3. (a) Find the general solution in positive integers of
\[ \frac{1}{x} + \frac{1}{y} = \frac{1}{2} \]
only if \( a \equiv 1 \pmod{4} \) and \( a \equiv 1 \pmod{4} \).

(b) If \( x, y, z \) are non-zero integers, then \( (a, m) = (a, n) = 1 \) if and only if
\[ \frac{1}{x} + \frac{1}{y} = \frac{1}{2} \]
digits is divisible by 9.

2. (a) Show that a number is divisible by 9 if the sum of its

Section I

1. \[ \frac{\log 2 + \log \sqrt{1 + \frac{1}{n}}}{\log 2 + \log (n + 1)} \]

(e) Prove that \( \log 2 \frac{1}{n} + (n + 1) \)

3. (a) Find all possible values of \( m \) which satisfies \( m = 23 \).

(b) Find a such that \( a \equiv 7 \pmod{5} \).

(c) (n - 1) is divisible by 6.

1. (a) Prove that \( n \) is an integer, the product \( n \) is divisible by 6.

Compulsory Question

Each section Question No. 1 is compulsory.

Note: Attempt two questions in all sections one question from

Maximum marks: 27

Time allowed: 3 hours

Number Theory and Trigonometry

PAPER BM-121

MATHEMATICS

CSE M-16
\[ \begin{align*}
\frac{z^n}{\sin \theta + i \cos \theta} &= 1 \\
\text{Hence deduce the expression of } \tan \theta \\
\log \left( \frac{z + x - 1}{x} \right) &= \log \left( \frac{z}{x} + 1 \right) \\
\tan \theta &= \frac{z + x}{1 + x} \\
\tan \theta &= \frac{x - z}{1 - x}
\end{align*} \]

Section I-IV

(3)
Section 1

1. Write solution of exact differential equation.
   (c) Ordinary Differential Equation
   
   Paper-BM-I22
   
   Mathematics
   
   CSE-M-16
   
   Time allowed: 3 hours

   Max. marks: 26

   Printed Pages: 3

   Roll No.
\[
\begin{align*}
\frac{d^2 z}{dx^2} + \lambda z &= 0 \\
\frac{d}{dx} \left( \frac{dz}{dx} \right) &= -\lambda z \\
\frac{d}{dx} \left( \frac{dz}{dx} \right) &= -\lambda z \\
\frac{dz}{dx} &= \lambda z \\
\int \frac{dz}{\lambda z} &= \int dx \\
\ln |z| &= \lambda x + C_1 \\
|z| &= e^{\lambda x + C_1} \\
|z| &= e^{\lambda x} \cdot e^{C_1} \\
|z| &= C_2 e^{\lambda x}.
\end{align*}
\]

**Section II**

1. Obtain the complete primitive and the singular solution.
2. Solve: \( x + \lambda z = \frac{\frac{dx}{\lambda p}}{\lambda z - \frac{\frac{dx}{\lambda p}}{\lambda z}} \).

**Section III**

1. Solve: \( \frac{dz}{dx} + \lambda z = 0 \).
2. Solve: \( \frac{dz}{dx} = -\lambda z \).
3. Solve: \( \frac{dz}{dx} = -\lambda z \).
4. Solve: \( \frac{dz}{dx} = -\lambda z \).
5. Solve: \( \frac{dz}{dx} = -\lambda z \).
6. Solve: \( \frac{dz}{dx} = -\lambda z \).

**Section IV**

1. Show that the system of conical cones is self-orthogonal.
2. Apply the method of variation of parameters to solve the equation.
3. Solve: \( \frac{dz}{dx} = -\lambda z \).

**Section V**

1. Solve: \( \frac{dz}{dx} = -\lambda z \).
2. Solve: \( \frac{dz}{dx} = -\lambda z \).
3. Solve: \( \frac{dz}{dx} = -\lambda z \).
4. Solve: \( \frac{dz}{dx} = -\lambda z \).
5. Solve: \( \frac{dz}{dx} = -\lambda z \).
6. Solve: \( \frac{dz}{dx} = -\lambda z \).
Turn over

4
If \( p \equiv 0 \pmod{p} \), then prove that \( p \) is a prime number.

4
2
Recall and prove Fermat's Little Theorem.

4
3.
Solve the congruence \( 15 \equiv 22 \pmod{21} \).

4
2
Find the \( \phi \) of \( 858 \) and \( 325 \), and express \( \phi \) in the form \( 858 + m \cdot 325 \).

Section 1

2
Show that 

\[
\log (1 + \cos 2\theta + \sin 2\theta) = \log (2 \cos \theta + i \theta).
\]

2
Prove that \( \cos^2 x - \sin^2 x = 1 \).

1
If \( \phi \) is a prime number and \( a \) is any number, then either

(a) \( a \) divides \( \phi \) or \( a \) is co-prime to \( \phi \).

Note: Attempt five questions in all, selecting one question from each section.

Maximum marks: 150

Time allowed: 3 hours

Number Theory and Trigonometry

MATHEMATICS

PAPER-BM-121

MATHS / M-16

Prime Pages: 3

Roll No.: 1452
8. (a) Express \[ \log (\cos \theta + i \sin \theta) \] in the form \( A + iB \).

Section IV

\[ a \]

5. \[ \frac{\lambda}{z} \sin \left( \frac{\lambda}{z} x \right) = \frac{\lambda}{z} \cos \left( \frac{\lambda}{z} x \right) \]

Show that \( IJ = x + i y \), where \( x \) and \( y \) are real. Find \( z \) and \( x + y = z = z \).

6. (a) \[ \cos \theta \sin \theta \sin 180^\circ \theta = 0 \]. Prove that:

\[ \frac{z}{z+i} \]

Section III

7. (a) Show that if \( z \) is a quadratic non-residue of \( \mathbb{Q} \), then \( \lfloor \frac{u}{x} \rfloor = \lfloor \frac{u}{[x]} \rfloor \).

8. (a) If \( x \) is any real number, then there exists a positive integer \( n \) such that \( x \leq n \leq 2x \). Find the least positive integer \( n \) such that

\[ \frac{u}{x} \leq 1 \]
Section I

2. (a) Show that the D.E.

\[ 2y = x \] is exact.

