

Roll No.

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Total No. of Questions: 09

Total No. of Pages: 02

B.Tech (Sem. - 1)
ENGINEERING MATHEMATICS-I

Subject Code: BTAM-101

M Code: 54091

Date of Examination : 16-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Answer the following:

- a) If u is a homogenous function of degree n in x, y then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = nu$
- b) Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy$
- c) Find length of curve $y = \log \sec x$ between $x = 0$ to $x = \frac{\pi}{3}$
- d) If error committed in measuring sides of square is 2%. Find an error in calculating the area.
- e) Define curvature.
- f) Find the directional derivative of $x^2y - y^2z - xyz$ at point $(1, -1, 0)$ in direction of $-\hat{i} + 2\hat{k}$
- g) Prove $\text{div}(\text{curl } v) = 0$ where v is differentiable vector field.
- h) State Stoke's theorem.
- i) Find the work done by the force F in moving a particle from a point P to the point Q $F = x^2\hat{i} + yz\hat{j} + z\hat{k}$, C is the line from $(1, 2, 2)$ to $(3, 4, 2)$.
- j) Find $\frac{dy}{dx}$ when $x^y + y^x = \alpha$, where α is any constant

SECTION-B

2. If $z = f(x, y)$, $x = r\cos\theta$, $y = r\sin\theta$, then show that $\left(\frac{\partial f}{\partial x}\right)^2 + \left(\frac{\partial f}{\partial y}\right)^2 = \left(\frac{\partial f}{\partial r}\right)^2 + \frac{1}{r^2}\left(\frac{\partial f}{\partial \theta}\right)^2$
3. Find extreme values of $f(x, y) = x^3y^2(1 - x - y)$
4. Find area outside the circle $r = 2a\cos\theta$ & inside the cardioid $r = a(1 + \cos\theta)$
5. If ρ_1 and ρ_2 be radii of curvature at extremities of two conjugate diameter of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ then prove that $(\rho_1^{2/3} + \rho_2^{2/3})(ab)^{2/3} = a^2 + b^2$

SECTION-C

6. Evaluate the surface integral $\iint F \cdot n dA$ over the surface S , where S is the portion of the surface of cylinder $x^2 + y^2 = 36$, $0 \leq z \leq 4$ included in the first octant and $F = z^2\hat{i} + xy\hat{j} - y^2\hat{k}$
7. Give physical interpretation of curl.
8. Find volume of ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$
9. Verify divergence theorem if $v = 3x^2\hat{i} + 6y^2\hat{j} + z\hat{k}$ and D is the region bounded by closed cylinder $x^2 + y^2 = 16$, $z = 0$ and $z = 4$.

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Roll No.

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (Electrical Engg.) (Sem.-1)

CHEMISTRY-I

Subject Code : BTCH-101B

M.Code : 76281

Date of Examination : 14-01-2023

Time : 3 Hrs.

Max. Marks : 60

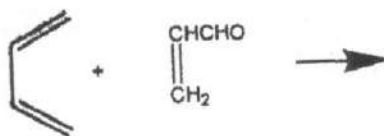
INSTRUCTIONS TO CANDIDATES :

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

I. Write short notes on:

- a) What is Aufbau Principle? Explain.
- b) What are dipole-dipole interactions? Explain.
- c) What is electrochemical corrosion? Give examples.
- d) What type of molecules show IR Spectra?
- e) Differentiate between P- type and N-type semiconductors.
- f) Why electron affinities of halogens are the highest?
- g) What is principle of HSAB?
- h) What is the difference between linkage isomerism and co-ordination isomerism?
- i) Complete the following:



- j) How is entropy related to free energy?



SECTION-B

2. a) Draw the molecular orbital energy level diagram of NO molecule?
b) Find out the bond orders of CO, N₂ and O₂²⁺?
3. a) Discuss in detail Crystal field splitting in octahedral complexes?
b) What is Pauli Exclusion Principle? Explain.
4. a) What is Fluorescence? Discuss its applications in medicines.
b) How many signals are present in following compounds:
 - i) CH₃-O-CH₃
 - ii) $\begin{array}{c} \text{CH}_3\text{-CH}_2\text{-C-CH}_3 \\ \parallel \\ \text{O} \end{array}$
 - iii) CH₃-CH₂-O-CH₂-CH₃
 - iv) CH₃-CH-Br₂
5. a) What are van der Waals forces? Discuss them briefly.
b) What do you understand by potential energy surface? Explain with an example.

SECTION-C

6. a) Derive Nernst equation for calculation of cell e.m.f.
b) What is Ellingham Diagram? How it can be constructed? What are the important characteristics?
7. a) What is ionization energy? Which elements have the highest ionization energy? How it shows variation along the period and down the group?
b) Write short notes on the following :
 - i) Effective Nuclear Charge
 - ii) Penetration of molecular orbitals.

8. a) Describe the conformational analysis of butane.
b) Draw structural isomers for C_3H_8O and $C_4H_{10}O$?
9. a) Write short notes on the following organic reactions:
i) Oxidation reactions
ii) Ring opening reactions
b) What are Elimination reactions? Give its mechanism.

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Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 1)

MATHEMATICS-I

Subject Code: BTAM-106-18

M Code: 75368

Date of Examination : 11-01-2023

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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Answer the following:

- a) Define a vector space.
- b) If A and B are square matrices. Is $AB = BA$? Justify.
- c) If A and B are symmetric matrices, then show that $AB - BA$ is skew-symmetric.
- d) Define eigenvalues of a matrix.
- e) Find the length of the Helix traced by

$$r(t) = a \cos t \mathbf{i} + a \sin t \mathbf{j} + ct \mathbf{k}, \quad a > 0, 0 \leq t \leq 2\pi$$

- f) Find the unit normal vector to the surface $xy^2 + 2yz = 8$ at the point $(3, -2, 1)$.
- g) Define divergence of a vector field.
- h) Let f be a differentiable scalar field. Then calculate the value of $\nabla \times (\nabla f)$.
- i) Find the length of the arc given by $\mathbf{r}(t) = t \mathbf{i} + t^2 \mathbf{j}$, $0 \leq t \leq \pi/2$.
- j) Evaluate $\int_C (x^2 - y^2) ds$, where C is the curve defined by $x = 3 \cos t, y = 3 \sin t, 0 \leq t \leq 2\pi$.



SECTION B

2. a) If x, y and z are different and

$$\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & xz^2 & 1+z^3 \end{vmatrix} = 0$$

then show that $1 + xyz = 0$

- b) Solve the following system of equations using Gauss elimination method.

$$x - y + z = 1, \quad 2x + y - z = 2, \quad 5x - 2y + 2z = 5$$

3. a) Examine whether the following set of vectors are linearly independent.

$$(1, 2, 3, 4), (2, 0, 1, 2), (3, 2, 4, 2)$$

- b) Find the inverse of the matrix by using Gauss-Jordan method.

