

~~April~~ May - 2022



Roll No.

Total No. of Pages : 03

Total No. of Questions : 18

B.Tech.(Agriculture Engg./Automation & Robotics/Automation Engg./Civil Engg./Computer Science & Engg./Electrical & Electronics Engg./Electrical Engg./Electronics & Communication Engg./Electronics & Electrical Engg./Information Technology/Mechanical Engg.)/

B.Tech. (CSE/ECE) (PIT)(Sem.-1)

MATHEMATICS-I

Subject Code : BTAM-101-18

M.Code : 75353

Date of Examination : 01-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

Solve the following :

- 1) What is maximum value of function $f(x) = -x^2$.
- 2) Find the equation of normal line to the surface $xyz = 6$ at $(1, 2, 3)$.
- 3) Show that the function $f(x, y) = \begin{cases} \frac{xy}{2y^2 + x^2}; & (x, y) \neq (0, 0) \\ 0; & (x, y) = (0, 0) \end{cases}$ is discontinuous at $(0, 0)$.
- 4) Evaluate $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\log\left(x - \frac{\pi}{2}\right)}{\tan x}$.
- 5) Calculate approximate value of $\sqrt{10}$ to two decimal places by Taylor's theorem.

40 A

- 6) Evaluate $\int_0^1 \int_1^a \frac{1}{xy} dy dx$.
- 7) Examine the nature of the series $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots \rightarrow \infty$.
- 8) Define orthogonal matrices with example.
- 9) Show that $(1, 1, 2)$ is an eigen vector of the matrix $A = \begin{bmatrix} 3 & 1 & -1 \\ 2 & 2 & -1 \\ 2 & 2 & 0 \end{bmatrix}$ corresponding to the eigen value 2.
- 10) Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$.

SECTION-B

- 11) a) Verify Cauchy's mean value theorem for $f(x) = \log x, g(x) = \frac{1}{x}$ in $[1, e]$.
- b) Apply Maclaurin's theorem with Lagrange's remainder to function $f(x) = \cos x$.
- 12) Discuss the convergence of the following improper integral
- a) $\int_0^{\infty} \frac{1}{b^2 x^2 + a^2} dx$ b) $\int_1^2 \frac{x+1}{\sqrt{x-1}} dx$.
- 13) Show that the rectangular solid of maximum volume that can be inscribed in a given sphere is a cube.
- 14) a) Evaluate by changing the order of integration of $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{x}{\sqrt{x^2-y^2}} dy dx$.
- b) Find the volume enclosed between the cylinders $x^2 + y^2 = 2ax$ and $z^2 = 2ax$.

Le9

SECTION-C

15) a) Discuss the convergence or divergence of the series $\sum \frac{n^p}{(n+1)^q}$.

b) Test the convergence of $\sum_{n=2}^{\infty} \frac{1}{[\log(\log n)]^n}$.

16) a) Test the convergence of $1 + \frac{(1+\alpha)}{(1+\beta)} + \frac{(1+\alpha)(1+2\alpha)}{(1+\beta)(1+2\beta)} + \frac{(1+\alpha)(1+2\alpha)(1+3\alpha)}{(1+\beta)(1+2\beta)(1+3\beta)} + \dots$

b) Discuss the convergence or divergence of the series $\sum_{n=2}^{\infty} \frac{n+\sqrt{n}}{n^2-n}$.

17) a) Use Gauss Jordan method to find the inverse of a matrix $\begin{bmatrix} 2 & 4 & 3 & 2 \\ 3 & 6 & 5 & 2 \\ 2 & 5 & 2 & -3 \\ 4 & 5 & 14 & 14 \end{bmatrix}$.

b) Find a matrix B which transforms $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ into a diagonal form.

18) Determine the values of a and b for which the system $\begin{bmatrix} 3 & -2 & 1 \\ 5 & -8 & 9 \\ 2 & 1 & a \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} b \\ 3 \\ -1 \end{bmatrix}$ has

- a) a unique solution,
- b) no solution,
- c) infinitely many solutions.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No.

Total No. of Pages :03

Total No. of Questions :18

B.Tech.(Artificial Intelligence & Machine Learning/Artificial Intelligence/ Artificial Intelligence & Data Science/ Computer Engg./Computer Science & Engg./Artificial Intelligence & Machine Learning/Computer Science & Engg.) (Cyber Security)/Computer Science & Engg.) (Data Science)/Computer Science & Engg.) (IOT)/Data Science/Electronics & Communication Engg./Information Technology/Mechanical Engg./CSE (Internet of Things and Cyber Security including Block Chain Technology)/B.Tech. (Computer Engg./CSE) (PIT) (Sem.-1)

MATHEMATICS-I

Subject Code : BTAM-104-18

M,Code : 75362

Date of Examination : 01-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B& C carrying EIGHT marks each.
4. Select atleast TWO questions EACH from SECTION - B & C.

SECTION-A

Solve the following :

1. Solve $\int_0^2 \sqrt{x(4-x^2)}^{-\frac{1}{4}} dx$
2. Write recurrence relation of Gamma function.
3. Find the area of the region enclosed by the curve $x^2 = 4y, y^2 = 4x$.
4. Evaluate $\lim_{x \rightarrow \infty} \frac{\sinh^{-1}x}{\cosh^{-1}x}$.
5. Calculate approximate value of $\sqrt{24}$ to two decimal places by Taylor's theorem.
6. Find the value of K so that the set of vectors $(K,1,1), (0,1,1), (K,0,K)$ is linearly dependent?

6
01-07 (H)

7. Find a linear transformation $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ such that $T(1,0) = (1,1)$ and $T(0,1) = (-1,2)$.
8. Show that two similar matrices A and B have same eigen values.
9. If A is an orthogonal matrix, then prove that $|A| = \pm 1$.
10. Define Vector space.

SECTION-B

11. a) State and prove relation between Beta and Gamma functions.
b) Expand $f(x) = e^{\sin x}$ by Maclaurin's theorem.
12. a) Prove that the area of the region bounded by the curve $a^4 y^2 = x^5(2a - x)$ is to that of the circle whose radius is 'a' is 5:4.
b) Find absolute maximum and minimum value of $f(x) = x - \log x$ on $\left[\frac{1}{2}, 2\right]$.

13. a) Find rank of $A = \begin{bmatrix} 2 & -6 & -2 & -3 \\ -5 & -13 & -4 & -7 \\ -1 & 4 & 1 & 2 \\ 0 & 1 & 0 & 1 \end{bmatrix}$

- b) Solve by Gauss Jordan method the system of equations

$$x + 2y + z = 2, 3x + y - 2z = 1, 4x - 3y - z = 3, 2x + 4y + 2z = 4.$$

14. a) Find the inverse of a matrix $\begin{bmatrix} 2 & 1 & -1 & 2 \\ 1 & 3 & 2 & -3 \\ -1 & 2 & 1 & -1 \\ 2 & -3 & -1 & 4 \end{bmatrix}$

b) Using properties of determinants, evaluate $\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (a+c)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix}$

SECTION-C

15. a) Diagonalize $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$.

b) Find Eigen Values & Eigen Vectors of $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$

16. a) Express the matrix A as sum of symmetric and skew symmetric matrix where

$$A = \begin{bmatrix} 4 & 2 & -3 \\ 1 & 3 & -6 \\ -5 & 0 & -7 \end{bmatrix}$$

b) Prove that $A = \frac{1}{3} \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ is orthogonal.

17. a) Let $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ defined by

$$T(x, y, z) = (x + y + z, 2x + 2y + 2z, 3x + 3y + 3z)$$

Find the associated matrix corresponding to standard basis.

b) Find the rank and nullity of the matrix $\begin{bmatrix} 1 & -2 & 2 & 3 & 6 \\ 0 & -1 & -3 & 1 & 1 \\ -2 & 4 & -3 & -6 & 11 \end{bmatrix}$.