2. (c) Find the complementary function of the differential equation.

1. (a) Define exact differential equation.

1. (g) Solve \( y' = \tan(px - y) \).

Section I

Each section question No. 1 is compulsory.

Note: Attempt five questions in all sections. One question from each section.

Maximum marks: \( 2 \times 5 = 10 \)

Ordinary Differential Equation

Paper-MA-122

MATHEMATICS

GSE / M-16

Page 1453
Given that $x = y \neq 0$ is a part of solution

\[ \frac{x}{\lambda x} \frac{dx}{dp} + \frac{z}{\lambda z} \frac{dz}{dp} = 0 \]

6. (a) Solve the D.E.

7. (b) Solve the D.E.

8. (a) Solve the D.E.

Section-I

Solve the D.E. by the method of variation of parameters:

\[ \text{Sec} \, x = \sec \lambda x \]

9. (a) Solve the D.E. by changing the independent variable.

\[ 0 = x \sin \lambda x - \frac{x}{\lambda x} \frac{dx}{dp} \cos \lambda x + \frac{z}{\lambda z} \frac{dz}{dp} \]

10. (a) Solve the D.E.

11. (a) Solve the D.E.

(2)
Section 1

2. (a) If \( \mathbf{a}, \mathbf{b}, \mathbf{c} \) are three vectors such that \( \mathbf{a} \times \mathbf{b} = \mathbf{c} \)
and

2. (b) Show that \( \mathcal{F}' = \mathcal{F} \), \( \mathcal{H}' = \mathcal{H} \), \( \mathcal{D}' = \mathcal{D} \).

2. (c) If \( \mathbf{v} \) is a constant vector and \( \mathbf{w} \times \mathbf{v} = 0 \), prove that

2. (d) Find the unit tangent vector \( \mathbf{T} \) at \( t = 1 \) on the curve \( \mathbf{x} = t - 1, y = t^2 - 3, z = 2t - 6, 0 \leq t \leq 1 \).

1. (a) Prove that \( [\mathbf{a} \mathbf{b} \mathbf{c}] + [\mathbf{a} \mathbf{c} \mathbf{b}] = [\mathbf{b} \mathbf{a} \mathbf{c}] + [\mathbf{c} \mathbf{a} \mathbf{b}] \).

Note: Attempt five questions in all. Select one question from each section. Time allowed: 3 hours.

Maximum marks: B.Sc. 40
with vertices (0,0,0), (x,z), (y,z), (0,2).

Prove that in an orthogonal curvilinear coordinate system, the following function from spherical to Cartesian:

\[ f = \rho \sin \phi \cos \theta + Z \cos \phi \sin \theta + r \cos \theta + t \f, \]

where \( \theta \) is a constant vector and \( f = \mathbf{e} \times \mathbf{f} \) proves that

\[ \nabla \times \mathbf{f} = 0. \]
Complimentary Question

All worded Log tables may be asked for.
Use of scientific (non-programmable) calculator is allowed. Selecting one question from each unit will.

Note: Question No. 1 is complimentary. Four more questions are

Maximum marks: 40

Time allowed: 3 hours

Properties of Matter and Kinetic Theory of Gas

Paper I

PHYSICS

CSE/MA-16
Unit—I

1. Find the specific heat of a gas at constant pressure and the relation between its temperature and volume.
2. Calculate the mean free path of a molecule at a given temperature and pressure.
3. Define the mean free path of a molecule and its significance in gas behavior.
4. State the basic principles of the kinetic theory of gases and derive the expression for the pressure exerted by a perfect gas.
5. Define the concept of mean free path and its relation with temperature and pressure.
6. State the ideal gas law and derive its expression.
7. Define the concept of specific heat capacity of a gas and its significance in gas behavior.
8. State the basic principles of the kinetic theory of gases and derive the expression for the pressure exerted by a perfect gas.
9. Define the concept of mean free path and its relation with temperature and pressure.
10. State the ideal gas law and derive its expression.

Unit—II

1. The density of hydrogen is 0.0896 kg/m³, and the density of helium is 0.178 kg/m³. Density of helium is 1.3 x 10⁻³ kg/m³. Density of hydrogen is 0.0896 kg/m³. Density of helium is 0.178 kg/m³. Density of helium is 1.3 x 10⁻³ kg/m³. Density of hydrogen is 0.0896 kg/m³.
2. The speed of sound in a gas is 340 m/s. The speed of sound in a gas is 340 m/s. The speed of sound in a gas is 340 m/s. The speed of sound in a gas is 340 m/s.
3. Define the concept of mean free path and its relation with temperature and pressure.
4. State the basic principles of the kinetic theory of gases and derive the expression for the pressure exerted by a perfect gas.
5. Define the concept of mean free path and its relation with temperature and pressure.
6. State the ideal gas law and derive its expression.
7. Define the concept of mean free path and its relation with temperature and pressure.
8. State the basic principles of the kinetic theory of gases and derive the expression for the pressure exerted by a perfect gas.
9. Define the concept of mean free path and its relation with temperature and pressure.
10. State the ideal gas law and derive its expression.
Turn over

5

Sketch the $V-I$ characteristics of a $p$-junction and discuss

(b)

$W = 1300 \text{ cm}^2 / A - S$

conduction is 300 $\text{S/cm}$. Given $W = 1.5 \times 10^{-7} \text{ cm}^2$,

- $n$-type semiconductor at room temperature. If the

find the concentration of holes and electrons in a

Unit 1

deminal semiconductors?

How compound semiconductors are much better than

amplifiers though it reduces gain considerably?

Why we deliberately use negative feedback loops in

impedance?

Why emitter follower amplifier has high input

(c)

In general, LED is not able to feed SI. Why?

Each student is expected to answer

Note: Attempt five questions in all. Select any five questions from

Maximum marks : 40

Time allowed : 3 hours

Semiconductor Devices

Paper II

PHYSICS

GSE- M-16

1458

1458

Prime Page:

Printed Page:

Refill No.
Described in detail, the principle and working of a CRO.


Also determine its

Unit I

3. Open loop gain v of amplifier and feedback fraction.

Feedback should not vary more than 2% when feedback is introduced into the amplifier. When feedback changes by 20%, and the gain with feedback is 10 times the gain without feedback, feedback is so large that feedback cannot be used in practice. Are there any feedback amplifiers with a feedback of 100.