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

4. Find all the eigenvalues and the corresponding eigenvectors of the following matrix.

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

5. a) The eigenvalues of 3×3 matrix A corresponding to the eigenvalues 1, 2, 3 are $[-1, -1, 1]^t, [0, 1, 0]^t, [0, -1, 1]^t$ respectively. Find the matrix A

- b) Prove that the eigenvectors of a symmetric matrix are real

SECTION C

6. a) Find directional derivative of the function $f(x, y) = x^2y^3 + xy$ at a point $(2, 1)$ in the direction of a unit vector that makes angle $\pi/3$ with x-axis.
 b) If \mathbf{a} is a constant and $\mathbf{r} = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$, show that $\text{curl}(\mathbf{a} \times \mathbf{r}) = 2\mathbf{a}$
7. a) Show that the vector field $\mathbf{v} = (y^2 - x^2 + y)\mathbf{i} + x(2y + 1)\mathbf{j}$ is irrotational and find a scalar function $f(x, y, z)$ such that $\mathbf{v} = \text{grad } f$
 b) If $f(x, y) = x^2 - xy - y + y^2$, find all points where the directional derivative in the direction $\mathbf{b} = (\mathbf{i} + \sqrt{3}\mathbf{j})/2$ is zero.
8. a) Evaluate $\int_C (x + y)dx - x^2dy + (y + z)dz$ where C is $x^2 = 4y, z = x, 0 \leq x \leq 2$
 b) Find the work done by the force $\mathbf{F} = -xy\mathbf{i} + y^2\mathbf{j} + z\mathbf{k}$ in moving a particle over a circular path $x^2 + y^2 = 4, z = 0$ from $(2, 0, 0)$ to $(0, 2, 0)$.
9. Verify Green's theorem for $f(x, y) = e^{-x}\sin y, g(x, y) = e^{-x}\cos y$ and C is the square with vertices at $(0, 0), (\pi/2, 0), (\pi/2, \pi/2), (0, \pi/2)$.

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Roll No.

Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 1)

MATHEMATICS-I

Subject Code: BTAM- 104-18

M Code: 75362

Date of Examination : 11-01-2023



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Answer the following:

- a) Can Rolle's theorem be applied to the function $f(x) = x(x + 3)^2, x \in [-3, 1]$.
- b) Define *gamma* function.
- c) Evaluate $\lim_{x \rightarrow 0} \frac{x - \sin x}{\sin x(1 - \cos x)}$
- d) If $A + B = \begin{bmatrix} 1 & -1 \\ 3 & 0 \end{bmatrix}$ and $A - B = \begin{bmatrix} 3 & 1 \\ 1 & 4 \end{bmatrix}$, then find values of A and B
- e) Find adjoint of $\begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix}$
- f) Define the dimension of vector spaces.
- g) Give the statement of rank nullity theorem.
- h) Give any two properties of Eigen values.
- i) Define skew symmetric matrix with an example.
- j) Find sum and product of latent roots of the matrix $\begin{bmatrix} 1 & -1 \\ -2 & 1 \end{bmatrix}$

SECTION-B

2. a) Expand $f(x) = \tan^{-1} x$ by Maclaurin's theorem.
 b) Evaluate $\lim_{x \rightarrow 1} \frac{x^x - x}{-1 + x - \log x}$.
3. a) Evaluate the integral $\int_0^{\pi/2} \sqrt{\tan x} dx$ in terms of beta function.
 b) Find minima of $f(x, y) = 4x^2 + 9y^2 - 8x - 12y + 4$.
4. a) Prove that
$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^2.$$

 b) Solve the equations $3x + y + 2z = 3, 2x - 3y - z = -3, x + 2y + z = 4$ using Cramer's rule.
5. a) Are the vectors $(1,1,1,3), (1,2,3,4), (2,3,4,9)$ linearly dependent.
 b) Find the rank of the matrix: $\begin{bmatrix} 4 & 2 & 1 & 3 \\ 6 & 3 & 4 & 7 \\ 2 & 1 & 0 & 1 \end{bmatrix}$.

SECTION-C

6. Show that the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$ satisfies the equation $A^3 - 6A^2 + 5A + 11I = 0$.
7. Let $T: R^3 \rightarrow R^2$ be the linear transformation defined by $T \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} y+z \\ y-z \end{pmatrix}$, then find the matrix representation of T w.r.t. the ordered basis $X = \{(1,0,1), (1,1,0), (0,1,0)\}^T$ in R^3 and $Y = \{(1,0), (0,1)\}^T$ in R^2 .
8. a) Is the matrix $\begin{bmatrix} 5 & 3 & 7 \\ 3 & 26 & 2 \\ 7 & 2 & 10 \end{bmatrix}$ orthogonal?
 b) Write the matrix $\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$ as the sum of symmetric and skew symmetric matrices.
9. Reduce the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ to the diagonal form.

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Roll No.

Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 1)

MATHEMATICS-I

Subject Code: BTAM-101-18

M Code: 75353

Date of Examination : 11-01-2023



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Answer the following:

- a) Give geometric interpretation of mean value theorem.
- b) Can Rolle's theorem be applied to the function:

$$f(x) = \begin{cases} x, & 0 \leq x \leq 1 \\ 2 - x, & 1 \leq x \leq 2 \end{cases} \text{ in the interval } [0, \pi].$$

- c) Evaluate $\lim_{x \rightarrow 0} [x^n (\ln x)]$.
- d) Does the limit $\lim_{(x,y) \rightarrow (0,0)} \frac{xy}{x^2+y^2}$ exists?
- e) Give the coordinates of the center of gravity of solid of mass M .
- f) Define convergence, divergence and oscillation of a series.
- g) Define D'Alembert's ratio test to check the convergence of the positive term series $\sum u_n$.
- h) Find sum and product of Eigen values of the matrix $\begin{bmatrix} 1 & -1 \\ 2 & -5 \end{bmatrix}$.
- i) Find the inverse of the matrix $\begin{bmatrix} 3 & 1 \\ 1 & 4 \end{bmatrix}$.
- j) Find rank of the matrix $\begin{bmatrix} 0 & 1 & -3 \\ 1 & 0 & 1 \\ 3 & 1 & 0 \end{bmatrix}$.

SECTION-B

2. a) Expand $f(x) = e^x$ in powers of $(x - 1)$ upto four terms.
- b) Evaluate the limit $\lim_{x \rightarrow 0} \frac{e^x - e^{-x} - 2 \log(1+x)}{x \sin x}$
3. a) Find the volume of the loop generated by the revolving the curve $y^2(a+x) = x^2(3a-x)$ about the x axis.
- b) Find extremum of the function $2 \sin x + \cos 2x, 0 \leq x \leq 2\pi$.
4. a) Discuss the continuity of the function $f(x, y) = \begin{cases} \frac{x^2+y^2}{xy}, & (x, y) \neq (0,0) \\ 0, & (x, y) = (0,0) \end{cases}$ at $(0,0)$.
- b) Find extreme values of $2x + 3y + z$ subject to the conditions $x + z = 1$ and $x^2 + y^2 = 5$.
5. a) Evaluate the integral $\iint_R e^{x^2} dx dy$, where R is the region given by $R: 2y \leq x \leq 2$ and $0 \leq y \leq 1$
- b) Evaluate $\iiint_T (x + 3y - 2z) dx dy dz$, over the boundary of $T: 0 \leq y \leq x^2, 0 \leq z \leq x + y, 0 \leq x \leq 1$.

SECTION-C

6. Examine the convergence of the series $\sum \frac{3 \cdot 6 \cdot 9 \cdots (3n)}{7 \cdot 10 \cdot 13 \cdots (3n+4)} x^n$.
7. a) Examine the convergence of the series $\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + \dots$
- b) Examine the convergence of the alternating series $1 - \frac{1}{2^k} + \frac{1}{3^k} - \frac{1}{4^k} + \dots$, for $k > 0$.
8. Find the characteristic equation of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and hence compute A^{-1} . Find the matrix represented by $A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$.
9. Reduce the matrix $\begin{bmatrix} 5 & 3 & 7 \\ 3 & 26 & 2 \\ 7 & 2 & 10 \end{bmatrix}$ to the diagonal form.

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Dec 2022

Roll No.

Total No. of Pages : 01

Total No. of Questions : 08

M.Tech. (CSE / ECE / EE / VLSI / Power System) (Sem.-1)

RESEARCH METHODOLOGY AND IPR

Subject Code : MTRM-101-18

M.Code : 75161

Date of Examination : 21-01-2023



Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWELVE marks.