18. Determine the coordinate vectors of $p = 4 - 2x + 3x^2$ relative to the following bases.

a) The standard basis for P_2 , $S = \{1, x, x^2\}$.

b) The basis for P_2 , $A = \{p_1, p_2, p_3\}$, where $p_1 = 2, p_2 = -4x, p_3 = 5x^2 - 1$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No.

Total No. of Pages :02

Total No. of Questions :18

B.Tech. (Bio Technology/Civil Engineering/Computer Science & Engineering/Electrical & Electronics Engineering/Electrical Engineering/Electronics & Communication Engineering/Information Technology/Mechanical Engineering)(Sem.-1)

ENGINEERING MATHEMATICS-I

Subject Code :BTAM-101

M.Code :54091

Date of Examination : 01-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

Solve the following:

1. Find the percentage error in the area of an ellipse when an error of +1 percent is made in measuring the major and minor axes.
2. If $x = r \cos \theta$ and $y = r \sin \theta$, Verify that $\frac{\partial(x,y)}{\partial(r,\theta)} \times \frac{\partial(r,\theta)}{\partial(x,y)} = 1$.
3. Find the radius of the curvature of $y^2 = 4ax$ at any point (x, y) .
4. State Greens theorem in the plane.
5. Find the equation of tangent plane for the surface $xyz = 6$ at $(1, 2, 3)$.
6. Evaluate $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dy dx$.
7. State Stoke's theorem.
8. Find the gradient of the function $\phi = y^2 - 4xy$ at $(1,2)$.
9. Show that the vector field given by $\vec{F} = (-x^2 + yz)\hat{i} + (4y - z^2x)\hat{j} + (2xz - 4z)\hat{k}$ is solenoidal.
10. Define homogenous function.



SECTION-B

11. Use Lagrange's method to find the minimum value of $x^2 + y^2 + z^2$ subject to the conditions $x + y + z = 1$ and $xyz = 1$.

12. If $U = \tan^{-1} \frac{x^3 + y^3}{x - y}$.

Prove that $x^2 \frac{\partial^2 U}{\partial x^2} + 2xy \frac{\partial^2 U}{\partial x \partial y} + y^2 \frac{\partial^2 U}{\partial y^2} = \sin 4u - \sin 2u = 2 \cos 3u$.

13. a) Find all the asymptotes of the curve

$$y^3 - 3x^2y + xy^2 - 3x^3 + 2y^2 + 2xy + 4x + 5y + 6 = 0.$$

b) Find the moment of inertia of the area between $y = \sin x$ from $x = 0$ to $x = \pi$ and x -axis about each axis.

14. Trace the curve $y^2 = \frac{x^3}{2a - x}$.

SECTION-C

15. a) Find the volume common to the cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$.

b) Evaluate $\iiint x^2 yz dx dy dz$ over the region bounded by $x = 0, y = 0, z = 0, x + y + z = 1$.

16. Verify Gauss Divergence theorem for $\vec{F} = (x + y^2)\hat{i} - 2xz\hat{j} + 2yz\hat{k}$ taken over tetrahedron bounded by coordinate planes and the plane $2x + y + 2z = 6$.

17. Prove that:

a) $\text{curl}(\phi \vec{A}) = (\text{grad } \phi) \times \vec{A} + \phi \text{curl } \vec{A}$

b) $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$.

18. Verify Stoke's theorem for $\vec{F} = (x^2 + y - 4)\hat{i} + 3xy\hat{j} + (2xz + z^2)\hat{k}$ over the surface of hemisphere $x^2 + y^2 + z^2 = 16$ above XOY plane.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No.

Total No. of Pages : 02



Total No. of Questions : 05

B.Tech. (Agriculture Engineering /Artificial Intelligence & Machine Learning/Artificial Intelligence (AI) and Data Science/Artificial Intelligence (AI) and Data Science/Artificial Intelligence/Automation & Robotics/Automobile Engineering/Automobile Engineering/Bio Technology/Civil Engineering/Computer Science & Engineering/Computer Science & Engineering (Artificial Intelligence & Machine Learning)/Computer Science & Engineering (Cyber Security)/Computer Science & Engineering (Data Science)/Computer Science & Engineering (IOT)/Data Science/Electrical & Electronics Engineering/Electrical & Electronics Engineering/Electrical Engineering/Electronics & Communication Engineering/Electronics & Electrical Engineering/ (Food Technology/Information Technology/Mechanical Engineering/CSE (Internet of Things and Cyber Security including Block Chain Technology)/CSE (Internet of Things and Cyber Security including Block Chain Technology)/ PIT B.Tech Computer Engg./PIT B.Tech CSE/PIT B.Tech ECE

(Sem.-1,2)

ENGLISH

Subject Code : BTHU-101-18

M.Code : 75349

Date of Examination : 04-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. All Questions Are COMPULSORY.
 2. Question no. 1, 2 & 3 carry TEN marks each.
 3. Question no. 4 and 5 carry FIFTEEN Marks each.
-
1. a) Use the following phrases in sentences :
An axe to grind, Blow away, Hear it on grapevine, Opt out, Phase in
 - b) State whether the following sentences are simple, compound or complex :
 - i) Unless the culprit accepts his fault, he will not be spared.
 - ii) I am confident that he is innocent in this matter.
 - iii) Let me reach my office and then I shall talk to him.
 - iv) The old man is a miser though he is very rich.
 - v) But for his faults he would have progressed immensely.
 2. a) Condense the following passage retaining the main idea and using the minimum number of words:

Charity is a universal duty, which it is in every man's powers sometimes to practice, since every degree of assistance given to another on proper motives, is an act of charity; and there is scarcely any man in such a state of weakness that he may not on some occasion benefit his neighbour. He who cannot relieve the poor may instruct the ignorant, and he that cannot attend the sick may reclaim the vicious. He who can give little assistance himself may yet perform the duty of charity by inflaming the ardor of others and recommending the petitions which he cannot grant, to those who have more power to bestow. The widow that shall give her mite to the treasury, and the poor man who shall bring to the thirsty a cup of cold water, shall not lose their reward.

b) Use the following transitional/ connecting devices in sentences of your own :

To sum up, Although, Nevertheless, In spite of, As a result

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

The study of history provides many benefits. First, we learn from the past. We may repeat mistakes, but, at least, we have the opportunity to avoid them. Second, history teaches us what questions to ask about the present. Contrary to some people's view, the study of history is not the memorization of names, dates, and places. It is a thoughtful examination of the forces that have shaped the courses of human life. We can examine events 'from the past and then draw inferences about current events. History teaches us about likely outcomes.

Another benefit of the study of history is the broad range of human experience which is covered. War and peace are certainly covered as are national and international affairs. However, matters of culture (art, literature and music) are also included in historical study. Human nature is an important part of history: emotions like passion, greed, and insecurity have influenced the shaping of world affairs. Anyone who thinks that the study of history is boring has not really studied history.

a) Discuss the main idea of this passage.

b) Which method of teaching history would the author of this passage support?

c) What are the benefits of studying history.

d) Give the meaning of the following words and use these in the sentences of your own: Inferences, Outcomes, Contrary, Memorization.