5. Is it possible to reduce distortion levels using negative feedback?

List the advantages and disadvantages of negative feedback.

4. Explain the reasons behind the limited bandwidth of such a circuit.

And highlight the importance of various components connected in series.

Draw the circuit diagram of a two stage RC-coupled amplifier.

Unit II

3. Point

Determine its operating point.

R_v = 5K and R_l = 790 K. Determine its operating point used in feedback amplifier circuit with V = 16V. V = 0 and V = 0.

4. Sketch the wave forms of the voltage across the 20 KΩ.
How does band model theory explain the metallic character?

2. Explain extrinsic and intrinsic semiconductors.

2. Describe briefly dipole-dipole forces.

2. Explain with example.

2. What is intermolecular hydrogen bonding? Explain with example.

Section-A

1. Why is carbonium ion give its use?

1. Why ClF is used in refrigerations?

1. Define carbonation.

1. What is the reaction by which first noble gas compound was discovered?

1. Write the formula of hydride, oxide and hydroxide.

1. Why sodium metal is kept under drosene?

1. Why NH has higher boiling point than PH3?

Compulsory:

Each from Section-A and Section-B. Question No. 1 is

Note: Attempt five questions in all. Selecting two questions

Time allowed: 3 hours

Maximum marks: 32

Inorganic Chemistry (Theory)

Paper-1V CH-104

CHEMISTRY

CSE / M-16

PREVIEW

ROLL NO

PAGE NO

1459
2. Why do Cl₂ and Br₂ differ?

3. What are Cl₂? How do Al₄ and CaCl₂ differ?

4. Why is N₂ a weaker Lewis acid than BCl₃ and BF₃?

5. Discuss the structure of Borazine

Section B

6. (a) Name any four oxides of sulphur.

(b) Write a balanced equation for the reaction of Na₂O with H₂O.

(c) Draw the structure of Na₂O.

(d) Draw the structure of Na₂O₃.

(e) Which is the strongest acid among HCl and HBr?

(f) Which is the strongest hydride between HCl and HBr?

(g) How do AlCl₃ and SiCl₄ differ?

(h) Why do HCl and HBr differ in their boiling points?

(i) Why are the halogen compounds more reactive than the noble gas compounds?

(j) Why do Cl₂ and Br₂ differ in their properties?

(k) Why do Cl₂ and Br₂ differ in their chemical reactions?

(l) Why do Cl₂ and Br₂ differ in their physical properties?

(m) Why do Cl₂ and Br₂ differ in their reactivity?

(n) Why do Cl₂ and Br₂ differ in their solubility in water?

(o) Why do Cl₂ and Br₂ differ in their toxicity?

(p) Why do Cl₂ and Br₂ differ in their flammability?

(q) Why do Cl₂ and Br₂ differ in their electrical conductivity?

(r) Why do Cl₂ and Br₂ differ in their magnetic properties?

(s) Why do Cl₂ and Br₂ differ in their thermal conductivity?

(t) Why do Cl₂ and Br₂ differ in their refractive index?

(u) Why do Cl₂ and Br₂ differ in their specific heat capacity?

(v) Why do Cl₂ and Br₂ differ in their latent heat of fusion?

(w) Why do Cl₂ and Br₂ differ in their latent heat of vaporization?

(x) Why do Cl₂ and Br₂ differ in their thermal expansion coefficient?

(y) Why do Cl₂ and Br₂ differ in their solubility in organic solvents?

(z) Why do Cl₂ and Br₂ differ in their solubility in water?

{\text{4. (e) Which is the strongest acid among HCl and HBr?}}
Turn over

3. Explain transition state theory. Give advantage of this theory.
2. Complete the following half life time:

\[ \text{Show half time taken for 99.9\% of first order reaction to} \]

4. Derive integrated rate equation for second order reaction.

Section A

Electrolyte

Write Debye-Hückel Osmotic equation for strong

0.02 M solution. Calculate the equivalent conductivity

Specific conductance of 0.12 M solution of an electrolyte is

What is the unit of equivalent conductance?

Define cell constant?

What are Arrhenius equation?

Give one example of pseudo unimolecular reaction?

What is the unit of first order reaction?

1. Define rate of reaction?

From each section Question No. 1 is compulsory.

Note: Attempt five questions in all, selecting two questions

Maximum marks: 32

Time allowed: 3 hours

Physical Chemistry

Paper-V, CH-105

CHEMISTRY

CESE WI16

1460
Section A

9. What is the basic principle of conduction through a liquid? Explain the relation of molecular conductivity with conduction for strong and weak electrolytes.

10. Describe the model of conduction. Calculate the mobility of sodium ions and predict the nature of conduction cell as unipolar. What are the main principles of Arrhenius theory?

11. Derive the equation for the concentration of reactants and products. How do you understand by electrochemical theory?

12. Define Kohlrausch's law and explain its three applications.

Section B

13. What is the characteristic of first order reaction?

14. Explain the collision theory for homogeneous reaction.

15. Calculate the activation energy of reaction whose reaction rate at 300 K is double for 10^6 times in temperature?

16. Explain the factors which affect the rate of reaction and why rate of reaction becomes double with every 10° rise in temperature?
Organic Chemistry

Paper-VI-CH-106

CHEMISTRY

GSE/M-16

I. Write the IUPAC names of the following compounds:

(a) CH₂=CH₂
(b) CH₃CH₂OH
(c) CH₃CO₂H

II. A mixture of ethene and ethane is more reactive towards electrophilic addition reaction.

(a) Which of the two is more reactive?
(b) Why is there a difference in reactivity?