1. How we can identify the research problem? Discuss the characteristics of good research problem.
2. What are ethics in research? Why it is important? Discuss few best practices to follow the research ethics.
3. How to develop a research proposal? Discuss the format of the research proposal in detail.
4. What are Intellectual Property Rights? Discuss methods of protecting the different innovations.
5. Can we take patent for software? What are advantages of filing a patent? How to get patent for an idea in India?
6. What is plagiarism? Discuss some common types of plagiarism. How we can detect the plagiarism?
7. Define technology licensing. Discuss different methods of technology transfer and different between exclusive and non-exclusive method of Technology transfer.
8. Write a short note on :
 - a) Significance of mentioning scope of the research problem
 - b) Identifying the research gaps
 - c) Data Collection.

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June 2023

Roll No.

Total No. of Pages : 04

Total No. of Questions : 11

B.Arch. / B.Com. / B.Sc. BE / B.Tech / BMCI / BRDM / BSIM / BBA /
M.Sc. (MC&I) / BCA / B.Sc. (IT) / DCA / DD BBA / (Sem.- 1)

HUMAN VALUES AND PROFESSIONAL ETHICS

Subject Code : HVPE-101

M.Code : 10049

Date of Examination : 24-01-23



Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A contains objective type questions.
2. SECTION-B contains short answer type questions.
3. SECTION-C contains descriptive answer type questions.
4. Attempt ALL questions.

SECTION-A

1. Fill in the blanks / True / False :

(10 × 1 = 10)

a) Ethical Human Conduct leads to Mutual Fulfilment.

ਨੈਤਿਕ ਮਾਨਵ ਆਚਰਣ ਸੇ ਪਰਸਪਰ ਪੂਰਿ ਹੋ ਜਾਤੀ ਹੈ।

ਨੈਤਿਕ ਮਨੁਖੀ ਵਿਉਹਾਰ ਪਰਸਪਰ ਪੂਰਕਤਾ ਵੱਲ ਲੈ ਜਾਂਦਾ ਹੈ।

b) Giving all the priorities to Physical Facilities is living with Animal consciousness.

ਭੌਤਿਕ ਸੁਵਿਧਾओं को सभी प्राथमिकताएं देना पशु चेतना के साथ रहना है।

ਸਰੀਰਕ ਸਹੂਲਤਾਂ ਨੂੰ ਹੀ ਸਾਰੀਆਂ ਪਹਿਲਾਂ ਦੇਣੀਆਂ ਪਸ਼ੂ ਬਿਰਤੀ ਨਾਲ ਰਹਿਣਾ ਹੈ।

c) There are four orders in Nature.

प्रकृति में चार आदेश हैं।

ਪ੍ਰਕਿਰਤੀ ਵਿਚ ਚਾਰ ਆਦੇਸ਼ ਹਨ।

d) Respect is right evaluation.

सम्मान सही मूल्यांकन है।

ਆਦਰ ਤੋਂ ਭਾਵ ਸਹੀ ਮੁਲਾਂਕਣ ਹੈ।

e) All the needs of Self are called Happiness.

स्वयं की सभी जरूरतों को खुशियाँ कहा जाता है।

ਸਵੈ ਦੀਆਂ ਲੋੜਾਂ ਨੂੰ ਖੁਸ਼ੀ ਕਹਿੰਦੇ ਹਨ।

- f) Existence is nature submerged in
 अस्तित्व का मतलब है में समाई हुई प्रकृति।
 असतीतव दा मतलब है ਵਿੱਚ ਸਮੋਈ ਹੋਈ ਪ੍ਰਕਿਰਤੀ।
- g) Physical facilities are necessary and for animal.
 भौतिक सुविधाएं पशुओं के लिए आवश्यक है, और है।
 ਭੌਤਿਕ ਸਹੂਲਤਾਂ ਪਸ਼ੂਆਂ ਲਈ ਜ਼ਰੂਰੀ ਹਨ, ਅਤੇ ਹਨ।
- h) Self-exploration is the process for education.
 आत्म-अध्ययन शिक्षा के लिए प्रक्रिया है।
 ਸਵੈ-ਅਧਿਐਨ ਸਿੱਖਿਆ ਲਈ ਪ੍ਰਕਿਰਿਆ ਹੈ।
- i) Justice is Harmony in
 न्याय में सामंजस्य है।
 ਨਿਆਂ ਵਿੱਚ ਤਾਲਮੇਲ ਹੈ।
- j) Right understanding + Relationship =
 ठीक समझ + संबंध =।
 ਠੀਕ ਸਮਝ + ਸੰਬੰਧ =।

SECTION-B

(5 × 4 = 20)

2. What do you mean by Animal Consciousness and Human Consciousness? How is the transformation possible from Animal Consciousness to Human Consciousness?
 आपका पशु चेतना और मानव चेतना से क्या मतलब है? पशु चेतना से मानव चेतना परिवर्तन कैसे संभव है?
 ਤੁਹਾਡਾ ਪਸ਼ੂ ਚੇਤਨਾ ਅਤੇ ਮਨੁੱਖੀ ਚੇਤਨਾ ਤੋਂ ਕੀ ਮਤਲਬ ਹੈ? ਪਸ਼ੂ ਚੇਤਨਾ ਤੋਂ ਮਨੁੱਖੀ ਚੇਤਨਾ ਤੱਕ ਦੀ ਤਬਦੀਲੀ ਕਿਸ ਤਰ੍ਹਾਂ ਸੰਭਵ ਹੈ?
3. Explain Natural Acceptance.
 सहज स्वीकृति समझाओ।
 ਕੁਦਰਤੀ ਮੰਜੂਰੀ ਸਮਝਾਓ।
4. What is the need of Value-Education?
 मूल्य शिक्षा की क्या जरूरत है?
 ਮੁੱਲ ਸਿੱਖਿਆ ਦੀ ਕੀ ਜ਼ਰੂਰਤ ਹੈ?

5. What are the basic guidelines of value education?
 मूल्य शिक्षा के बुनियादी दिशानिर्देश क्या हैं?
 ਮੁੱਲ ਸਿੱਖਿਆ ਦੇ ਬੁਨਿਆਦੀ ਦਿਸ਼ਾ ਨਿਰਦੇਸ਼ ਕੀ ਹਨ?
6. What is prosperity? What is the difference between prosperity and wealth?
 समृद्धि क्या है? समृद्धि और धन के बीच क्या अंतर है?
 ਖੁਸ਼ਹਾਲੀ ਕੀ ਹੈ? ਖੁਸ਼ਹਾਲੀ ਅਤੇ ਪੈਸੇ ਦੇ ਵਿੱਚ ਕੀ ਅੰਤਰ ਹੈ?

SECTION-C

(5 × 6 = 30)

7. Human-being is co-existence of Self and Body? Explain.
 इंसान स्वयं और शरीर का सह-अस्तित्व है? समझाओ।
 ਮਨੁੱਖ ਸਵੈ ਅਤੇ ਸਰੀਰ ਦਾ ਸਹਿ-ਅਸਤਿਤਵ ਹੈ? ਸਮਝਾਓ।

OR

What do you understand by competence in professional ethics? Elaborate.
 आप व्यावसायिक नैतिकता में दक्षता से क्या समझते हैं? समझाओ।
 ਤੁਸੀਂ ਪੇਸ਼ੇਵਰ ਨੈਤਿਕਤਾ ਵਿੱਚ ਯੋਗਤਾ ਵਲੋਂ ਕੀ ਸਮਝਦੇ ਹੋ? ਸਮਝਾਓ।

8. Differentiate between intention and competence. How do we come to confuse between the two?
 इरादा और क्षमता के बीच क्या अंतर है? कैसे हम गलती करते हैं?
 ਇਰਾਦਾ ਅਤੇ ਸਮਰੱਥਾ ਦੇ ਵਿੱਚ ਕੀ ਅੰਤਰ ਹੈ? ਕਿਵੇਂ ਅਸੀਂ ਗਲਤੀ ਕਰਦੇ ਹਾਂ?