4. Write an essay in about 500 words on "*Information Technology and Its Impact on Future Work Culture*".

5. Assuming yourself to be the Purchase Officer of Sigma Eye Centre, 24, Vasant Vihar, Patna, write a complaint to Clear Vision Store 124, Mayur Vihar, New Delhi, reporting that the four of the eight consignments containing glasses have been received in a damaged condition. Write a letter asking for the replacement of the damaged goods and seek compensation for the additional postage cost incurred. Invent the details necessary.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

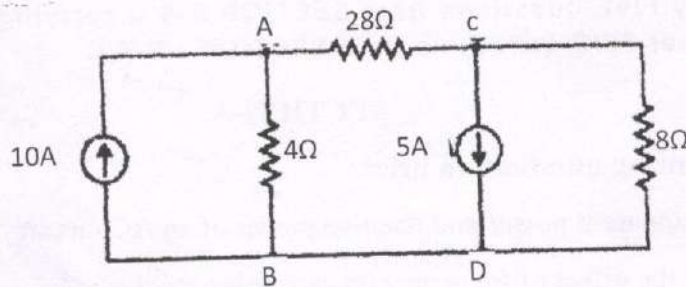
- f) What material are used in these parts of a DC motor (i) commutator segments (ii) brushes?
- g) Define the voltage regulation for a transformer.
- h) What is admittance? Give its units.
- i) "For electric traction DC series motors are best suited". Why?
- j) List the properties of an ideal fuse wire.

SECTION-B

2. Derive the relationship between voltage and current for a purely inductive circuit. Also show that the average power consumed by the circuit is zero.
3. An alternating voltage is given as $v = 220\sin 314t$, determine its (i) maximum value (ii) effective value (iii) form factor (iv) value of voltage after 0.002 sec taking reckoning time from the instant when voltage is zero and becoming positive; (v) time after which voltage attains 110 V for the first time.
4. Discuss the principle of operation of a DC motor. Also, derive the emf equation.
5. Using a diagram explain the construction of an underground cable. Also write regarding is the function of each part.

SECTION-C

6. Distinguish between a three-phase squirrel cage induction motor and phase wound induction wound.
7. Find the current in 28Ω resistor using source conversion method.



8. For the "one time use" type of fuse what do the following convey?
- | | |
|-----------------------------------|---------------------------|
| a) Fuse Current Carrying Capacity | b) Breaking capacity |
| c) I^2t value of fuse | d) Rated voltage of fuse. |
9. Discuss the construction of an auto-transformer and derive the expression for the copper savings in it.

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC against the Student.

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Bio Technology/Civil Engineering/Computer Science & Engineering/Electrical & Electronics Engineering/Electrical Engineering/Electronics & Communication Engineering/Information Technology/Mechanical Engineering) (Sem.-1,2)

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code : BTEE-101

M.Code : 54097

Date of Examination : 13-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

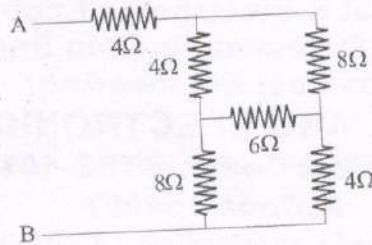
Answer briefly :

1. a) What is ohm's law? Also discuss its limitations.
b) Discuss KVL with the help of suitable example.
c) What will be the ratio of the resistance of a 200W, 230V lamp to that of a 100W, 115V lamp?
d) What do you understand by electro-motive-force?
e) What do you meant by mutual inductance?
f) What do you understand by speed regulation?
g) What do you meant by LVDT?
h) Why DC motors are not operated to develop maximum power in practice?
i) What is the significance of Boolean algebra?
j) Convert decimal number 187 to 8-bit binary.

35A

SECTION-B

2. What is the significance of Star Delta Transformation? Find the equivalent resistance between A & B in the given network.



3. Derive the expression for average value for half cycle of an alternating current.
4. What are the salient features of distribution transformer? Also compare power transformer and distribution transformer.
5. Discuss the construction of Synchronous machines? Also discuss its classifications and applications.

SECTION-C

6. What do you understand by BJT? Discuss its principle of operation, characteristics and applications.
7. What do you understand by Strain gauge? Discuss its principle of operation and applications.
8. A 400 KVA transformer has a core loss of 2kW and maximum efficiency at 0.8 pf occurs when the load is 240 kW. Calculate (a) the maximum efficiency at unity power factor, and (b) the efficiency on full load at 0.71 power factor.
9. Discuss in detail, the (a) R-S, (b) J-K, (c) D and, (d) Toggle flip-flops with the help of suitable examples.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

SECTION-B

- 11) Explain the quantum theory of free electrons in metals. Derive an expression for the Fermi-energy at absolute zero.
- 12) Discuss Kronig-Penney model. Using the model show the energy spectrum of electron consisting of a number of allowed energy bands separated by forbidden bands.
- 13) a) Write a short note on Zener diode. Explain how the Zener diode maintains a constant voltage across the load.
b) For a Si semiconductor with a band gap of 1.12 eV, determine the, position of the Fermi level at 300 K if $m_n^* = 0.12m_e$ and $m_p^* = 0.28m_e$.
- 14) a) Derive an expression for the carrier concentration in an extrinsic semiconductor. What would be the position of the Fermi level? Explain.
b) Consider the Fermi 0.3 eV below the conduction band at room temperature ($= 27^\circ\text{C}$) in an n-type semiconductor. If the temperature is raised to 57°C , what would be the new position of the Fermi level?

SECTION-C

- 15) Explain the characteristics of laser beams. What are the necessary conditions for Lasing action?
- 16) What do you mean by spontaneous emission? Discuss Einstein's coefficients. Derive the relation between them.
- 17) Explain the concept of directionality and monochromaticity as applied to lasers.
- 18) a) What is the divergence of Laser? Write the principle and procedure of calculating the divergence of the laser.
b) Calculate the divergence of a laser beam at distances of 1 and 10 m from the laser spot and whose diameters are 2 and 4 mm, respectively.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

SECTION-B

11. What are the special features of classical free electron theory of metals? Derive an expression for the electrical conductivity of a metal. Write any two drawbacks of the classical free electron theory of metals.
12. What is band theory of solids? Explain energy band diagram and distinguish metal, semiconductor and insulator on the basis of above theory.
13. Distinguish between extrinsic and intrinsic semiconductors. Discuss the effect of increasing amounts of dopants on the Fermi level in extrinsic semiconductors.
14. Obtain the expression for carrier concentration in n-type semiconductor.

SECTION-C

15. What is photo-detector? Explain the principle, construction and working of pin photodiode. Discuss its advantages over Photodiode.
16. What is Stimulated absorption, Spontaneous emission and Stimulated emission? Obtain the relation between different Einstein's coefficients and discuss the result.
17.
 - a) How to determine the type of the semiconductor using Hot point probe method?
 - b) What is Capacitance-Voltage (CV) measurement? Explain the method to determine depletion width using CV measurement.
18.
 - a) What is Van der Pauw method? Explain the measurement of resistivity using Van der Pauw method.
 - b) The resistivity of an intrinsic semiconductor is $5.5 \Omega \text{ m}$ at 30°C and $3.0 \Omega \text{ m}$ at 42°C . Find the band gap.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.



Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech. (Biotechnology /CE/CSE/Electrical & Electronics
Engg./EE/ECE/Electronics & Electrical Engg./IT/ME) (Sem.-1,2)**

ENGINEERING PHYSICS

Subject Code : BTPH-101

M.Code : 54105

Date of Examination : 04-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write briefly :
 - a) Define electromagnetic spectrum.
 - b) Explain Ferro and Ferri magnetism.
 - c) What is Meissner Effect?
 - d) What is Stimulated emmission?
 - e) Write applications of optical fibres.
 - f) Define relativity.
 - g) Define group and phase velocities.
 - h) Define unit cell.
 - i) Write two applications of nanomaterials.
 - j) Define the significance of wave function.