III. Define the following:

(a) Electrophilic addition reaction
(b) Stereoisomerism
(c) Constitutional isomerism

IV. Which of the two above reactions is more important in organic chemistry?

(a) Electrophilic addition reaction
(b) Electrophilic substitution reaction

V. Write balanced equations for the following reactions:

(a) CH₃CO₂H + NaOH → CH₃CO₂Na + H₂O
(b) CH₃CH₂OH + O₂ → CH₃CHO + H₂O

VI. Discuss the stereochemical displacement mechanism for 

(a) Alkylation
(b) Halogenation

VII. Write all possible isomers for the compound RCH₃.
1. Explain the reaction affecting the occurrence and rates of

\[ \frac{CH_2Br}{CH_2Br} \leftarrow \frac{CCH_4}{CCH_4} \]

\[ \frac{CH_2C_{18}H_{35}}{CH_2C_{18}H_{35}} \]

2. Complete the following reactions:

\[ CH + CH \rightarrow C + H \]

3. Give the elimination addition mechanism of conversion of

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]

4. Explain why 1°-alkanes undergo both 1,2 and 1,4

Section B

5. Predict the principal mononuclear products of the

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]

6. Give one example of each

\[ C = C \]

7. When are aromatic and non-aromatic

\[ H_2C = CH_2 \]

8. Explain the following series of alkenes in decreasing order

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]

9. Give the reason for your answer

\[ H_2C = CH_2 \]

10. Draw the following reactions:

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]

Section C

11. Explain the mechanism of dehydration of alcohols to form

\[ CH + CH \rightarrow C + H \]

12. In the above symmetrical Friedel-Crafts reaction, predict

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]

13. Draw the following reaction and support your answer

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]

14. Explain the following reaction:

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]

15. Explain the mechanism of hydration of aldehydes.

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]

16. Give the reason for your answer

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]

Section V

17. Arrange the following in order of decreasing reactivity

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]

18. How was it modelled?

\[ CH_2C_{18}H_{35} \rightarrow CH_2C_{18}H_{34} \]
When does the party remain the reader of?

When does the party remain with Whitten when?

Name the essay and its author.

For the extract from the American Union was worth bringing and playing

that prescription the American Union was worth bringing and playing

the word Whitten had been strongly in favor of the committee. Peeling

for Whitten had been strongly in favor of the committee. Peeling

is bringing and playing with the occasion. At the onset of the

is growing and playing with the occasion. At the onset of the

game of compassion, training readers of how to present

game of compassion, training readers of how to present

more points based on this first hand knowledge of politicals

more points based on this first hand knowledge of politicals

Whitten Whitten, better known as a finished piece of self-declaration.

Whitten Whitten, better known as a finished piece of self-declaration.

1. What is the word in the passage means same.

2. When would he receive every week?

3. When was the mention of the writer?

4. What are we Indians good at?

5. Name the essay and its author.

Note: Answer all questions.

Maximum marks: 10

Time allowed: 3 hours

ENGLISH

CSE / M-16

Page No.

1462
6. Read the following passage and answer the questions that follow.

(For Non-Indian Students only)

In India, the government is taking steps to eradicate child labor. The government has introduced new laws to protect children from exploitation. The new laws require employers to pay a fair wage and provide education to children. The government also provides subsidies to families with children. These laws have helped to improve the lives of many children in India.

(a) What is the main argument of the essay?
(b) What are the benefits of the new laws?
(c) How have the lives of children changed under these new laws?

5. Translate the following passage into Hindi:

The government is working to improve the lives of children in India. It has introduced new laws to protect children from exploitation. These laws require employers to pay a fair wage and provide education to children. The government also provides subsidies to families with children. These laws have helped to improve the lives of many children in India.

4. Match the following sentences:

(a) What are the major causes of our current situation according to CBN?
(b) What is the difference between the two types of learning?
(c) What is the difference between the two types of learning?
(d) What is the difference between the two types of learning?

3. Read the following passage and answer the questions that follow.

In India, the government is taking steps to eradicate child labor. The government has introduced new laws to protect children from exploitation. The new laws require employers to pay a fair wage and provide education to children. The government also provides subsidies to families with children. These laws have helped to improve the lives of many children in India.

(a) What is the main argument of the essay?
(b) What are the benefits of the new laws?
(c) How have the lives of children changed under these new laws?

2. Explain in your own words what you have learned in the previous unit.

(a) What did you learn in the previous unit?
(b) What will you do to improve your understanding of the topic?
Unit I

1. Discuss Alternation of Generations with reference to the life cycle of Marchantia.

2. Write briefly about the reproduction of Marchantia.

3. What is Chromatic Fusion?

4. What are Syndetic and Syngamy?

5. Define the term Protonema.

6. What are the similarities and differences between elaters and pseudo-elaters?

7. Propositions are amphibious of plant kingdom, justify.

Compulsory Question

Note: Attempt five questions in all, selecting two from each.

Maximum marks: 40

Time allowed: 3 hours

Diversity of Archaeplastids

Paper 1

BOTANY

GSE / M-16

Roll No.
8. Help with suitable diagrams.

9. Discuss briefly the biological cycle of a (fern) studied by you with the

L.T. of Excisionus.

10. Sketch the diagram on the sheet required.

8. Write the following:

(a) Rhizome of Selaginella

(b) Rhizome of Equisetum

(c) Rhizome of Pteridophyta

8. Write brief notes on:

Unit II

8. Advanced sporophytes: Comment.

Antheridia present a combination of primitive and

8. Pronotum of Pteridophyta

8. Economic importance of Pteridophytes

4. Ethnobotanical uses of: (2)
The help of suitable cross. Explain it with a suitable example.

4. What do you mean by principle of segregation? Explain it with an example.

5. Give an account of replication of eukaryotic DNA. What is the enzymes involved in the DNA replication process? Explain the roles of different enzymes involved in the DNA replication process.

Unit I

1. Write short answers to the following:

1. Operation model
2. Induced mutations
3. Linkage groups
4. Dihybrid cross
5. Replicate DNA
6. Universality of genetic code
7. DNA proof reading
8. Translation

Note: Attempt five questions in all, selecting two questions from each unit. Question No. 1 is compulsory (short answer type).

Time allowed: 3 hours

Maximum marks: 40

Genetics
Paper-II
BOTANY
CSE / M-16

1466

Printed Pages: 2

ROLL No. ..............
5. What are the two means by which the expression of genes can be modified? How do they interact to modify gene expression?