OR

What are the problems we are facing today because of operating on the basis of pre conditioned desires?
 पूर्व-मानता इच्छाओं के आधार पर परिचालन करने से हम आज क्या-क्या समस्याओं का सामना कर रहे हैं?
 ਪੂਰਵ-ਮਾਨਤਾ ਇੱਛਾਵਾਂ ਦੇ ਆਧਾਰ ਉੱਤੇ ਚੱਲਣ ਕਰਕੇ ਅੱਜ ਅਸੀਂ ਕਿਹੜੀਆਂ-ਕਿਹੜੀਆਂ ਸਮੱਸਿਆਵਾਂ ਦਾ ਸਾਮਣਾ ਕਰ ਰਹੇ ਹਾਂ?

9. What are the five dimensions of Human Endeavour in society?
 समाज में मानव प्रयास के पांच आयाम क्या हैं?
 ਸਮਾਜ ਵਿੱਚ ਮਨੁੱਖ ਕੋਸ਼ਿਸ਼ ਦੇ ਪੰਜ ਪਹਿਲੂ ਕੀ ਹਨ?

OR

What are the programmes to ensure Health?
 स्वास्थ्य को सुनिश्चित करने के लिए क्या-क्या कार्यक्रम हैं?
 ਸਿਹਤ ਨੂੰ ਠੀਕ ਰੱਖਣ ਲਈ ਕਿਹੜੇ-ਕਿਹੜੇ ਤਰੀਕੇ ਹਨ?

10. What are the implications of value based living?

ਮੂਲਯ ਆਧਾਰਿਤ ਜੀਵਨ ਯਾਪਨ ਕੇ ਅਚਛੇ ਪਰਿਣਾਮ ਕਯਾ ਹੈਂ?

ਕਦਰਾਂ ਕੀਮਤਾਂ ਤੇ ਆਧਾਰਿਤ ਜੀਵਨ ਜੀਉਣ ਦੇ ਚੰਗੇ ਨਤੀਜੇ ਕੀ ਹਨ?

OR

What are the broad holistic criteria for evaluation of technologies, production systems and management models ? How do they map with the comprehensive human goal?

ਪ੍ਰਾਯੋਗਿਕੀ, ਉਤਪਾਦਨ ਪ੍ਰਣਾਲੀ ਔਰ ਪ੍ਰਬੰਧਨ ਮਾਡਲ ਕੇ ਮੂਲਯਾਂਕਨ ਕੇ ਲਿਏ ਵਯਾਪਕ ਸਮਗ੍ਰ ਮਾਪਦੰਡ ਕਯਾ ਹੈਂ? ਕੈਸੇ ਕੇ ਵਯਾਪਕ ਮਾਨਕ ਲਕ੍ਸ਼ਯ ਕੇ ਸਾਥ ਮੇਲ ਖਾਤੀ ਹੈ।

ਤਕਨਾਲੋਜੀ, ਉਤਪਾਦਨ ਸਿਸਟਮ ਅਤੇ ਪ੍ਰਬੰਧਨ ਮਾਡਲ ਦੀ ਪੜਤਾਲ ਕਰਨ ਲਈ ਵਿਆਪਕ ਸੰਪੂਰਨ ਮਾਪਦੰਡ ਕੀ ਹਨ? ਕਿਵੇਂ ਉਹ ਵਿਆਪਕ ਮਨੁੱਖ ਲਕਸ਼ ਦੇ ਨਾਲ ਮੇਲ ਖਾਂਦੀ ਹੈ?

11. Explain self-organisation and health.

ਆਤਮ ਸੰਗਠਨ ਔਰ ਸਵਾਸਥਯ ਕੇ ਬਾਰੇ ਮੈਂ ਕਥਾਓਂ।

ਆਤਮ ਸੰਗਠਨ ਅਤੇ ਸਿਹਤ ਦੇ ਬਾਰੇ ਵਿੱਚ ਦੱਸੋ।

OR

What are the salient unethical practices in the profession at present? Analyze the root cause and possible solution.

ਮੌਜੂਦਾ ਸਮਯ ਮੈਂ ਪੇਸ਼ੇ ਕੇ ਮੁਖਯ ਅਨੈਠਿਕ ਤਰੀਕੇ ਕਯਾ ਹੈਂ? ਮੂਲ ਕਾਰਨ ਔਰ ਸੰਭਵ ਸਮਾਧਾਨ ਕਾ ਵਿਸ਼ਲੇਸ਼ਣ ਕਰੋਂ।

ਮੌਜੂਦਾ ਸਮਾਂ ਵਿਚ ਪੇਸ਼ੇ ਦੇ ਮੁੱਖ ਅਨੈਠਿਕ ਤਰੀਕੇ ਕੀ ਹਨ? ਮੂਲ ਕਾਰਨ ਅਤੇ ਸੰਭਵ ਸਮਾਧਾਨ ਦਾ ਵਿਸ਼ਲੇਸ਼ਣ ਕਰੋਂ।

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Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 1,2)
ENGINEERING PHYSICS

Subject Code: BTPH-101

M Code: 54105

Date of Examination : 28-01-23

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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Write briefly:

- a) Give the physical significance of gradient, divergence and curl of a physical quantity.
- b) Derive the relationship between electric field and potential ($E = -\nabla V$)
- c) Define Meissner's effect in superconductivity.
- d) State Bragg's law of diffraction in crystals.
- e) Differentiate between spontaneous & stimulated emission.
- f) Define acceptance angle and numerical aperture in optical fibers.
- g) Explain the concept of Ether.
- h) Write the characteristics of a well-behaved function.
- i) What do you understand by wave-particle duality?
- j) Write a few biomedical applications of nonmaterials.



SECTION-B

2. a) Write Maxwell's equations in free space in their differential form and derive the EM wave equation.
- b) Prove that the velocity of EM waves in free space is equal to the velocity of light. (6+2)
3. a) Make a comparison of different properties for dia, para, ferro and ferri magnetic materials.
- b) Derive the London equations for superconductivity. (4+4)
4. a) What is the concept of Miller indices? Derive the formula for the distance between two adjacent planes of a simple cubic lattice.
- b) Deduce the Miller indices for planes in each of the following sets which intercept \vec{a} , \vec{b} and \vec{c} at (4+4)
- i) $3a, 3b, 2c$ ii) $a, 2b, c$ iii) $a, b/2, c$
5. a) Define Einstein's coefficients of radiation and derive the relationship between them.
- b) Discuss the construction, working and energy level diagram of Ruby laser. (3+5)

SECTION-C

6. a) Explain the allowed modes in an optical fibre. How are they related to normalized frequency?
- b) Calculate the refractive indices of the core and cladding materials of a fibre from the following data: $NA = 0.22, \Delta\mu_r = 0.012$, where NA is numerical aperture. (5+3)
7. a) Write Lorentz transformation equations and using them derive the expressions for length contract and time dilation in a relative motion.
- b) Derive the relativistic form of Newton's second law of motion when \vec{F} is parallel to \vec{v} . (5+3)
8. a) Define group and phase velocities of matter waves.
- b) Derive time dependent Schrodinger wave equation. (3+5)
9. Discuss the following techniques for the synthesis of nanoparticles:
- a) Ball milling
- b) Sol-gel technique (4+4)

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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech (Sem.-1,2)
FUNDAMENTALS OF COMPUTER PROGRAMMING AND IT

Subject Code : BTCS-101

M.Code : 54095

Date of Examination : 19-01-2023

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) What is the syntax of nested If statement?
- b) What is a conditional operator in C++?
- c) What is a case statement?
- d) What is arithmetic operator?
- e) Differentiate between compiler & interpreter.
- f) What is a function?
- g) How many byte are required for Int a[20] statement.
- h) What is an algorithm?
- i) How structure is represented.
- j) What is a conditional statement?