SECTION B

2. Define polarization. Discuss in detail the different types of polarization. (8)
3. Explain magnetostriction and its application in production of ultrasonic waves. (8)
4. a) Describe Bragg's spectrometer. (6)
b) The X-ray of wavelength 0.154 nm were obtained using Molybdenum BCC metal as target. The diffraction was obtained from the {200} planes at $2\theta = 58.535^\circ$. Find lattice constant for Mo. (2)
5. What is solid state laser? Describe the principle, construction and working of Ruby laser. (8)

SECTION C

6. What is an optical fiber? Explain the terms acceptance angle and Numerical Aperture. (8)
7. Describe Michelson-Morley experiment. (8)
8. Develop time-dependent and time-independent Schrodinger wave equations. (8)
9. Discuss how is the synthesis of nanomaterials done using a ball-milling technique. Discuss the underlying difficulties as well. (8)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.



Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (BT / CE / CSE / Electrical & Electronics Engg./Electrical Engg./
ECE / IT / ME) (Sem.-1,2)

ELEMENTS OF MECHANICAL ENGINEERING

Subject Code : BTME-101

M.Code : 54101

Date of Examination : 15-07-22

July 2022

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Answer briefly :

- a) State Zeroth Law of Thermodynamics.
- b) What do you mean by PMM of first kind?
- c) State the importance of second law of thermodynamics.
- d) In a refrigerator, heat is transferred from a lower temperature to higher temperature. Is this a violation of second law of thermodynamics? Explain.
- e) Distinguish between point function and a path function.
- f) Compare S.I. Engine and C.I. Engine.
- g) Enumerate the criteria for selection of materials for engineering applications.
- h) Differentiate between brass and bronze.
- i) Define polar moment of inertia.
- j) Under what conditions the center of mass and center of gravity coincide?

SECTION-B

2. Three Carnot engines E1, E2, E3 operate between temperature of 1000 K and 300 K. Make calculations for the intermediate temperature if the work produced by the engines are in the ratio of 4: 3: 2.
3. To a close system 150kJ of work is supplied. If the initial volume is 0.6 m^3 and the pressure of the system changes as $p = 8-4V$, where p is in bar and V is in m^3 , determine the final volume and pressure of the system.
4. What is the difference between a heat pump and a refrigerator? Explain the concept with suitable diagram. Show that the COP of a pump is greater than the COP of a refrigerator by unity.
5. What are smart materials? Explain the theory behind shape memory alloys and give the composition and applications of some commercially available shape memory alloys.

SECTION-C

6. One mole of an ideal gas at 0.5 MPa and 300 K is heated at constant pressure till the volume is doubled and then it is allowed to expand reversibly and adiabatically till the temperature is reduced to 300 K. Calculate heat and work transfers. If it is desired to restore the system from final state to its initial state by a reversible isothermal process what amount of work is required to be done on the system?
7. Apply steady flow energy equation to a nozzle and derive an equation for velocity at exist.
8. Discuss the following properties of the materials :
 - a) Ductility
 - b) Resilience
 - c) Weldability
 - d) Plasticity.
9. Find the centre of gravity of a $100 \text{ mm} \times 150 \text{ mm} \times 30 \text{ mm}$ T-section.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

B. Tech (4 2 Sem)
A



Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Agriculture Engineering/Artificial Intelligence & Machine Learning/Artificial Intelligence (AI) and Data Science/Artificial Intelligence/Automation & Robotics/Automobile Engineering/Bio Technology/Civil Engineering/Computer Engineering/Computer Science & Engineering/Computer Science & Engineering (Artificial Intelligence & Machine Learning)/ Computer Science & Engineering (Cyber Security)/ Computer Science & Engineering/Computer Science & Engineering (IOT) (Data Science)/Data Science/Electrical & Electronics Engineering/Electrical Engineering/Electronics & Communication Engineering/Electronics & Electrical Engineering/Food Technology/Information Technology/Mechanical Engineering/CSE (Internet of Things and Cyber Security including Block Chain Technology)/Computer Engg./CSE/ECE (PIT) (Sem.-1,2)

CHEMISTRY-I

Subject Code : BTCH-101-18

M.Code : 75343

Date of Examination : 06-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Answer briefly :

- a) Discuss the types of the hardness of water and suggest a method for its removal.
- b) Define Isobestic Point and give its significance
- c) Distinguish between Meso and Racemic mixtures.
- d) How does entropy of a solid vary on fusion.
- e) Write a note on vander-Waal forces.
- f) Discuss HSAB principle and give its one application.
- g) Give Fajan's rules for polarizability.
- h) What are electrophilic reagents?
- i) Compare bond order and stability of oxide and superoxide ion.
- j) Discuss the role of dopant in semi-conductor chemistry.

SECTION-B

2. a) Give the physical significance of wave function. Discuss the origin of quantum numbers from Schrodinger wave equation. (6)
b) Differentiate between extrinsic and intrinsic semi-conductors. (2)
3. a) Draw the energy level diagram for NO molecule also determine their bond order and magnetic behaviour. (5)
b) Give factors affecting CFSE in transition metal complexes. (3)
4. a) Draw a well labelled Jablonski diagram and explain : (6)
(i) Intersystem Crossing.
(ii) Phosphorescence
b) Explain the importance of finger print region in IR spectroscopy. (2)
5. a) Derive van der Waal's equation for real gases. Give units and significance of van der Waal's constants. (6)
b) What are Potential Energy Surfaces. Give their application. (2)

SECTION-C

6. a) Derive Nernst Equation for the calculation of cell E.M.F. (4)
b) Using Ellingham diagram to explain carbon monoxide is a suitable reducing agent for oxide ore. (4)
7. a) Why Electron affinity of halogens is very high. (2)
b) Which is smaller and Why (Cl or Cl⁻)? (2)
c) Apply VSEPR theory to explain the shape of molecules : (4)
i) PCl₃
ii) Ammonium ion.
8. a) Discuss in detail conformational analysis of n-Butane. (5)
b) Write a note on optical isomerism. (3)
9. a) Discuss the Friedel Craft Alkylation reaction of Benzene with mechanism. (4)
b) How the nature of solvent affects rate of nucleophilic substitution reactions. (4)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

29A

SECTION-B

11. What are the various features of Word Processor?
12. What are the various output devices of computers? Explain the working principle of each of them.
13. How primary memory is different from secondary memory?
14. Write an algorithm/flowchart to find the sum of even numbers.

SECTION-C

15. Describe about the various basic data types in C++.
16. Write a program to determine and print the sum of series for a given value of n :
$$1 + 1/2 + 1/3 + 1/4 + \dots + 1/n$$
17. Explain about the various control structures in C++ language.
18. Explain how Input / Output operations on files is handled in C.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Agriculture Engg. / Automobile Engg. /
Civil Engg. / CSE / ME) (Sem.-1,2)

ELECTROMAGNETISM

Subject Code : BTPH-103-18

M.Code : 75357

Date of Examination : 11-07-22



Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write briefly :

- a) Discuss conservative versus non-conservative fields by giving examples.
- b) Provide physical interpretations for the closed surface integrals of any two vectors.
- c) What do you mean by the line integral of electric field?
- d) What is the difference between a potential and potential difference?
- e) Define electric displacement and explain the significance of the electric displacement vector.
- f) What is the physical interpretation of Gauss' law for the magnetic field?
- g) Explain skin depth.
- h) Write Maxwell's four equations in differential form.
- i) State Faraday's laws of electromagnetic induction.
- j) Differentiate between linear, circular and elliptical polarization.

