No.2: Examine the series for absolute convergence or conditional convergence
$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n.2^n}$

Q. No.3: Find the values of a and b for which the system has (i) no solution (ii) unique solution (iii) infinitely many solutions for:

$$2x + 3y + 5z = 9,$$
$$7x + 3y - 2z = 8,$$
$$2x + 3y + az = b.$$

OR

Q. No 3: Evaluate the integral $\int_0^{\infty} \frac{x^2 dx}{(1+x^4)^3}$

Q. No 4: Find the extremum values of $\sqrt{x^2 + y^2}$ when $13x^2 - 10xy + 13y^2 = 72$.

OR

Q. No .4: What is the volume generated by revolving the area enclosed by the loop of the curve
$$y^4 = x(4 - x) \text{ about x-axis.}$$

Q. No.5: Diagonalize $A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ and hence find A^8. Find the modal matrix.

OR

Q. No.5: Test for convergence of the following series with $x > 0$ and whose nth term is:

$[1 \cdot 3 \cdot 5 \cdots (2n - 1) (x^{2n+1})] / [2 \cdot 4 \cdot 6 \cdots (2n) \cdot (2n + 1)]$

Central University of Haryana
ODD Semester Term End Examination April 2022
B.Tech. Programmes
Branch:
Course Code: BT PHY 117A   **Max Time: 3 Hrs**
Course Title: BT PHY 1st Year Semiconductor Physics

Instructions:

Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).

Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1

(a) Write a Fermi- Dirac Expression

(b) Difference between Fermi Surface and Fermi Energy

(c) What is Hall - Effect

(d) Write a Model which explain the transport properties of electrons in materials (especially metals)

(e) What is Intrinsic semiconductor

(f) What determines the colour of light

(g) What is Bloch's Theorem

PART –II

Q. No.2

Calculate the drift velocity of electrons in a metal wire of radius 10^{-4} m carrying a current of 2 Ampere. Take the concentration of electrons in the wire to be 10^{28} m^{-3}. Also calculate the value of average thermal speed of the electrons in this specimen at room temperature on the basis of kinetic theory of gases.

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Q. No.5 (a) Describe P-N Junction. (b)An n-type Si semiconductor containing 10^{16} phosphorus (donor) atoms cm^{-3} has been doped with 10^{17} boron (acceptor) atoms cm^{-3}. Calculate the electron and hole concentrations in this semiconductor.

Course Code: BTEE404   **Max Time: 3hrs**
Course Title: Power Generation   **Max**

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1

(a) State any four renewable sources of energy.
b) State any two disadvantages of thermal power plant.
(c) State any two types of condensers used in thermal power plants.
(d) List out advantages of disadvantages of Nuclear Power Station.
(e) What is super-heater?
(f) What is the use of cooling tower?
(g) State any two advantages of nuclear power station.

PART –II

Q. No.2
What is the working and Classifications of the boilers.
OR
Q. No.2
Describe Thermal Power Plant and Sketch the line diagram of the plant.

Q. No.3
What is Hydro plant. What are the classifications and how site is slected for it?
OR
Q. No 3
Describe about the specification and Characteristics of Hydro generator?

Q. No.4
What are the Principle of energy production by nuclear fission and Draw Schematic diagram of nuclear
power plant
     OR
Q. No .4
Describe Different types of reactors and Problems of nuclear power plants.

Q. No.5
Ellaborate Methods of determining depreciation, Straight line, Diminishing value and sinking found method.
OR
Q. No.5
Describe Commissioning and Testing of Transformers and Alternators.

Course Code: BTEE404   **Max Time: 3hrs**
Course Title: Power Generation   **Max**

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
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Course Code: **BTEE401A**   **Max Time:**
Course Title: **Logic and Sequential Circuits**   **Max Marks: 70**

Instructions:

Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1

(a) Realise the Ex-OR gate using NAND gate only.
(b) Convert $(19.75)_{10}$ in to binary.
(c) Define Edge Triggered Flip-Flop.
(d) Explain the term asynchronous. Illustrate 2-bit asynchronous binary counter.
(e) Describe the working of a NOR gate S-R Latch.
(f) Describe operation of bi-directional shift register.
(g) Subtract $(11100)_2$ from $(10011)_2$ using 2's complement method.

PART –II

Q. No.2 With the help of suitable illustrations, describe the PMOS, NMOS and CMOS logic gates. Explain the working of CMOS NAND and NOR gates. What are the advantages of CMOS logic?

OR

Q. No.2 Explains the error detecting and correcting code system and constructs the Hamming Code for BCD **0110** by using even parity.