6. Write short notes on the following:
   (a) DNA damage and repair
   (b) Gene expression and regulation

8. Give brief account of the following:
   (a) Protein structure
   (b) Gene expression in eukaryotes

9. Write short note on the following:
   (a) Functions of physical DNA
   (b) Physical properties
Unit-I

3. Draw the circuit diagram of a transistor amplifier using a bipolar junction transistor.
4. What is the function of collector and emitter in a transistor? Explain.
5. Define the concept of gain in a transistor amplifier. Explain.
6. What is the difference between common emitter and common base configurations?

Unit-II

3. Define the concept of feedback in a circuit. Explain.
4. What is the expression for the stability factor for the circuit?
6. What do you understand by transistor biasing? Why is it important?

Compulsory Questions

Each unit question No. 1 is compulsory.

Note: Attempt five questions in all, selecting one question from each unit.

Time allowed: 3 hours
Maximum marks: 40

Paper-I

ELECTRONIC DEVICES AND CIRCUITS

GSE / M-16

Printed Pages: 2
Roll No. 1471
How can a JFET act like a voltage-controlled resistor?

Draw and explain CS and CD low frequency model of N-channel MOSFET in depletion mode.

Explain the construction and working of a JFET.

Unit I-

Zero impedance. capacitor alone and assume other capacitances to have R-C coupled transistor amplifier due to emitter's phase. Derive the expression for the lower cutoff frequency of the circuit which effects bandwidth. What do you mean by bandwidth of an amplifier? Explain.

Explain the transistor coupling amplifiers. Explain the frequency response curve of R-C coupled amplifier.

Unit III-

Explain emitter bias circuit using n-p-n transistor.

Gain in dB (decibels of gain of stages are 60, 100 and 160). Calculate the overall gain of amplifier consists of three stages. The voltage amplifier Q point. Why does the voltage divider bias circuit have a very emitter voltage. Then discuss the steps in calculating the collector.

Draw the voltage divider biasing circuit for n-p-n transistor.
The given circuit:

1. Obtain the equivalent between nodes e and f, for the given circuit.
2. State and explain Kirchhoff's Voltage Law.
3. Obtain a star equivalent connection for a delta connection.

Unit I

What do you mean by image impedance?

Networks

Explanation of what you mean by reciprocity in two port networks.

Why superposition theorem cannot be applied to non-linear networks.

Define and explain ideal current source.

Note: Attempt five questions in all selecting one from each.

Time allowed: 3 hours.

Maximum marks: 40

Network Analysis

Paper-II (Theory)

Electronic

GSE/M-16

Printed Pages: 3

Roll No. 1472
4. (a) State and explain reciprocity Theorem.
(b) Find out whether the following network is reciprocal or not:

![Network Diagram]

5. (a) Define and explain Tellegen's Theorem.
(b) Obtain Thevenin's equivalent for the given circuit between nodes 'a' and 'b':

![Network Diagram]

6. (a) Discuss admittance parameters.
(b) Find Y-parameters for the given network:

![Network Diagram]

7. (a) Discuss inverse hybrid parameters.
(b) Find inverse-h parameters for the given circuit:

![Network Diagram]

8. (a) Discuss parallel connection of two port network.
(b) Discuss Lattice networks.

9. (a) Obtain elements of the T-network in terms of ABCD parameters.
(b) The port currents of a two port network are given by:
\[ I_1 = -V_1 + 2V_2 \]
\[ I_3 = 2V_1 - 3V_2 \]
Find the equivalent π-network.
Logical Organization of Computers

COMPUTER SCIENCE
GCE / M-16

Paper-II

LOGICAL ORGANIZATION OF COMPUTERS

Section A

1. The bit notation for binary, octal, and hexadecimal number systems is as follows:

(a) Binary: 2
(b) Octal: 8
(c) Hexadecimal: 16

2. Write the value of the following expressions:

(a) 1234
(b) 1234
(c) 345
(d) 70

3. (a) Convert the decimal number 10.625 to binary.

- (b) Prove the following:
  \[ a + b = b + a \]

4. Differentiate between combinational and sequential circuits.

5. Write the DeMorgan's Theorem.

6. Prove the identity:

\[ a \cdot b = b \cdot a \]

Section B

7. How many bits are needed to represent the number 127 in binary?

8. What is the decimal equivalent of the hexadecimal number 3F?

9. Convert the decimal number 100 to binary.

10. Convert the hexadecimal number A1 to decimal.

Section C

11. Convert the binary number 1101 to octal.

12. Convert the octal number 37 to binary.

13. Convert the hexadecimal number 5C to binary.

14. Convert the binary number 10101010 to octal.

15. Convert the hexadecimal number 7B to binary.

Note: Attempt any five questions. Question No. 1 is compulsory. Attempt all the remaining questions.
Unit I

3.5 Design Mod-5 counter using JKFF.

2.3

Make divide by eleven analyzer using counter.

9.6

Make divide by six analyzer using counter.

5.8

Explain clocked SRFF, its problem and solution.

Unit II

3.5 Explain Karnaugh map for solving logic function.

2.3

Explain 1's and 2's complement for solving logic function.

2.4

Draw and label a variable K-map for solving.

(II)

\[ Z = (Z + X + Y) (Z + X + \bar{Y}) \]

(II)

\[ Z = X + Y \]

Solution using Boolean Algebra.

4.4 Define Boolean Algebra and Write properties of Boolean Algebra.

Unit III

3.4

Solve using Canonical Expressions for Full-Adder:

8.4

Make code converter from BCD to 8421.

7.4

Make a 1's and 2's complement to solve.

3.4

Solve using K-Map.
2. What is motherboard and explain the different components of motherboard?

Unit-I

(a) Display
(b) CPU
(c) Memory
(d) Motherboard
(e) Hard Disk
(f) Printer

2 x 4

Web Browser and Search Engine
Digital Sound
Modulation
Expansion Slot

2 x 4

Explain:

Information Technology
Paper-I

Computer Applications
CSE/M-16

Time allowed: 3 hours

Maximum marks: 70
7. Explain the concept of Multimedia and how multimedia is useful in field of Education and Business.