30 A

SECTION-B

2. a) What is line charge density? Derive an expression for the electric field due to an infinitely long uniformly charged straight wire using Coulomb's law.
b) Derive the Laplace's and Poisson's equations and discuss their applications.
3. Using Gauss's theorem calculate the electric field due to uniform spherical of charge at a point (a) outside the shell and (b) inside the shell. Hence show that for points lying external to it a uniformly charged spherical shell behaves as if the entire charge were concentrated at its center and for point lying inside it the electric field is zero.
4. a) State and explain Biot-Savart law. Using the concept of the vector potential, derive the expression for Biot-Savart's law.
b) Prove that the line integral of the magnetic field over a closed path enclosing a current carrying wire is independent of the shape of the path.
5. a) Write short notes on: (i) Hysteresis curve (ii) Permanent magnets.
b) The horizontal component of flux density of the earth's magnetic field is 1.7×10^{-5} weber/m². What is the horizontal component of the magnetic intensity?

SECTION-C

6. a) Derive the expression for energy stored in a magnetic field.
b) What is electromagnetic induction? Derive the differential form of Faraday's law.
7. a) Derive the equation of continuity for the time varying fields.
b) State the Poynting theorem and prove it.
8. a) State and explain Maxwell's equations for the electromagnetic field. Starting from Maxwell's equations, deduce the wave equation for a plane wave in free space.
b) Derive Coulomb's law of electrostatics with the help of Maxwell's first equation.
9. Show that inside the conducting medium the wave is damped and obtain an expression for the skin depth.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

June - 2022



Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech. (Aerospace Engineering/Bio Technology/
Civil Engineering/Computer Science & Engineering/Electrical &
Electronics Engineering/Electrical Engineering/Electronics &
Communication Engineering/Electronics & Electrical
Engineering/Information Technology/Mechanical Engineering)
(Sem.-1,2)**

ENGINEERING DRAWING

Subject Code : BTME-102

M.Code. : 54102

Date of Examination : 19-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions EACH from SECTION - B & C.

SECTION-A

1) Answer briefly :

- a) What is a sectional view? Why they are important in engineering drawing?
- b) Draw a regular Pentagonal Lamina of side 55mm.
- c) What is the purpose of the development of surfaces? Explain.
- d) What do you mean by Representative Fraction (RF)?
- e) Draw symbols used to represent first angle and third angle orthographic projections.
- f) Explain with the help of a suitable drawing, the Aligned and Unidirectional system of placement of dimensions.
- g) What are right solids and oblique solids? Explain with a suitable freehand drawing.
- h) Show by means of traces, a plane perpendicular to both HP and VP.
- i) Write the following statement using single stroke capital vertical letters of 12 mm size : "IKGPTU KAPURTHALA".
- j) Differentiate Isometric Projection and Isometric Drawing.

31A

SECTION-B

- 2) The distance between Delhi and Agra is 200 km. In a railway map, it is represented by a line 5 cm long. Find its R.F. Draw a diagonal scale to show single km and long enough to measure up to 600km.
- 3) Plan and elevation of a line "AB" 60 mm long, measures 54 mm and 45 mm respectively. End "A" is 15 mm from HP and 10 mm from VP. Draw the projections of the line and determines its inclination to the reference planes when line lies in first quadrant.
- 4) A regular pentagonal plate of side 40 mm is resting on HP on one of its sides such that its surface makes an angle of 40° with HP and is perpendicular to VP. Draw the orthographic projections.
- 5) A right regular hexagonal prism of base edge 38 mm, axis 62 mm long is resting on its rectangular face on HP, with axis parallel to both HP and VP. Draw its projections.

SECTION-C

- 6) A right regular hexagonal prism of base edge 20 mm and height 50 mm rests on HP on its base with one of its base edges perpendicular to VP. An Auxiliary Inclined Plane (AIP) inclined to HP at 30° cuts its axis at 30 mm from the base. Develop the lateral surface of the truncated prism.
- 7) A right circular cone, diameter of base rim 40 mm and height 70 mm rests on its base on HP. A section plane perpendicular to VP and inclined to HP at 45° cuts the cone meeting its axis at a distance of 40 mm from its apex. Draw its front view and sectional top view.
- 8) A cylinder 50 mm diameter and 70 mm long axis resting on HP on its base is completely penetrated by another cylinder of 40 mm diameter and 70 mm long axis horizontally. Both axes intersect & bisect each other. Draw projections showing curves of intersections.
- 9) A right regular pentagonal prism, edge of base 20 mm, and height 50 mm has a central circular hole of diameter 20 mm drilled centrally through it, along its axis. Draw its isometric view.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

June-2022



Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Agriculture Engineering/Artificial Intelligence & Machine Learning/Artificial Intelligence (AI) and Data Science/Artificial Intelligence/Automation & Robotics/Automobile Engineering/Civil Engineering/Computer Science Engg./Data Science/ Electrical & Electronics Engineering/ Electrical Engineering/ Electronics & Communication Engineering/ Electronics & Electrical Engineering/ Food Technology/ Information Technology/ Mechanical Engineering/ CSE (Internet of Things and Cyber Security including Block Chain Technology)/B.Tech. (Computer Science & Engineering/Artificial Intelligence & Machine Learning/Cyber Security Data Science/IOT)
(Sem.-1,2)

ENGINEERING GRAPHICS & DESIGN

Subject Code : BTME-101-21

M.Code : 91335

Date of Examination : 19-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1) Write short notes on :

- a) Explain the following terms with a suitable drawing: Apex, Slant Height, Base Rim and Generator.
- b) Draw a regular Pentagonal Lamina of side 55mm.
- c) Explain with the help of an example the Aligned system of placement of dimensions.
- d) What do you mean by Representative Fraction (RF)?
- e) Explain any Two Lines used in Engineering Drawing.
- f) How will you represent Metals and Liquid on a drawing sheet?

32 A

- g) What are right solids and oblique solids? Explain with a suitable freehand drawing.
- h) Show by means of traces, a plane perpendicular to both HP and VP.
- i) Write the following statement using single stroke capital vertical letters of 12 mm size : "IKGPTU KAPURTHALA".
- j) Differentiate Isometric Projections and Isometric Drawing.

SECTION-B

- 2) Construct a Diagonal Scale of R.F = 1:50 to read meters, decimeters and centimeters and long enough to measure up to 6m. Indicate 3.46m on the scale.
- 3) A point "G" is 22mm in front of VP and 42mm above HP. Draw its projections and find out its shortest distance from the reference line.
- 4) A line AB has its end "A" 15 mm above HP and 20 mm in front of VP. End "B" 40 mm above HP and 50 mm in front of VP. The distance between the end projectors is 45 mm. Draw the projections of the line and find out its true length, true inclinations with principal planes, HT and VT.
- 5) Line "AB" 65mm long; has its end "A" both in HP and VP. It is inclined at 45° to the "HP" and 30° to the "VP". Draw its projections when the line is lying in third quadrant.

SECTION-C

- 6) A right regular triangular prism of base edge 40 mm, axis 65 mm long is resting on its rectangular face on HP, with axis parallel to both HP and VP. Draw its projections.
- 7) A regular hexagonal thin plate of 45 mm side is resting on one of its corners in HP. Draw its projections when the plate surface is vertical and inclined to VP at 30° .
- 8) Draw the projections of a cone of base diameter 42 mm and axis 62 mm; lying on HP on its generator such that the axis is parallel to VP. Assume the cone lying in first quadrant.
- 9) A right regular hexagonal prism, edge of base 20 mm, and height 50 mm has a central circular hole of diameter 20 mm drilled centrally through it along its axis. Draw its isometric view.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.

Roll No.

Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (CE/BT/CSE/EEE/ECE/IT/ME) (Sem.-1,2)

ENVIRONMENT SCIENCE

Subject Code : EVSC-101

M.Code : 54107

Date of Examination : 18-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

Write briefly :

- 1) What is the significance of 'interaction of systems' in ecosystem?
- 2) Differentiate between renewable and non-renewable resources giving two examples of each.
- 3) List any four biodiversity hot spots of India.
- 4) How are sources of air pollution classified? Give example of each.
- 5) Write any four causes of deforestation.
- 6) Differentiate between soil erosion and land degradation.
- 7) What is meant by sustainable development?
- 8) What is meant by environmental ethics?
- 9) Establish environmental protection as part of human rights.
- 10) Comment on the role of information technology in environment protection and human health.

SECTION-B

- 11) Identify the major environmental problems in your region. Analyze and identify the multidisciplinary scientific areas which can offer solutions to the problem. Also, specify the role of you as an individual solving the issue.
- 12) *"Industrialization, though increased productivity, brought in environmental degradation"*. List out the major environmental problems associated modern industrial practices.
- 13) Discuss the energy flow through a desert ecosystem. Give neat sketches.
- 14) Consider automobile air pollution as major urban pollution issue. Identify the different pollutants and discuss their effects. Suggest suitable control measures.

SECTION-C

- 15) List out and discuss the urban problems related to energy. Do you think electric vehicles offer solutions to urban environmental problems?
- 16) Write notes on :
 - a) Urban water conservation strategies
 - b) Wasteland reclamation.
- 17) Explain the role green house gases in global warming and climate change. Discuss the international efforts in curbing the climate change threats.
- 18) Discuss the salient provisions and issues associated with the enforcement of any four environmental laws in India.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.



Roll No.

Total No. of Pages : 02

Total No. of Questions : 18

**B.Tech. (Agriculture Engg./AI & ML/ AI & DS / Automation & Robotics. /
Automobile Engg. / Bio Technology / Civil Engg. / Computer Engg. / CSE
/ Cyber Security / Data Science / IOT / EEE / EE / ECE / Food Tech / IT /
ME) B.Tech. CSE (IOT & Cyber Security including Block Chain
Technology) / PIT B.Tech Computer Engg. / PIT B.Tech ECE
(Sem.-1,2)**

PROGRAMMING FOR PROBLEM SOLVING

Subject Code : BTPS-101-18

M.Code : 75346

Date of Examination : 13-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

Write briefly :

- 1) What is a pointer and why it is used?
- 2) What is a link list and how it is different from an array?
- 3) What is the difference between a variable and a constant?
- 4) What is an array of structures? Define it.
- 5) What is the difference between declaration and definition?
- 6) What is the complexity of Selection sort and why?
- 7) What is the difference between logical and syntax errors.
- 8) What is an operating system?
- 9) What are object and executable code?
- 10) What is the difference between strings and arrays?

34 A

SECTION-B

- 11) Write a program for Selection sort.
- 12) Write a program using loops to find the sum of the numbers from 1 to 10.
- 13) Write a program to find the factorial of a number. The user will enter a number, and you have to calculate its factorial and display it.
- 14) Write a program using pointers to Swap two numbers entered by the user.

SECTION-C

- 15) What is the difference between call by value and call by reference? Explain with an example.
- 16) Why recursion is used in programming? Can we write any program written with recursion without using recursion as well?
- 17) What is the difference between user-defined and system-defined functions? Write any user- defined function to add two numbers.
- 18) Explain how we can use if-else statements and how they differ from switch statements?

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC case against the Student.

Roll No.

Total No. of Pages : 02

Total No. of Questions : 18

**B.Tech. (Automation & Robotics/Bio Technology/Civil
Engineering/Computer Science & Engineering/Electrical & Electronics
Engineering/Electrical Engineering/Electronics & Communication
Engineering/Information Technology/Mechanical Engineering)
(Sem.-1,2)**

ENGINEERING CHEMISTRY

Subject Code : BTCH-101

M.Code : 54093

Date of Examination : 08-07-22



Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C Each.

SECTION-A

Answer briefly :

- 1) What is the importance of 'finger print region' in infrared spectroscopy?
- 2) What is Lambert-Beer's Law?
- 3) Distinguish between hard water and soft water.
- 4) Write down the properties of water to be used as green solvent.
- 5) The observed chemical shift of a proton is 350 Hz from TMS and the operative frequency of NMR spectrometer is 100 MHz. Calculate the chemical shift in δ ppm.
- 6) What is calgon conditioning of boiler feed water?
- 7) What is meant by polymer reinforced composite?
- 8) Why does the small anodic area result in intense corrosion?
- 9) What are natural gas liquids?
- 10) What are nonmaterial's?

60

SECTION-B

- 11) a) Why molecules absorb in UY-Visible region? What are the types of electronic transitions that can occur in a molecule? Explain giving examples.
- b) What is the principle of IR spectroscopy? Calculate the fundamental modes of vibrations in C_6H_6 and CH_4 molecules.
- 12) a) What is meant by quantum yield of a photochemical-reaction? How would you explain very high and very low quantum yields of some photochemical reactions?
- b) Differentiate between fluorescence and phosphorescence.
- 13) a) Explain the desalination of water by reverse osmosis method.
- b) Differentiate between scale and sludge. How are scales formed? What are their disadvantages?
- 14) a) Name the twelve principles of green chemistry. Explain the use of innocuous reagents in green synthesis.
- b) How can the ultrasonic radiations be used to carry out the green chemical synthesis? Explain by taking a suitable example.

SECTION-C

- 15) a) What is differential aeration corrosion? Illustrate the reactions involved in differential aeration corrosion with reference to iron materials.
- b) What are the different methods of controlling corrosion? Explain sacrificial anodic protection method.
- 16) a) Differentiate between addition polymerisation and condensation polymerization with suitable examples.
- b) *'Weight average molecular weight is higher than number-average molecular weight of a polymer'*. Explain.
- 17) a) What are the characteristics of self assembly? Explain the formation of self assembled monolayers.
- b) What are coercing colloids? Give its applications.
- 18) a) What is the composition of crude oil? Also, classify the crude oil in different categories.
- b) Describe the catalytic cracking of crude petroleum oil.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

Applied Sci

B. Tech (1, 2 Sem)



Roll No.

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (Automation & Robotics/Bio Technology/Civil Engineering/Computer Science & Engineering/Electrical & Electronics Engineering/Electrical Engineering/Electronics & Communication Engineering/Information Technology/Mechanical Engineering)
(Sem.-2)

ENGINEERING MATHEMATICS – II

Subject Code : BTAM-102

M.Code : 54092

Date of Examination : 06-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C. have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Answer briefly :

a) Find the general value of $\log(-4)$.

b) If $A = \begin{bmatrix} 1 & 4 \\ -3 & 5 \end{bmatrix}$. Hence find A^{-1} .

c) Define similar matrices.

d) Solve $(x-a) \frac{dy}{dx} + 3y = 12(x-a)^3$.

e) Solve $\frac{dy}{dx} + \frac{1}{x}y = x^3 - 3$.

f) Solve $(x+y-10)dx + (x-y-2)dy = 0$.

g) Find the general solution of $\frac{d^3y}{dx^3} + y = 0$.

- 62
- h) Give an example of a matrix which is Skew symmetric but not skew Hermitian.
- i) Examine the vectors for Linear dependence $X_1 = (1, -1, 1)$, $X_2 = (2, 1, 1)$, $X_3 = (3, 0, 2)$
- j) State Gauss test.