Q. No.3 Simplify the given function using K-map method and realise the Boolean expression using suitable logic gates:

$$Y(A, B, C, D, E) = \sum m\,(\,3, 6, 7, 8, 10, 12, 14, 17, 19, 20, 21, 24, 25, 27, 28)$$

OR

Q. No 3 Simplify the given Boolean function using Quine Mc-Cluskey method and realise the Boolean expression using suitable logic gates:

$$Y = \sum m\,(0, 1, 3, 7, 9, 11, 15)$$

Q. No.4 Design a 3 bit binary UP/DOWN counter with a direction control M and JK Flip Flop.

OR

Q. No .4 Design natural binary sequence mod-8 synchronous counter using D-Flip Flops?

Q. No.5 State the basic process of ADC and explain Successive-approximation of A/D converter in detail.

OR

Q. No.5 Write brief note on followings:

(a) A/D converter using Voltage to frequency conversion
(b) A/D converter using Voltage to time conversion

Course Code: BT EE 103A   **Max Time: 3 Hours**
Course Title: Basic Electrical Engineering   **Max Marks: 70 marks**

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1 Explain the following:-   (2X7=14)

(a) Thevenin and Norton Theorem with circuit diagram
(b) Average, RMS, Form factor, Peak factor of 1-phase AC circuit
(c) Principle of operation of DC motor
(d) Mathematical eq. of Phase and Line current, Phase and Line voltage in star connection 3-phase supply
(e) Techniques of Power factor improvement
(f) Explain the condition of Ideal Transformer
(g) Explain the classification of DC generators

PART –II

Q. No.2 Drive Star to Delta transformations for DC circuit with proper diagrams. Find current I in the network shown in Fig (i) using star-delta transformation.   (1X14=14)
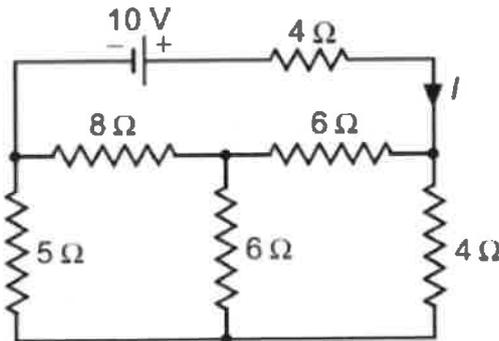

Fig. 1
OR

Q. No.2 A balanced delta connected load of (8+j6) ohm per phase is connected to a 3 phase 230 volt, 50 Hz AC supply. Find 1) Phase current 2) Line current 3) Power factor 4) Active power 5) Reactive power 6) volt- amp.

Q. No.3 Explain the open and short circuit test of transformer? What are the different types of losses in transformer? Write it mathematical equation.   (1X14=14)

OR

Q. No 3 Explain the working principle of Single phase transformer? Draw the phasor diagram of transformer on load and on no-load? Drive an expression for condition for maximum efficiency of a single phase transformer.

Q. No.4. A 4 pole, DC shunt motor takes 22A from 220 V supply. The armatures and fields resistance are 0.5 ohm and 100 ohm respectively. The armature is lap connected with 300 conductors. If the flux per pole is 20mWb. Calculate 1) speed 2) Torque   (1X14=14)

OR

Q. No .4 Explain with diagrams and equations the construction and working of 3-phase induction motor and synchronous
generators.

Q. No.5 Explain Resonance in Series and Parallel AC circuits with appropriate diagrams. A coil of resistance 40 ohms and inductance 0.75 H forms a part of a series circuit for which resonance frequency is 55 Hz in Fig. (iv). If supply is 250 V, 50 Hz, find (i) line current, (ii) power factor, (iii) power consumed and (iv) voltage across the coil.   (1X14=14)
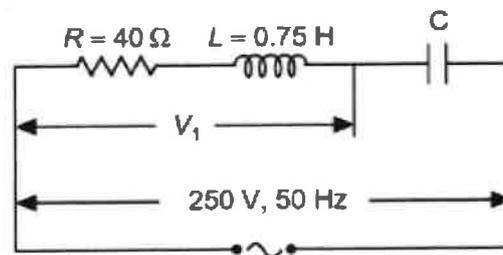

Fig 2

OR

Q. No.5 Explain the concept of earthing and Grounding in electrical installations with diagram. Also explain types of wires and cables as components of LT Switchgear. Explain following terms 1) MCB 2) MCCB 3) ELCB

Course Code: BT EE 103A   **Max Time: 3 Hours**
Course Title: Basic Electrical Engineering   **Max Marks: 70 marks**

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. No.1 Explain the following:-   (2X7=14)

(a) Thevenin and Norton Theorem with circuit diagram
(b) Average, RMS, Form factor, Peak factor of 1-phase AC circuit
(c) Principle of operation of DC motor
(d) Mathematical eq. of Phase and Line current, Phase and Line voltage in star connection 3-phase supply
(e) Techniques of Power factor improvement
(f) Explain the condition of Ideal Transformer
(g) Explain the classification of DC generators