8. (a) Explain the concept of Mobile Communication.
(b) I-Commerce:
   (a) What is I-Commerce?
   (b) Emphasize and explain the structure of

9. (a) What is Internet and what main uses of Internet in brief?
(b) What is multiplexing? Describe two basic methods of
(c) Multiplexing

10. What do you mean by Transmission medium and explain various

11. What is data Transmission media?

12. What do you mean by PC Evolution and explain the

13. What is Data Warehousing and describe the characteristics of Data

14. (a) Write a short note on:

15. (a) Define and explain the concept of Geographic Information System.
(b) On-Line Analytical Processing

16. (a) Explain the difference between Serial Port and Parallel Port.
(b) Classifications of PC?
(a) Explain features of C programming.
(b) Explain the purpose of break statement.
(c) Explain the purpose of assignment statement.
(d) Define identifier and keyword.
(e) Define constant and variable.

Program in C

Paper-II

COMPUTER APPLICATIONS

CSE/M-16

Page 1

Mark: 30

Roll No: 01

Printed Pages: 3
(a) What do you mean by an array? How an array can be initialized and processed?

(b) The following program is to be executed and answer the following questions:

1. What is the purpose of the program?
2. What is the output of the program?
3. Write the code to find the largest number of three given numbers and draw a flowchart to find the largest number out of three given numbers.

(1) Write the short note on:
(a) Types of operators in programming.
I. Fill up the blanks:
8 \times 8 = 8
8 \times 8 = 8

II. Compulsory Question

Questions carry equal marks.

From each unit Question No. 1 is compulsory.

Note: Attempt any five questions selecting at least one question from each unit.

Paper – Course No. III
HUMAN PHYSIOLOGY
CSE / M-16

[Maximum marks : 40]
Lesson II

1. Explain the reproductive system of a female.
2. Explain the inspiration and expiration process of lungs.
3. Discuss the names and function of accessory glands of digestive system.
4. Explain a cell with the help of diagram and name the organelles of a cell.

Lesson III

5. Process of penetration of sperm in to egg is known as
6. Explain the excretionary system.
7. Explain the mechanism of urine formation.

Unit II

8. Give the names of bones of axial skeleton system.
2. Discuss the discomforts and their prevention that mothers face.

Unit-I (Chpt-1)

(a) Problems of Pregnancy and Delivery
(b) Postnatal Care
(c) Characteristics of Neonate
(d) Nutrition and Feeding
(e) Normal Birth
(f) Hemorrhage post partum
(g) Antepartum Hemorrhage
(h) Premature labour

4 x 2 = 8

I. Write short note on any four:

Complementary Question / Additional Questions

Note: Attempt five questions in all, selecting two questions from each unit. Note No. 1 is compulsory.

Time allowed: 3 hours

PAPER–COURSE I12
PREGNATAL, INFANT GROWTH AND CARE

GSE / M-16

Prime Pages: 2

Roll No.
Why children are immunized? Write the immunization Schedule.

9.

(a) Short note on fever.

(b) Short note on cough.

(c) Write about the physical development of a child.

6.

Write about the physical skills of 0-2 years babies.

7.

Discuss the development of the child.

8.

Discuss the different stages of prenatal development.

4.

Discuss the signs of pneumonia.

3.

Discuss the signs of pneumonia.
1. Write in detail the importance of Home-management by

\[ \text{Unit-1 (20-30 marks)} \]

- All questions carry equal marks.
- Question No. 3 is compulsory.
- Attempt five questions in all, selecting two questions from each unit.

\[ \text{Maximum marks : 40} \]

\[ \text{Time allowed: 3 hours} \]

**Paper-Course-114**

**INTRODUCTORY HOME MANAGEMENT**

GSE / M-16

**1504**
1. Define the term sustainable written in detail about standards.

2. Explain human and non-human resources in detail.

3. Classify goals and explain the actions according to goal setting.

4. Write down importance of decision making.

5. How many types of decisions are there?

6. Evaluate goals and explain the actions according to goal setting.

7. Explain the decision-making process in detail.

8. Define the term sustainable written in detail about standards.

9. Classify the following:

- Goals
- Values
- Decisions
- Resources
Name the vitamin which is available only from animal foods.

(a)

Name two minerals that are necessary for bone growth.

(b)

Excess of which nutrient causes hyperactivity?

(c)

In which decade the colour of the tongue becomes bloody.

(d)

Name one mineral and one vitamin necessary for clothing.

Comprehension Question / Multiple Choice

All questions carry equal marks.

Note: Attempt five questions in all selecting two questions from each unit. Question No. 1 is compulsory.

4×2 = 8

Basic Nutrition

Paper-Course-115

HOME SCIENCE

CSE / M-16
1. Discuss briefly any one of the following:

(a) Normal blood pressure
(b) Role of calcium
(c) Deficiency of vitamin C
(d) Vitamin D

2. Discuss the functions and effects of deficiency of vitamin C.

3. Discuss the functions and effects of deficiency of vitamin D.

4. Discuss the role of water in the body. What are the effects of deficiency?

5. Name the reasons why less solid waste is produced in a room compared to a bathroom.

6. How many calories do we get from one gram of carbohydrates?
Paper-Course-116

Nutritional Biochemistry

GSE M-16

Printed Pages: 3

Roll No.
Section B (Q. 9-10)

4. Discuss the importance of enzymes.

5. Explain the difference between class hydrolase and base of enzymes.

6. Discuss the phenomenon of metabolic excretion.

7. How is enzyme activity affected by pH and temperature?

8. What is the effect of pH and temperature on enzyme activity?

9. How are inhibitors of drug excretion by enzyme and temperature?

10. How is the phenomenon of metabolic detoxification of drugs discussed in humans?

11. Define and state the number of enzymes. Discuss the importance of these estimations.

12. Explain the mechanisms of drug excretion by DPN enzymes of nucleic acids.

13. Discuss various levels of organization of protons.

14. Discuss the clinical situation related to deficiency of iron.
HR = 10% of Basic pay
DA = 107% of Basic pay
Basic pay = Basic pay + DA + HRA

1. Write a program to find total salary of each employee using structures. Take structure members as Employee name, salary, etc., as many structures as required.
3. What are the common bitwise operators? Give examples.
4. What is the difference between cost and benefit? Give examples.
5. How are members of structure are referenced using pointer?
6. Briefly explain enumerated type data.
7. Difference between structure and union.

Compulsory Question

Each unit will carry equal marks.