SECTION-B

2. a) Solve $(1+x)^2 \frac{d^2y}{dx^2} = (1+x) \frac{dy}{dx} + y = 4 \cos[\log(1+x)]$.
- b) Solve the following differential equations $(y^2 - 2x^2y) dx + (2xy^2 - x^3) dy = 0$.
3. a) Solve $y'' + y = \operatorname{cosec} x$ by method of variation of parameters.
- b) Solve the differential equation $\frac{d^2y}{dx^2} + 3 \frac{dy}{dx} + 2y = \sin e^x$.
4. The damped LCR circuit is governed by the equation $\frac{d^2q}{dt^2} + R \frac{dq}{dt} + \frac{q}{C} = 0$, where L, C, R are positive constants. Find the condition under which the circuit is over damped, under damped and critically damped. Find also the critical resistance.
5. a) Solve the Clairaut's equation $y = xy' + \frac{1}{y'}$.
- b) Solve $[1 + \log(xy)]dx + \left[1 + \frac{x}{y}\right]dy = 0$.

SECTION-C

6. a) Separate into real and imaginary parts $\tan^{-1}(e^{i\theta})$.
- b) Find modulus and argument of $(1-i)^{1+i}$

63

7. a) Expand $\sin^8 \theta$.

b) Show that the Matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is similar to the diagonal Matrix. Also, find the Transforming Matrix and the Diagonal Matrix.

8. a) Discuss the convergence or divergence of the series $\sum \frac{n^p}{(n+1)^q}$.

b) Test the convergence of $\frac{x}{1.2} + \frac{x^2}{3.4} + \frac{x^3}{5.6} = \dots$

9. a) If $A = \begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$, Find A^{-1} by Gauss Jordan Method.

b) Find all the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

June-2022



Roll No.

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (Artificial Intelligence & Machine Learning/Artificial Intelligence and Data Science/Artificial Intelligence/Computer Science & Engineering) / B.Tech. (Computer Science & Engg.) (Artificial Intelligence & Machine Learning/Cyber Security/Data Science/IOT) / B.Tech. CSE (Internet of Things and Cyber Security including Block Chain Technology/Data Science/IT)
(Sem.-2)

MATHEMATICS-II

Subject Code : BTAM204-18

M.Code : 91960

Date of Examination : 18-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write short notes on :

- a) The mean of 10 numbers is 7 and the mean of 15 other numbers is 12. Determine the mean of 25 numbers taken together.
- b) What is skewness? How does it differ from Kurtosis?
- c) Find the expectation of the number on a dice when thrown.
- d) If a leap year is selected at random, what is the chance that it will contain 53 Tuesdays?
- e) Bring out the fallacy, if any, in the following statement:
"The mean of a Poisson distribution is 5 while its standard deviation is 4".
- f) If $n = 10$ and $\sum D^2 = 280$, what is the coefficient of Rank Correlation?
- g) Calculate the regression equation Y on X from the following data :
 $\sum X = 30, \sum Y = 23, \sum XY = 168, \sum X^2 = 224, \sum Y^2 = 175, N = 7.$

65

- h) Fit a linear curve to the data $\sum X = 15$, $\sum Y = 204$, $\sum XY = 748$, $\sum X^2 = 55$, $N = 5$.
- i) Is the following function a probability density function?

$$f(x) = \begin{cases} 0 & , x < 2 \\ \frac{1}{8}(3 - 2x) & , 2 \leq x \leq 4 \\ 0 & , x > 4 \end{cases}$$

- j) A sample of 400 male students is found to have a mean height of 67.47 inches. Can it be reasonably regarded as sample from a large population with mean height 67.39 inches and S.D. 1.30 inches.

SECTION-B

2. a) Calculate mean, variance and third central moment from the following data :

x :	0	1	2	3	4	5	6	7	8
y :	1	9	26	59	72	52	29	7	1

- b) A coin is tossed until a head appears. What is the expectation of the number of tosses required?
3. a) Find the coefficient of skewness from the data given below:

Size :	3	4	5	6	7	8	9	10
Frequency :	7	10	14	35	102	136	43	8

- b) Three bad eggs got mixed up with 7 good eggs. If three eggs are drawn (without replacement) from 10 eggs, find the mean and variance for the number of bad eggs among them.
4. a) n person are seated on n chairs at a round table. Find the probability that three are sitting next to each other.
- b) Find the binomial distribution whose mean is 3 and variance 2.
5. a) If a random variable x has a Poisson distribution such that $P(x = 2) = 9 P(x = 4) + 90 P(x = 6)$. Then find mean and standard deviation,
- b) Calculate correlation coefficient from the following data :

$$n = 10, \sum X = 140, \sum Y = 150, \sum (X - 10)^2 = 180, \sum (Y - 15)^2 = 215, \sum (X - 10)(Y - 15) = 60.$$

BB

SECTION-C

6. In the accounting department of bank, 100 accounts are selected at random and estimated for errors. The following results were obtained :

No. of errors :	0	1	2	3	4	5	6
No. of accounts :	35	40	19	2	0	2	2

Does this information verify that the errors are distributed according to the Poisson probability law?

7. Fit the curve $y = a + bx^2$ to the data :

x :	10	20	30	40	50
y :	8	10	15	21	30

8. Given below are the figures of production (in thousand tonnes) of coal :

Year :	1980	1981	1982	1983	1984	1985	1986
Production : (in thousand tones)	70	85	94	83	90	100	98

Fit a straight line by the method of least squares.

9. Can vaccination be regarded as preventive measure of small pox as evidenced by the following data of 1482 persons exposed to small pox in a locality. 368 in all were attacked of these 1482 persons and 343 were vaccinated and of these only 35 were attacked.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.

June - 2022



Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Automation & Robotics) / EEE / EE / ECE (Sem.-2)

MATHEMATICS - II

Subject Code : BTAM-202-18

M.Code : 91958

Date of Examination : 18-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write short notes on :

- a) Find the integrating factor of differential equation: $(1 + xy) ydx + (1 - xy) xdy = 0$.
- b) Define Clairaut's equation. Give an example.
- c) Solve $\frac{d^4 y}{dx^4} + 4y = 0$.
- d) Find the differential equation of all right circular cones having vertex at origin and axis the z-axis.
- e) Solve the lagrange's equation: $p \tan x + q \tan y = \tan z$.
- f) Classify the differential equation : $t \frac{\partial^2 u}{\partial t^2} + 2 \frac{\partial^2 u}{\partial x \partial t} + x \frac{\partial^2 u}{\partial x^2} + \frac{\partial u}{\partial x} = 0$.
- g) What are the drawbacks of Bisection method?
- h) What is the relation between Δ and E?
- i) What do you mean by numerical integration?
- j) What is Euler's iteration formula?

SECTION-B

2. Solve $(1 + x^2) y'' + xy' - y = 0$ in series about $x = 0$.
3. Solve the differential equation : $(D^2 + 4D + 3) y = \sin 3x \sin 2x$.
4. Solve the following Lagrange's partial differential equation :
 $P \cos (x + y) + q \sin (x + y) = z$.
5. Solve $z = p^2x + q^2y$, by Charpit's method.

SECTION-C

6. Find a negative real root of the equation $x^2 - 4x + 10 = 0$ by bisection method.
7. Fit a polynomial of degree 3, which takes the following values:

x	3	4	5	6
y	6	24	60	120

8. Apply Runge - Kutta's method of order 4 to find $y(0.2)$ in steps of 0.1 given $\frac{dy}{dx} = 3x + 2y$ and $y(0) = 1$.
9. Use Milne's predictor method to evaluate the integral of $\frac{dy}{dx} - 4y = 0$ at $x = 0.4$ given that

x	0	0.1	0.2	0.3
y(x)	1	1.492	2.226	3.320

Also compare your answer with exact solution.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.