PART –II

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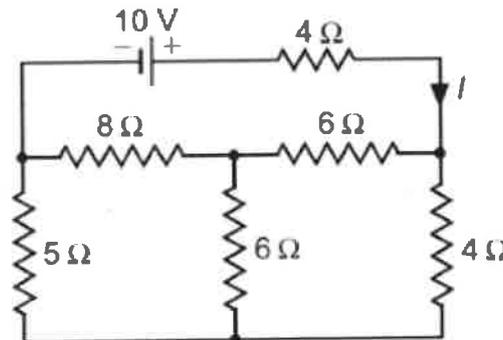

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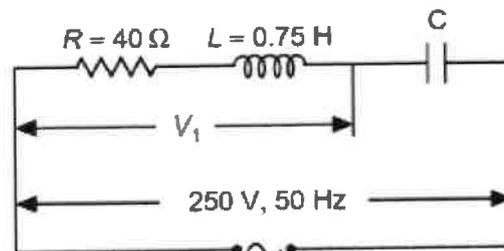

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Course Code: EE328A   Max Time: 3hrs.
Course Title: Digital Control System   Max Marks: 70

Instructions:
Question Number **one (PART-I)** is compulsory and carries total 14 marks (Each sub Question carries two Marks).
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

PART -I

Q. 1   (7×2=14)
(a) Explain basic building blocks of the digital control system. Show its advantages over analog control system.
(b) Explain Data Acquisition, Conversion, and Distribution Systems.
(c) For the following analog signal, find the Nyquist sampling rate, also determine the digital signal frequency and the digital signal.

$$x(t) = 3\cos(70\pi)t$$

(d) Explain sampling Effect in Frequency Domain. Also explain Anti Aliasing Filter.
(e) Explain in detail about Quantizer with required expressions.
(f) Explain Digital-to-Analog (D/A) Conversion point wise.
(g) State whether the following signals are discrete or continuous.
  (i) Elevation contours on a map
  (ii) The score of basketball game
  (iii) signals leaving or entering the CPU of a computer.

PART –II

Q. No.2 (a) Obtain the inverse z-transform of the function using Partial Fractions

$$u(k) = \begin{cases} 1, & k \geq 0 \\ 0, & k < 0 \end{cases}$$

OR

Q. No.2 (b) Solve the linear difference equation

$$x(k+2) - \frac{3}{2}x(k+1) + \frac{1}{2}x(k) = 1(k)$$

With initial conditions $x(0)=1$, $x(1)=5/2$

Q. No.3 The transfer function of the plant is
                    (s+2)/[s(s+1)].
Determine the characteristics of a digital controller (in the difference equations form) such that the response of the system to a unit step function will be c (t) = 5(1-e⁻ᶻᵗ)u(t). The sampling period is 1 s. Use the following table of Laplace and z transforms.

Time function	Laplace transform	Z transform
u (t)	1/s	z/(z-1)
t	1/s²	zT/(z-1)²
e⁻ᵃᵗ	1/(s+a)	z/(z-e⁻ᵃᵀ)

OR
Q. No 3 A discrete –data system is described by the difference equation
$$c(k+2) + 5c(k+1) + 3c(k) = u(k+1) + 2u(k)$$
where u (k) is the reference input and c(k) is the output. Show that the state equation of the system is:

$$x(k+1) = \begin{bmatrix} 0 & 1 \\ -3 & -5 \end{bmatrix} x(k) + \begin{bmatrix} 1 \\ -3 \end{bmatrix} u(k)$$

Assume zero initial conditions and describe the technique used to arrive at the above equation.

Q. No.4 Find the z-transfer function of an armature-controlled DC motor.
OR

Q. No .4 A closed-loop control system must be designed for a damping ratio of about 0.7, and an undamped natural frequency of 10 rad/s. Select a suitable sampling period for the system if the system has a sensor delay of 0.02 sec.

Q. No.5 Obtain the parallel realization for the transfer function:

$$G(z) = \frac{2z^2 + 2z + 1}{z^2 + 5z + 6}$$

OR

Q. No.5 Determine the observability and detedtability of the system

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \\ x_3(k+1) \end{bmatrix} = \begin{bmatrix} 2.0 & 4.0 & 2.0 \\ -1.1 & -2.5 & -1.15 \\ 2.6 & 6.8 & 2.8 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \\ x_3(k) \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 0 & 1 \end{bmatrix} u(k)$$

$$y(k) = \begin{bmatrix} 2 & 10 & 3 \\ 1 & 8 & 3 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \\ x_3(k) \end{bmatrix}$$

Central University of Haryana
ODDSemester Term End Examination April 2022
B.Tech. Programmes
Branch: Electrical Engineering
Course Code: EE328A   Max Time: 3hrs.
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