SECTION-B

2. What are the latest specifications of computer which can be used as node in a network. Explain?
3. What are the various memories used in computers. Explain with the help of example
4. Write algorithm/flowchart to find the sum of n odd numbers.
5. What are the various features of spreadsheet? Explain.

SECTION-C

6. Write a "C++" program to find factorial of a given number.
7. Describe the various data types of C++ .
8. Write a C++ program to find out a solution for given-quadratic equation.
9. Explain the meaning and purpose of the following:
 - a) Bit wise operator
 - b).File opening modes
 - c) Pointers
 - d) struct

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B.Tech. (Sem.-1,2)
OPTICS & ELECTROMAGNETISM

Subject Code : BTPH-106-18

M.Code : 75366

Date of Examination : 20-01-2023

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) Write any two characteristics of diffraction grating.
- b) Define the term double refraction.
- c) Which type of pumping is required for Ruby laser?
- d) What is the need to achieve population inversion?
- e) Define Gauss law.
- f) Write the laws of magnetism.
- g) Write the losses associated with optical fibres.
- h) What is ferromagnetism?
- i) Find de Broglie wavelength of neutrons if they are incident on a crystal having interatomic spacing of 1.5 \AA ; if first order diffraction at an angle of 50° is happening,
- j) Write the physical significance of wave function.



SECTION-B

2. Obtain the Fraunhofer diffraction pattern produced by a single slit using suitable diagrams.
3. Discuss the production of linearly, elliptically and circularly polarized light.
4. Write a note on total internal reflection. Derive an expression for numerical aperture of an optical fibre.
5. Specify three possible types of transitions between two atomic energy levels and derive relations between Einstein's coefficients.

SECTION-C

6. What is dielectric polarization? Derive and explain Clausius-Mossotti equation.
7. Write, explain and derive Maxwell's four equations.
8. Describe Davisson-Germer's experiment to explain the wave nature of electrons.
9. Derive time dependent and time-independent Schrodinger wave equation.

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Total No. of Pages: 02

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B.Tech (Sem. – 1,2)

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BTEE-101

M Code: 54097

Date of Examination : 20-01-23

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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Write briefly:

- a) Draw the phasor diagram of Electric field: $E_0(e^{-j10\pi t} + e^{+j10\pi t})$. Also, write it in rectangular form.
- b) Give the analogous terms of magnetic circuit related to an electrical circuit.
- c) Draw the circuit diagram and waveforms of a bridge rectifier.
- d) Write the differences between Bipolar Junction Transistor and Field Effect Transistors.
- e) Define synchronous speed. How does this speed relate to slip?
- f) Convert the $(1234)_{10}$ number into the hexadecimal number.
- g) Which motor is preferred for speed regulation?
- h) Convert the decimal number 39.75 to hexadecimal.
- i) Draw the characteristics curve of positive and thermistor.
- j) A choke coil when connected across a 500V, 50Hz supply takes 1 A at 0.8 power factor. What capacitance must be placed in parallel with it so as to make the power factor of the combination unity?



SECTION-B

2. Find the amount of electrical energy expended in raising the temperature of 45 litres of water by 73°C . To what height could a weight of 5 tonnes be raised with the expenditure of same energy? Assume efficiencies of the heating equipment and lifting equipment to be 90% and 70% respectively.
3. a) Discuss and derive the resonance in a series circuit. Give its properties.
b) A voltage $v = 100\sin 314t$ is applied to a circuit consisting of a 25Ω resistor and an $80\mu\text{F}$ capacitor in series. Determine:
 - i) An expression for the value of the current flowing at any instant.
 - ii) The power consumed.
 - iii) The p.d. across the capacitor at the instant when current is one half of its maximum value.
4. Describe the concept of bias stabilization in transistors and amplifiers.
5. Establish the relation for emf induced in the secondary winding of transformer. What are types of losses occur in transformers? Establish the condition of maximum efficiency of transformer.

SECTION-C

6. Discuss the types of D.C. motors. Compare their Torque, speed characteristics and applications.
7. Distinguish between latch and flip flop. Explain the working of cross coupled NAND gate as flip flop. Draw the truth table of RS, JK, D and T flip flops. Convert the RS flip flop into JK flip flop. How edge triggered flip flop different from level triggered? Give its advantage.
8. **Write detailed short note on the following:**
 - a) Universal Gates
 - b) Field Effect transistors
9. a) Explain the principle of working of a digital multimeter.
b) What is LVDT? Give its principle of working, applications, advantages and disadvantages.

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B.Tech. (Sem.-1, 2)
ENGINEERING GRAPHICS AND DESIGN

Subject Code : BTME-101-121

M.Code : 91335

Date of Examination : 27-01-2023



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

I. Write short notes on :

- a) Differentiate between Frustum and Truncated Solid.
- b) Differentiate between Isometric Projections and Isometric View.
- c) Explain with the help of an example the Unidirectional system of placement of dimensions.
- d) What is difference between plane scale and diagonal scale?
- e) Explain the types of Dimensions with a suitable drawing.
- f) Define primary and secondary planes.
- g) Give examples (with suitable drawing) of solids of revolution.
- h) Show by means of traces, a plane perpendicular to HP and inclined to VP.
- i) Write the following statement using single stroke capital vertical letters of 12 mm size:
"LABORATORY IS A TEMPLE WHERE SEARCH FOR TRUTH IS MADE"
- j) Draw a regular Hexagonal Lamina of side 45mm.

SECTION-B

2. Construct a Plain Scale of R.F.=1/50 to read meters and decimeters and long enough to measure up to 8m. Show 7.4m and 4m 5dm on the scale.
3. A point "M" is 31mm behind of VP and 54 mm below HP. Draw its projections and find out its shortest distance from the reference line.
4. A line CD, 60 mm long, has its end 'C' in HP and 15 mm in front of VP. The line is inclined at 45° to the HP and 30° to the VP. Draw its projection when the end 'D' is in first quadrant. Also find its HT and VT.
5. Line "AB" is lying on profile plane. Its end "A" is 44mm in front of VP & 12 mm above HP and end "B" is 8mm in front of VP & 52mm above HP. Draw its projection and find, True Length, inclinations with the principle planes, HT and VT.

SECTION-C

6. A regular hexagonal thin plate of 45mm side has a central circular hole of 45mm diameter at its center. It is resting on one of its corners in HP. Draw its projections when the plate surface is vertical and inclined to VP at 30° .
7. A cone of base rim diameter 45mm and axis 65 mm lying on HP on a point of its circumference such that the generator is perpendicular to HP. Draw its projections assuming the cone lying in first quadrant.
8. A right regular square pyramid of base edge 42mm and axis 65 mm long; rests on its base on HP with its base edges equally inclined to VP. Draw its projections assuming the pyramid in 1st quadrant.
9. A cube of 25 mm edge is placed centrally on the top of another square block, of 40mm edge and 15mm thick. Draw the isometric drawing of the two solids.

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Total No. of Pages: 03

Total No. of Questions: 09

B.Tech (Sem. – 1,2)
ENGINEERING DRAWING

Subject Code: BTME-102

M Code: 54102

Date of Examination : 23-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Write short notes on:

- a) What kind of symbolic lines are used to represent visible outlines?
- b) Construct a plain scale of RF = 1/24 showing yards and feet.
- c) Sketch the symbol of first angle projection.
- d) "Second & fourth angle projection are not preferred". justify this statement.
- e) Sketch the positions of VP, HP and PP with respect to various quadrant systems.
- f) How the auxiliary planes are used to find out the true shape of projections?
- g) Differentiate between perspective, isometric and orthographic projections.
- h) Sketch an Oblique solid and a Truncated solid.
- i) What is trace of a line?
- j) Explain the term 'Shortest Distance' of a point.