Note: Attempt five questions in all including compulsory. No. 1
Maximum marks: 80

Time allowed: 3 hours

Paper-BCA-I21
ADVANCED PROGRAMMING-C
BCA-M-16

1533

Preceded pages: 2
Rolled page: 2

No Roll No. ...
10. Explain the purpose of a procedure in C.

8. Write a C program to count the number of words in a file.

7. Explain the functions available for reading and writing character by character from the file.

6. Explain the different modes of accessing the file.

5. How is the file opened and closed using the pointer?

4. Which elements are referenced by pointers?

3. Write a C program to sum the elements of a linear array in function.

2. How is one-dimensional array is referenced using pointers? Give an example.

1. Write a program in C to interchange the value of two program variables and print the decremented value of the pointer variable and pointer is decremented? How is the pointer decremented? How address is stored in
Paper-BCA-122
LOGICAL ORG OF COMPUTER-II
BCA/M-16

Time allowed : 3 hours
Maximum marks : 80

Note: Attempt any five questions. Question No. 1 is compulsory. Select one from each unit.

1. Define Memory and discuss types of memory.

2. (a) Make shift-register to store 1011.
   (b) Make synchronous counter using 2/4 code.


4. (a) Discuss D-FF
   (b) to solve the given problem. Discuss AND-OR-SHIFT.

5. Explain clocked SRTF. Its problem and discuss its solution.

6. (a) How many FFs are needed to make Mod-5 counter
   (b) What is external interrupt
   (c) When is ROM, Name type of ROM
   (d) Define fetch cycle
   (e) Make execution table of CPU
   (f) Differentiate Sequential and combinational circuits

Prime Pages : 2
Roll No:

Page No.
Discuss speed mismatch between main memory and I/O.

Explain Program-controlled data transfer.

Assignment 1

Discuss various Instruction formats to solve

Explain Addressing Modes.

Assignment 1

Discuss Non-immediate addresses

Discuss storage operation in magnetic Disks.

Assignment 1
Mathematical Foundations-II

Paper-BCA-123

BCA/M-16

Time allowed: 3 hours

Maximum marks: 80

Unit I

(a) Show that $A^2 - 23A - 40 = 0$.

(b) Prove that $\{0, 1, 2, 3\}$ is a field.

(c) Prove that the intersection of two subgroups is a subgroup.

(d) Define Ring with Example.

(e) Prove that a group of four elements is an abelian group.

Unit II

(a) Show that $d = b \iff (d \leftrightarrow b \leftrightarrow d) \iff (b \leftrightarrow d \leftrightarrow b)$ for all $d, b \in \mathbb{N}$.

(b) Prove that $u + (1 + 2u)$ is a multiple of 6 by using Euclid's algorithm.

(c) Prove that $3a < 2b$ by dividing $a$ by $b = 3a$. (A) 

(d) Show that $[d \leftrightarrow (b \leftrightarrow [r \leftrightarrow (d \leftrightarrow h) \iff (b \leftrightarrow d \leftrightarrow h)]$ for all $d, h \in \mathbb{N}$. 

Unit III

Note: Attempt five questions in all. Selecting at least one question from each unit question. No. 9 is compulsory.

Adjournement time: 3 hours

Maximum marks: 80
Define subgroup. (e)

Define symmetric matrix with example.

Find $A^{-1}$. (f)

Define rank of a matrix. (g)

Define characteristic equation of a square matrix. (h)

Define prime ideal of ring. (i)

Define group with example. (j)

Unit $\mathbb{V} (\text{Complex})$

and hence find $A^{-1}$. 8

Write Cayley-Hamilton theorem for matrix $A$. 9

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

Find eigenvalues and eigenvectors of matrix $A$. 9

Unit $\mathbb{V}^{-1}$

prove that $A^{-1} = \begin{bmatrix} 4 & 2 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $B^{-1} = A^{-1}B$. (q)

Solve $2x + 3y = 4$ by matrix method. 6

For $A = \begin{bmatrix} 5 & 7 \\ 3 & 1 \end{bmatrix}$, find $x$ and $y$ so that $A^2 + xA + yI = 0$. (p)
Explain various text editing features in PageMaker.

3.

Explain any DTP packages in brief.

2.

Paragraph selection dialogue box in PageMaker.

Which are hardware and software requirements of Desk Top Publishing.

Unit-I

5. Which is the purpose of Window control option in

(a) 
(b) 
(c) 
(d) 
(e) 
(f)

What is the purpose of layout and effect ?

What is the purpose of document setup dialogue box in

What is purpose of working with columns.

What is purpose of linking and embedding of objects ?

Computor Question

qestion from each unit: 6 question No. 1 is compulsory.

Note: Attempt five questions in all, selecting at least one

Time allowed: 3 hours

Maximum marks: 80

Paper-124

OFFICE AUTOMATION TOOLS

BCA-M-16

Printed Pages: 2

ROLL No. 1536
8 Explain various steps to insert animated pictures.
8 Explain various steps to insert recorded sound effect.
8 Explain various steps to insert, move, and resize text box.
8 Explain various steps to add a hyperlink in MS-Word.
8 Explain purpose of attributes in MS-Word.
8 Explain various steps to create a style in MS-Word.

(q) (a) (b)

9. What is purpose of PowerPoint? Explain various
phases of PowerPoint.
PAPER-125
DESIGN
STRUCTURED SYSTEM ANALYSIS AND DESIGN
BCA / M-16
What are primary activities for system maintenance?

9.

What are least plans? Why they are made? Give ex.

8.

How life is organized in different ways?

7.

Explain Form Design. Give example. What are the characteristics

6.

Unit III

(2)
Keep in mind while dealing with customers and suppliers...

1. What is Group Dynamics? Describe the reasons which you should

2. What is meant by Body Language? Discuss the types and

3. What is the significance of Body Language?

4. Write a note on the process of listening. Also describe the

5. Write a note on the importance of interview. Describe various

6. What is self-concept?

7. What is the function of a company? Describe important features of a resume. Write a resume for the

8. Discuss the benefits of learning various

9. Discuss aspects of self presentation:

10. Block Impersonal Skills. Describe the features in detail then

11. Write short answer of the following:

   (Comprehension Question)

   questions carry equal marks
each unit in addition to comprehension question No. I. All

   Note: Attempt four questions in all, selecting one question from
   each unit. Maximum marks : 80
   Time allowed : 3 hours
When is an endorsement? Explain.

