



**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

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

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  $T: R^2 \rightarrow R^2$  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

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

(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

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

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

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

(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 asymptotes 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  $\mathbb{R}^3$ . 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  $\mathbb{R}^3$ . Extend the basis of  $W$  to a basis of the whole space  $\mathbb{R}^3$ .



Central University of Haryana  
ODD Semester Term End Examination April 2022  
B.Tech. Programmes

Branch: CSE & CIVIL

Course Code: BT HUM 101B/A  
Course Title: ENGLISH LANGUAGE SKILLS

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.

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**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                                      o 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  $\frac{1}{20}$ th 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 ciliary 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 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 81/91, 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](mailto: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.

1) Formal  
4) Paragraph  
3) Introduction  
5\* Conclusion  
2) Level of understanding

Conclusion  
- Appendix



**Central University of Haryana**  
**ODD Semester Term End Examination April 2022**  
**B.Tech. Programmes**

Branch:

Max Time: 3 Hrs

Course Code: BT PHY 117A  
 Course Title: BT PHY 1<sup>st</sup> 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
- o (d) Write a Model which explain the transport properties of electrons in materials (especially metals)
- (e) What is Intrinsic semiconductor
- o (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<sup>-3</sup>. 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 Sommerfeld Model in detail.

$$k = \frac{2\pi m v}{h}$$

$$\frac{dh}{dc} = \frac{1}{2R} \frac{2\pi m}{h^2}$$

Q. No.3

Explain in detailed the Density of States of 3D, 2D, 1D and 0D materials

OR

Q. No 3

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

$$-\frac{\hbar^2}{2m} \frac{d^2\psi}{dx^2} + V(x)\psi = E\psi$$

$$-\frac{\hbar^2}{2m} \frac{d^2\psi}{dx^2} + V\psi = E\psi$$

$$\frac{\hbar^2}{2m} \frac{d^2\psi}{dx^2} + (E - V(x))\psi = 0$$

Q. No.4

What is Nanotechnology, Advantages, Disadvantages & Applications

OR

Q. No .4 (a) Describe Spontaneous and Stimulated Emission (b) Describe Resistivity by Four 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<sup>2</sup> V<sup>-1</sup> s<sup>-1</sup>, 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<sup>-3</sup> has been doped with  $10^{17}$  boron (acceptor) atoms cm<sup>-3</sup>. Calculate the electron and hole concentrations in this semiconductor.

$$nR = \int \frac{dn}{dx} \frac{dx}{kT}$$



Central University of Haryana  
ODD Semester Term End Examination April 2022

B.Tech. Programmes

Branch: Electrical Engineering

Course Code: BT EE 103A

Course Title: Basic Electrical Engineering

Max Time: 3 Hours

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)

- Thevenin and Norton Theorem with circuit diagram
- Average, RMS, Form factor, Peak factor of 1-phase AC circuit
- Principle of operation of DC motor
- Mathematical eq. of Phase and Line current, Phase and Line voltage In star connection 3-phase supply
- Techniques of Power factor improvement
- Explain the condition of Ideal Transformer
- 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)

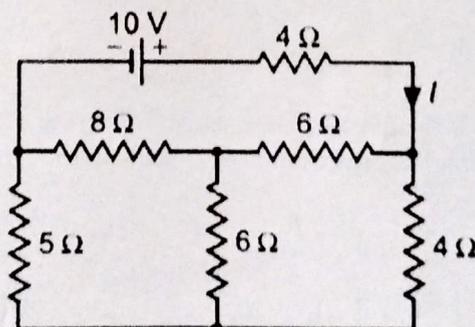


Fig. 1

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)

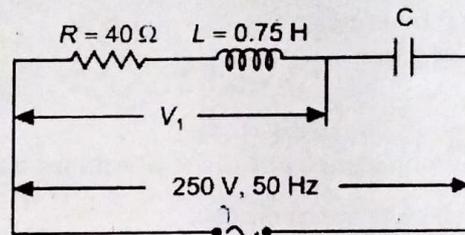


Fig 2

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