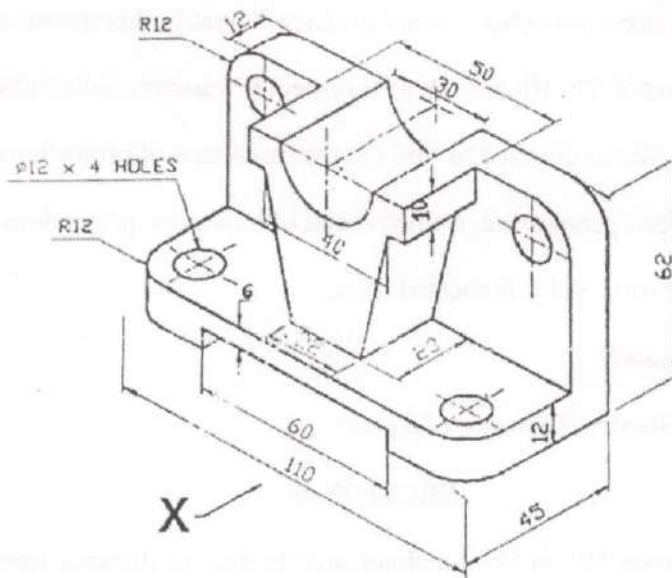
SECTION-B

2. A point Q is 45mm above HP, in first quadrant, and its shortest distance from XY line is 60mm. Draw its front and top view.
3. A line AB is in third quadrant. Its end A is 25mm below HP. The line is inclined at 30° to the VP. The lengths of its elevation and plan are 70mm and 60mm respectively, and its HT is 25mm behind the VP. Draw its projections and find other variables.

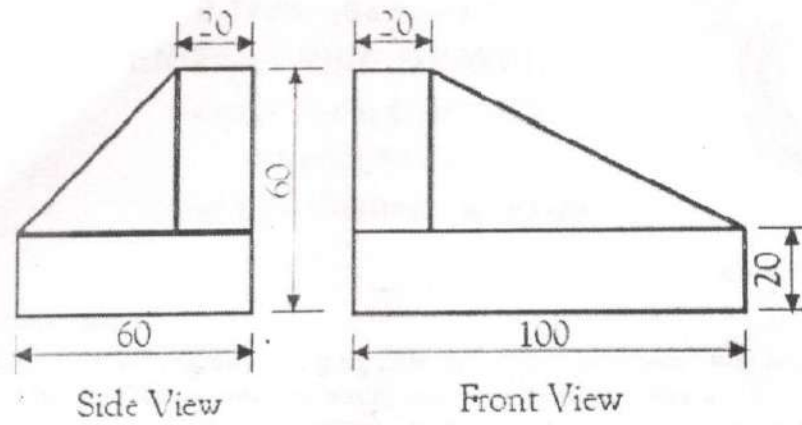
4. A regular hexagonal lamina, of 28mm sides, is resting on HP on one of its sides such that the side is perpendicular to the VP and plane of the lamina inclined to the HP at 45° . The lamina is then rotated through 90° so that side on the HP becomes parallel to the VP, still keeping the angle of plane of lamina with HP as 45° . Draw the front view and top view of the lamina held in its final position.
5. A right circular cylinder, diameter of base 50mm and length of axis 70mm long, rests on HP on its base rim such that its axis is inclined at 45° to HP and top view of the axis is inclined at 60° to the VP. Draw its projections.

SECTION-C

6. A right circular pentagonal prism, side of base 25mm and 54mm long, lies on one of its rectangular faces on HP, such that its axis is inclined to VP at 45° . A section plane perpendicular to both HP and VP cuts the prism, meeting its axis at a distance of 5mm from the end face which is away from the VP. Draw the front and top views of the cut prism. Also project its profile view showing true shape of the section.
7. A right regular pyramid of base 48×32 mm and height 62mm, rests on its base in HP with one of its base sides parallel to VP. A section plane perpendicular to the VP and inclined at 30° to the HP cuts the pyramid, bisecting its axis. Develop the lateral surface of the pyramid.
8. The figure shows the isometric view of a machine Block. Draw the orthographic projections of the block.



9. The figure shows the side view and front view of a machine Block. Draw the isometric view of the block.



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B.Tech (Sem. – 1,2)

ELEMENTS OF MECHANICAL ENGINEERING

Subject Code: BTME-101

M Code: 54101

Date of Examination : 21-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Write short notes on:

- a) What is a quasi-static process?
- b) What is a pure substance?
- c) Explain the term latent heat of steam.
- d) Explain the term dryness fraction of steam.
- e) What do you mean by PMM of the second kind?
- f) Explain the first law of thermodynamics with respect to close systems.
- g) Define the term availability.
- h) Define the term true stress.
- i) Draw (only) and list stress strain diagram of ductile materials.
- j) How the composites are different from conventional materials.

SECTION-B

2. A fluid at a pressure of 3bar, and with specific volume of $0.18\text{m}^3/\text{kg}$, contained in a cylinder behind a piston expands reversibly to a pressure of 0.6 bar according to law, $p = C/V^2$, where C is constant. Calculate the work done by the fluid on the piston.
3. 0.15m^3 of an ideal gas at a pressure of 15 bar and 550K is expanded isothermally to 4 times the initial volume. It is then cooled at 290K at constant volume and then compressed back polytropically to its initial state. Calculate the net work done and heat transferred during the cycle.
4. Write down the general energy equations for steady flow system and simplify when applied to the following:
 - a) Reciprocating air compressor
 - b) Steam turbine
5. The heat capacity of a system at constant volume is given by $C_v = ZT^2$, where $Z = 0.045\text{J}/\text{K}^3$. A system is originally at 250K, and a thermal reservoir at 125K is available. Determine the maximum amount of work that can be recovered as the system is cooled down to the temperature of the reservoir.

SECTION-C

6. An engine working on otto-cycle has a volume of 0.45m^3 , pressure 1 bar and temperature 30°C at the beginning of compression stroke. At the end of compression stroke, the pressure is 11 bar. 210kJ of heat is added at constant volume. Determine:
 - a) Pressure, temperature and volume at a salient point in the cycle
 - b) Percentage clearance
 - c) Efficiency
 - d) Network per cycle
 - e) Mean effective pressure
 - f) Ideal power developed by the engine if the number of working cycles per minute is 210. Assume the cycle id reversible.
7. Derive the expression for the efficiency of the following cycles:
 - a) Diesel cycle
 - b) Duel Cycle
8. Discuss the following properties of the materials:
 - a) Elasticity
 - b) Toughness
 - c) Machinability
 - d) Brittleness
9. Locate the centroid of a trapezium with the base b and the parallel side's h_1 and h_2 .

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Roll No.

Total No. of Pages : 03

Total No. of Questions : 05

B.Tech. (Sem.-1,2)

COMMUNICATIVE ENGLISH

• Subject Code : BTHU-101/BCOP-105

M.Code : 45086

Date of Examination : 14-01-23



Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. All QUESTIONS are COMPULSORY.
2. All questions carries TWELVE marks.

Jan 2023

1. Read the following passage and answer the questions given at the end :

Targets set by policymakers to slow global warming are too soft to prevent more heatwaves and extreme temperatures in the US within a few years, with grim consequences for human health and farming. A study warned this week.

Although the US and more than 100 other countries agreed in Copenhagen last year to take action to reduce greenhouse gas emissions 'so as to hold the increase in global temperatures below two degrees Celsius', a study conducted by Stanford University scientists showed that might not be enough.

Stanford earth sciences professor Noel Diffenbaugh and former post-doc fellow Moetasim Ashfaq wrote in the study, published in Geophysical Research Letters, that 'constraining global warming to two degrees Celsius above pre-industrial conditions may not be sufficient to avoid dangerous climate change.