2. Write a note drawing distinction between official and business correspondence.

1. Explain the meaning of “commercial bank.”

2. Explain the meaning of the term “In loco.”

3. Explain the meaning of the term “consent.”

4. Explain the meaning of the term “Treasury.”

5. Explain the meaning of any six of the following terms:
   - Federal Reserve
   - Debit
   - Continuity
   - Balance sheet
   - Reserve of lender
   - Above check

6. How do we place an order? Explain by giving examples.

Note: Attempt all questions. Q. No. 1 is compulsory.

Maximum Marks: 30

Paper-201

English-II

COMMUNICATION SKILLS

BSEM-M-16

ROLL No. 03

TOTAL PAGES: 02
(a) Discuss a high-pass filter. Draw its frequency response and determine its cut-off frequency.

(b) In a diode, explain in brief avalanche and Zener breakdowns.

(c) Why base of a transistor is made very thin. Justify.

(d) Why the input resistance of FETs is very high. Justify.

(e) Explain your answer.

(b) Charging circuits are called D.C. restorer. Comment.

(c) How drift and diffusion currents can be distinguished.

Note: Attempt five questions in all selecting at least one question from each unit.

Maximum Marks: 40

Time: Three Hours

B1IT-203

ELECTRONIC DEVICES AND CIRCUITS

B1IT/M-16

12131

ROLL NO. 03

TOTAL PAGES: 03
6. Discuss the different current components in a PNP transistor.

Unit III

4. Discuss a shunt-clamping circuit.

5. Draw the circuit diagram of a voltage doubler.

6. Discuss working of a bridge rectifier. Calculate its ripple factor and rectifier efficiency. Where are its advantages over a centre-tapped full wave rectifier?

Unit II

3. (a) Discuss space charge capacitance and diffusion.

5. (a) Prove that:

\[ \frac{1+\frac{1}{f}}{f} = a \]
UNIT 1

I. Write the application of shift registers.

II. Requirement of IC chip, what should the designer do to meet this requirement? Can memory be satisfied by a single available memory capacity in applications where the required memory capacity cannot be satisfied by a single available memory capacity.

3. Define the term accuracy and resolution of DAC.

4. Explain briefly why dynamic RAM requires refreshing. Where the applications of shift registers.

By selecting only one question from each unit:

No. I is compulsory Attempt remaining four questions carry equal weight. Attempt five questions in all.

Note: There are nine questions in this paper. All questions have equal weight.

Maximum Marks: 40

BSTMT-204
DIGITAL ELECTRONICS-II

BSTMT/M-16

Total Pages: 03

Roll No. 03

(Please fill in the roll number)
Unit I

1. Explain the working of a bipolar RL cell, which can be used as a PROM.
2. How are the bipolar transistors connected to form a dynamic RAM cell?
3. With the help of a circuit diagram, explain the read operation of a circuit diagram.

Unit II

5. Calculate the value of the MSB and full-scale output for an 8-bit DAC for 0-127 range.
6. Explain the working of a 4-bit bidirectional shift register.

Unit III

7. Discuss the principle and working of magnetic disk memory.
8. Discuss the principle and working of semiconductor memories.
9. Explain the working of a magnetic core memory with an example.
10. Discuss the concept of addressable memory with an example.
Pseudo code

(a) What are the advantages and limitations of

minimum and maximum of order max

(b) Draw a flowchart to find the addition of two

Write short notes on the following:

2. Write short notes on the following:

3. Write short notes on the following:

Note: Attempt five questions in all. Selecting at least one

Maximum Marks: 40

Time: Three Hours

B.S.T.-206

PROGRAMMING TECHNIQUES

B.S.T./M-16

Roll No. ........................................ Total Pages: 03
7. Develop an algorithm to compute \( S(n) \) for given \( n \).

\[ S = \frac{1 \times 2 \times 3 \times \ldots \times n}{n \times (n-1) \times (n-2) \times \ldots \times 1} \]

8. Develop an algorithm to compute sums for the first \( n \) terms (\( n \) \( \geq 0 \)) of the following series:

- Unit I


5. Explain the uniqueness of \( S(n) \) due to Kruskal's

6. Explain the efficiency that can be increased

7. Explain, how does the verification of program

8. Explain the worst and average case behavior of an

- Unit II

4. Design a procedure to print largest of \( n \) given

5. Design a program to print the greatest of the

6. How many logical functions used in MS Excel

7. Write the steps to import a database in Excel

8. How are charts used in Excel? Compare any four chart
Basic Computer Education

Paper-Level-I

Computer Awareness

BAE A-16

Total Marks: 100

Time Allowed: 3 Hours

Maximum marks: 100

Section A: 20 marks

1. Make a block diagram of computer and explain essential parts.

Section B: 20 marks

(a) Discuss the advantages and limitations of using a computer.

Section C: 20 marks

(a) Explain the purpose and functioning of an operating system.

Section D: 20 marks

(a) Discuss the importance and applications of computer literacy.

Section E: 20 marks

(a) Discuss how to send email to multiple users.

Section F: 20 marks

(a) Explain the use of MS-Word.
Environmental Studies

BVE - A - 16

Note: Answer any five questions in total. Question 1 is compulsory.

Time allowed: 3 hours

Maximum marks: 75

Page No.

Prepared by:

3
1. Why short notes on:

- Effects of Nuclear pollution
- Effects of Urban pollution
- Effects of air pollution
- Effect of water pollution
- Effect of Noise pollution

2. Describe the scope and importance of environmental studies.

3. Write short notes on:

- Public awareness
- Global warming
- Natural disasters
- Environmental studies

4. Define ecological pyramids. Describe in detail different types of ecological pyramids.

5. Write short notes on:

- Impact of population explosion on rural and urban
- Woman and child welfare
- Population explosion

6. Write short notes on:

- Population explosion
- Hot spots of biodiversity
- Habitat loss of biodiversity

7. Environmental effects of extraction mineral resources.


9. Environmental effects of: (a) industrial 
(b) transportation
(c) domestic