June-2022



Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Agricultural Engg. / Automobile Engg. / Mechanical Engg.)
(Sem.-2)

MATHEMATICS - II

Subject Code : BTAM-203-18

M.Code : 91959

Date of Examination : 18-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Write short notes on :

- a) Obtain general solution of differential equation $y = xy' + (y')^2$.
- b) Find Integrating Factor of $(3xy^2 - y^3) dx - (2x^2y - xy^2) dy = 0$.
- c) Find non-ordinary (singular) points of $(1 - 6x) \frac{dy}{dx} = y$.
- d) Solve : $x \cos xy + \sin y \frac{dy}{dx} = 0$.
- e) Solve the differential equation $x \frac{dy}{dx} - y - 2x^3 = 0$.
- f) Test the analyticity of the function $w = \sin z$.
- g) Show that $2x(1 - y)$ can be the imaginary part of an analytic function.
- h) Find the image of $|z| = 2$ under the mapping $w = z + 3 + 2i$.
- i) Evaluate $\int_0^{1+i} (x - y + ix^2) dz$ along the line from $z = 0$ to $z = 1 + i$.
- j) State Cauchy's Integral Theorem.

70

SECTION-B

2. a) For what value of k , the differential equation

$$\left(1 + e^{\frac{kx}{y}}\right) dx + e^{\frac{x}{y}} \left(1 - \frac{x}{y}\right) dy = 0 \text{ is exact.}$$

- b) Solve $x^3 y''' - 3x^2 y'' + 7xy' - 8y = 3x^2 + 8x$.
3. a) Solve the differential equations : $p^2 + 2py \cot x = y^2$.
- b) Find the general solution of the equation $y'' + 16y = 32 \sec 2x$; using method of variation of parameters.
4. a) Solve: $y^2 \log y = xyp + p^2$.
- b) Find the solution of $xy' + y = y^2$.
5. Solve Legendre Equation $((1-x^2) \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} + m(m+1)y = 0$, m is any real or complex in power series about 0.

SECTION-C

6. a) If $f(z)$ and $\overline{f(z)}$ are both analytic then show that $f(z)$ is constant.
- b) Evaluate $\frac{1}{2\pi i} \int_C \frac{z^2 + 5}{z - 3} dz$, where C is $|z| = 4$.
7. a) Prove that $u = x^2 - y^2$ and $v = -\frac{y}{x^2 + y^2}$ are harmonic but $u + iv$ is not regular.
- b) Expand $f(z) = \frac{z+1}{(z-3)(z-4)}$ as a Taylor's series about $z = 2$.
8. a) Find the analytic function $f(z) = u + iv$ if $u + v = \frac{x}{x^2 + y^2}$ and $f(1) = 1$.
- b) Evaluate $\int_C \frac{e^{2z}}{(z - \pi i)^3} dz$, where C is $|z - 2i| = 2$.
9. Find the Laurent's series of $f(z) = \frac{z}{(z^2 + 1)(z^2 + 4)}$ in $1 < |z| < 2$.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.

June, 2022

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (CSE/AE/ME) (Sem.-2)

MATHEMATICS-II

Subject Code : BTAM-203-18

M.Code. : 76256

Date of Examination : 18-07-22

Time : 3 Hrs.

Max. Marks : 60



INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

Answer briefly :

1. a) Solve $y = px + \sin^{-1}p$.
- b) Find Integrating Factor of $(1 + xy) y dx + (1 - xy) x dy = 0$.
- c) Find non-ordinary (singular) points of $\frac{d^2y}{dx^2} + (x-1) \frac{dy}{dx} + y = 0$.
- d) Solve the initial value problem $e^x (\cos y dx - \sin y dy) = 0 ; y(0) = 0$.
- e) Solve $\frac{dy}{dx} + y = 1$
- f) Write C-R equations in cartesian co-ordinates.
- g) Show that the function $u = \sin x \cosh y + 2 \cos x \sinh y + x^2 - y^2 + 4xy$ is harmonic.
- h) Find the image of the circle $|z| = 1$ under the transformation $w = z + 2 + 4i$.
- i) Evaluate $\int_{1-i}^{2+i} (2x + iy + 1) dz$ along the straight line joining $(1 - i)$ to $(2 + i)$.
- j) State Cauchy's residue theorem.

SECTION-B

2. a) Solve $\frac{dy}{dx} = \frac{x-2y+5}{2x+y-1}$.
- b) Solve the differential equation $x^2 \frac{d^2y}{dx^2} + 2x \frac{dy}{dx} - 12y = x^3 \log x$.
3. a) Solve the differential equations $x + \frac{p}{\sqrt{1+p^2}} = a$.
- b) Solve the differential equations $\frac{d^2y}{dx^2} + y = \sec x$.
4. a) Solve $\left(\frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}} \right) \frac{dx}{dy} = 1, x \neq 0$.
- b) Solve: $2 \frac{dy}{dx} = \frac{y}{x} + \frac{y^2}{x^2}$.
5. Solve $(1+x^2)y'' + xy' - y = 0$ in series about $x = 0$.

SECTION-C

6. a) Find p such that the function $f(z) = r^2 \cos 2\theta + ir^2 \sin p\theta$ is analytic.
- b) Evaluate $\int_C e^{\sin z^2} dz$ where C is $|z| = 1$.
7. a) Prove that $\log \sqrt{x^2 + y^2}$ is harmonic.
- b) Expand $f(z) = \frac{1}{z^2 - 4z + 3}$ as a Taylor's series about $z = 4$.
8. a) Find the analytic function $f(z) = u + iv$ given that $2u + 3v = e^x (\cos y - \sin y)$.
- b) Evaluate $\int_C \frac{\cos \pi z}{z^2 - 1} dz$, where C is the rectangle whose vertices are $2 \pm i, -2 \pm i$.
9. Find the Laurent's series expansion of $f(z) = \frac{1}{z(z-1)}$ for $0 < |z| < 1$ and $0 < |z-1| < 1$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

June - 2022

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Electrical Engg./ECE) / (Automation & Robotics) / (Civil Engg.) /
(Computer Science & Engineering) / (Electrical & Electronics
Engineering) /
(Electronics & Electrical Engineering) (Sem.-2)

MATHEMATICS-II

Subject Code : BTAM-202-18

M.Code : 76255

Date of Examination : 18-07-22

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

Answer briefly :

1. a) Find the integrating factor of differential equation by inspection :

$$ydx - xdy + \log x = 0.$$

- b) Solve the clairaut's equation $p = \cot(y - px)$.

- c) From the partial differential equation of the function $z = f\left(\frac{x}{y}\right) + g(x, y)$ by eliminating arbitrary functions.

- d) Find the general solution of the partial differential equation $(3D^2 - 10DD' + D'^2)z = 0$.

- e) Discuss the advantages of Bisection method.

- f) Evaluate $\Delta\left(\frac{x^2}{\cos 2x}\right)$.

- 74
- g) Write down Simpson's $\frac{1}{3}$ - rule and $\frac{3}{8}$ - rule.
- h) State Runge-Kutta's method of fourth order.
- i) Classify the following equation :
- $$u_{xx} + 4u_{xy} + (x^2 + 4y^2) u_{yy} = \sin(x + y)$$
- j) State two-dimensional wave equation.

SECTION-B

2. Solve $xp^2 - 3yp + 9x^2 = 0, x > 0$.
3. Solve the differential equation : $(x^2D^2 - 3xD + 1)y = \frac{\log x \sin(\log x) + 1}{x}$.
4. Solve the following Lagrange's partial differential equation :
- $$px + qz = -y.$$
5. Solve $yzp^2 = q$, by Charpit's method.

SECTION-C

6. Find the fourth root of 32 correct to three decimal places using the method of false position.
7. Find the missing value of the following data :

x	0	5	10	15	20	25
y	6	10	-	17	-	31

8. Calculate $\int_0^4 \sqrt{64 - x^3}$ by Trapezoidal rule using 9 ordinates.
9. Solve the equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0 = y$, $x = 3 = y$ with $u = 0$ is the boundary and mesh length = 1.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.