'In the next 30 years, we could see an increase in heat waves like the one now occurring in the eastern US or the kind that swept across Europe in 2003 that caused tens of thousands of fatalities,' said Diffenbaugh, lead author of the study.' Those kinds of severe heat events put enormous stress on major crops like corn, soybean, cotton, and wine grapes, causing a significant reduction in yields,' he said.

Diffenbaugh and Ashfaq used two dozen climate models to project what could happen in the US if carbon dioxide emissions cause temperatures to rise 1.8 degrees Fahrenheit (one degree Celsius) between 2010 and 2039- a likely scenario, according to the UN's International panel on climate change. If that occurs, the mean global temperatures in 30 years would be about 2 degrees Celsius hotter than in the pre-industrial era of the 1850s.

Questions :

- i. What did the US and more than 100 other countries agree to?
- ii. What does the study published in *Geophysical Research Letters* as cited in the passage suggest?
- iii. What can be inferred from the first paragraph of the passage?
- iv. The research reported in the passage has been conducted by
 - a) The scientists working in Princeton University.
 - b) The earth scientists working in Stanford University.
 - c) The scientists working on Global Warming.
 - d) The earth scientists who attended the Copenhagen Conference.
- v. With which of the following possibilities of global warming is the author of the passage most likely to disagree?
 - a) Heat waves are likely to cause a large number of fatalities in the US in the years to come.
 - b) The temperature rise on the earth's surface is likely to harm farming in a crucial way.
 - c) The steps proposed at Copenhagen are likely to reverse the pattern of global warming in the next 30 years or so.
 - d) In the next 30 years the earth's surface's surface is likely to get warmer by two degrees Celsius than what it was in the pre-industrial era of the 1850s.

2. i. Use the following words in meaningful sentences:

Overtly; evolution; feasibility; state; combat

ii. Do as directed:

- a) Give up smoking face the consequences.

(Fill the blank with appropriate conjunction)

b) The process of production of this product can be discussed in five stages.

(Write the question for which this sentence is the answer)

c) The officer as well as the driver were injured in the accident.

(Correct and rewrite the sentence)

d) They said to the servant, "Can you prepare tea for us within five minutes?"

(Rewrite in the indirect speech)

e) Due to recession, many companies (downsize) their operations.

(Use the appropriate form of verb)

3. In the present era, social media is being used at a very high rate for workplace activities and agendas. What do you think are the advantages or disadvantages of this trend? Should the use of social media be promoted or discouraged in the workplace? Develop argumentative writing and your write-up should be between 250-300 words.
4. Assuming yourself to be the Purchase Officer of Aradhana Opticals, 24, Vijay Marg, Patna, write a complaint letter to Ageless Glasses, 123, Mayur Vihar, New Delhi, reporting that four of the eight consignments containing glasses have been received in a damaged condition. Ask for the replacement of the damaged goods and seek compensation for the postage charges incurred.
5. The Chairman of HP Computers Ltd., Dispur has felt the need for an intensive HR training programme for its entry-level and middle level managers. Hence, he has asked you, being the Director of the Company, to analyse the various areas in which training is required for them. You have collected data for this purpose which is tabulated below:

Draft a report (about 250 words) to the Chairman, analysing, and interpreting the data so as to enable him to organize an effective training programme

Table showing training needs in percentage

Level of Managers	Soft Skills	Managerial Skills	Software Skills
Middle Level	39.8	26.2	34
Top Level	34.4	23.3	43.3

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Jan 2023

Roll No.

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Total No. of Pages: 03

Total No. of Questions: 09

B.Tech (Sem. - 1,2)
CHEMISTRY-I
Subject Code: BTCH- 101-18
M Code: 75343
Date of Examination : 25-01-23



Time: 3 Hrs.

Max. Marks: 60

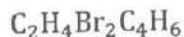
INSTRUCTIONS TO CANDIDATES:

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

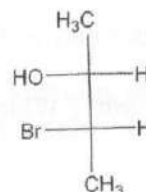
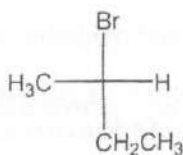
SECTION-A

1. Write briefly:

- a) What is the difference between scattering and reflection?
- b) What is the difference between oxidation number and oxidation state?
- c) What do you understand by substitution/elimination ratio?
- d) Which of the following will show IR spectrum?
O₂, N₂, HI, CO₂
- e) What is standard reduction potential?
- f) What information can be drawn from Ellingham diagrams?
- g) Why d and f orbitals show poor shielding effect?
- h) List the factors on which Δ₀ depends.
- i) The following compounds show only one signal in ¹HNMR. Write their structural formula



- j) Indicate R or S configuration at stereogenic center(s). Assign priorities to each group.



SECTION-B

2. a) Deduce the time-independent Schrodinger equation. (6)
b) Give the significance of wave function. (2)
3. a) Under the influence of crystal field, predict the electronic arrangement on the metal ions and nature of ligands in the following complexes:
- i) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ ii) $[\text{Fe}(\text{CN})_6]^{4-}$ iii) $[\text{Fe}(\text{CN})_6]^{3-}$

How many unpaired electrons are there in each complex and what would be their magnetic moments? (6)

- b) What is meant by band theory? What is the difference between conduction band and valence band? (2)
4. a) Explain the theory of NMR spectroscopy. (6)
b) What is the difference between diffraction and scattering? (2)
5. a) Define excluded volume. Show that excluded volume, designated as b , is four times the actual volume of gas molecules. (5)
b) Calculate the pressure exerted by one mole of CO_2 gas in 1.36 dm^3 vessel at 48°C using van der Waals equation. Given: $a = 3.59 \text{ dm}^6 \text{ atm mol}^{-2}$ and $b = 0.0427 \text{ dm}^3 \text{ mol}^{-1}$. (3)

SECTION-C

6. a) What is corrosion? Discuss mechanism of dry corrosion. (5)
b) Calculate the standard free energy change (ΔG°) of the reaction:
- $$\frac{1}{2}\text{H}_2(\text{g}) + \frac{1}{2}\text{I}_2(\text{s}) \rightarrow \text{HI}(\text{g}) \quad \Delta H^\circ = 25.95 \text{ kJ}$$
- The standard entropy of $\text{HI}(\text{g})$, $\text{H}_2(\text{g})$ and $\text{I}_2(\text{s})$ are 206.27, 130.60 and $116.73 \text{ JK}^{-1} \text{ mol}^{-1}$, respectively. Is this reaction feasible at standard state? (3)
7. a) Discuss the molecular geometries of the following:
- i) NH_3
- ii) SF_6 (Atomic number: $\text{N} = 7, \text{S} = 16$) (4)
- b) What is the difference between oxidation number and oxidation state? (2)
- c) What is electron affinity? Which element has highest electron affinity? (2)

8. a) Discuss the following: (4)
i) Enantiomers ii) Diastereomers
- b) Discuss isomerism in transitional metal complexes. (4)
9. a) Compare and contrast the S_N1 and S_N2 mechanisms of substitution of alkylhalides. (4)
- b) Write short notes on the following organic reactions: (4)
i) Cyclization reactions
ii) Reduction reactions

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Roll No.

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Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 1,2)
ELECTROMAGNETISM

Subject Code: BTPH-103-18

M Code: 75357

Date of Examination : 20-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Write briefly:

- a) Explain the physical significance of divergence and curl of an electrostatic field.
- b) Write the boundary conditions of an electric field at the interface of two media.
- c) Explain the concept of bound charges due to polarization.
- d) Write the Bio-Savart law, explaining each term.
- e) Write the boundary conditions of a magnetic field at the interface of two media.
- f) Define Faraday's law of induction and its importance.
- g) State continuity equation and give its physical significance.
- h) Show that the equation of continuity is contained in Maxwell's equations.
- i) What do you understand by the relation between electric and magnetic fields of an EM wave?
- j) Why magnetic potential has to be selected as a vector?

SECTION-B

2. a) Derive the expression for electric field and electric potential for a charge distribution.
b) Derive the expression for energy stored of a charge distribution in a dielectric medium. (4+4)
3. a) Explaining the concept of polarization and bound charges derive the expression for potential of a polarized object.
b) Show that $D = \epsilon_0 E + P$ where the symbols have their usual meanings. (6+2)
4. a) Explain the physical significance of divergence and curl of a magnetic field. Derive the expressions for divergence and curl of a magnetic field.
b) Explain the choice of magnetic potential in its vector form. (6+2)
5. a) Distinguish between dia-, para- and ferromagnetic materials. Derive an expression for magnetic susceptibility of a paramagnetic substance.
b) What do you understand by hysteresis remanence (retentivity) and coercivity? How to determine their values from a hysteresis loop? (4+4)

SECTION-C

6. a) Explain electromagnetic braking and mention its applications.
b) Derive the expression for energy stored in a magnetic field. (4+4)
7. a) Derive Maxwell's four equations in vacuum and mention their physical significance.
b) Derive Coulomb's law of electrostatics with the help of Maxwell's first equation. (5+3)
8. a) State Poynting theorem and prove it.
b) Derive the Electromagnetic wave propagation equation in terms of E and B separately for vacuum. (5+3)
9. a) Distinguish between linear, circular and elliptical polarization.
b) Prove the transverse nature of electromagnetic waves. (5+3)

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Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 1,2)
ENGINEERING CHEMISTRY

Subject Code: BTCH-101

M Code: 54093

Date of Examination : 18-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Write briefly:

- a) Cause of chemical shift in NMR.
- b) Difference between Galvanic cell and Electrolytic cell.
- c) Cause of alkalinity of raw water.
- d) Advantages and limitations of lime soda process.
- e) Define Nanomaterials.
- f) Write down the formulae of Average molecular weight.
- g) Give an example of second generation petrochemicals.
- h) What are self Assembling materials?
- i) What type of primary raw material is used for petrochemicals?
- j) Write down the formula for calculating Atom Economy.

SECTION-B

2. a) **Distinguish between:** (2,2)
- i) Thermal and photochemical reactions ii) Fluorescence and phosphorescence
- b) The quantum efficiency of photochemical reaction:
- $$\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$$
- Is 1.0×10^6 with wavelength of 480nm. Calculate the number of moles of HCl(g) produced per joule of radiant energy absorbed. (4)
3. a) **Define following terms** (2,2,2)
- i) Atom Economy ii) Green Chemistry iii) Bio-Catalysis
- b) Give different way to minimise Hazardous waste. (2)
4. Write a detailed note on the construction, working and chemistry behind the photovoltaic cell. (8)
5. a) Calculate the amount of lime (84% pure) and Soda (92% pure) required for treatment of 20,000 liters of water, whose analysis is as follows $\text{Ca}(\text{HCO}_3)_2 = 40.5$ ppm; $\text{Mg}(\text{HCO}_3)_2 = 36.5$ ppm; $\text{MgSO}_4 = 30.00$ ppm; $\text{CaSO}_4 = 34.0$ ppm; $\text{CaCl}_2 = 27.75$ ppm and $\text{NaCl} = 10.00$ ppm. Also calculate the temporary and permanent hardness of water. (4)
- b) Describe method involved in the treatment of water required for industries. (4)

SECTION-C

6. a) Discuss the importance of design and material selection in controlling corrosion. (2)
- b) **Discuss briefly:** (2,2)
- i) Galvanic corrosion ii) Stress corrosion
- c) Why does steel not rust if covered with ice? (2)
7. a) Discuss the first, second and third generation petrochemicals. (4)
- b) What is natural gas? Write down the properties of natural gas. (4)
8. **Write a short note on the following:** (2,2,2,2)
- a) Two dimensional assemblies b) Nanoscale material
 - c) Supramolecular structure d) Coercing colloids
9. a) What are different types of polymerization reactions? Give examples (4)
- b) How does molecular weight affect the properties of polymer? (4)

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Total No. of Pages: 02

Total No. of Questions: 05

B.Tech (Sem. – 1,2)

ENGLISH

Subject Code: BTHU-101-18

M Code: 75349

Date of Examination : 18-01-23



Time: 3 Hrs.

Max. Marks: 60

INSTRUCTIONS TO CANDIDATES:

1. All questions are **COMPULSORY**.
2. Questions 1,2 and 3 carry **TEN** marks each.
3. Questions 4 and 5 carry **FIFTEEN** marks each.

1. a) Use the following phrases in sentences: (5)

- i) Covid-19
- ii) epidemic
- iii) however
- iv) moreover
- v) pandemic.

b) State whether the following sentences are compound or complex (5)

- i) I think I will buy the red car, or I will lease the blue one.
- ii) I really want to go to work, but I am too sick to drive.
- iii) I am counting my calories, yet I really want dessert.
- iv) She returned the computer after she noticed it was damaged.
- v) Whenever prices go up, customers buy less products.

2. a) Explain the importance of writing skills and how writing skills can be improved through understanding and practicing providing suitable examples. (5)

b) What should be taken care of while drafting business Emails? (5)

3. Use the following transitional/ connecting devices in a sentence of your own: (10)
- a) See you soon
 - b) Top of the world
 - c) By all means
 - d) Looking forward
 - f) Stands out
4. Write a report to the Editor of a newspaper drawing the attention of the concerned authorities towards the problem COVID-19 epidemic, and suggest the preventive measures for the control. (15)
5. Your school is celebrating ANTI - DRUG Day. Write an essay in 450 – 500 words on the topic Minimization of usage of drugs is the only way to make a happy and progressive society. (15)

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Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 1,2)

PROGRAMMING FOR PROBLEM SOLVING

Subject Code: BTPS-101-18

M Code: 75346

Date of Examination : 16-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Write briefly:

- a) What is the syntax of nested If statement?
- b) What are looping statements?
- c) What is a complier?
- d) What is the need for an operating system?
- e) Differentiate between compiler & interpreter.
- f) What are the various types of software used in computers?
- g) How many bytes are required for Int a[20] statement?
- h) What is an algorithm?
- i) How syntax of a program is different from semantics?
- j) What is a conditional statement?

SECTION-B

2. Write a program in 'C' language to find the greatest common divisor of two numbers.
3. What is a function? What is the difference between call by value & call by reference? Explain with help of an example.
4. Write a program to sort a given list of numbers in ascending order.
5. Describe the various data types used in 'C'.

SECTION-C

6. What is an array? Write a program to find the sum of the rows, columns and non diagonal elements of a matrix.
7. What is the syntax of various input output statements available in programming language?
8. Describe briefly about recursion with suitable examples.
9. Write the syntax with two different examples each for:
 - a) struct
 - b) union

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.

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Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 1,2)

SEMI-CONDUCTOR & OPTOELECTRONICS PHYSICS

Subject Code: BTPH-105-18

M Code: 75363

Date of Examination : 20-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Write briefly:

- a) What are the main drawbacks of classical free electron theory?
- b) What do you understand by Fermi level? Explain its significance in semiconductors.
- c) State Bloch's theorem for a periodic system.
- d) Explain why the conductivity of a pure semiconductor increases with temperature while that of a metal decreases.
- e) The energy gap in an LED is 1.5 eV. Find the wavelength of electromagnetic radiation it would emit.
- f) Explain the terms: spontaneous and stimulated emission of radiation.
- g) What property of materials can be measured with Hot-point probe?
- h) What physical parameters can be extracted from I-V characteristics of the diode?
- i) What do you mean by negative effective mass of electron?
- j) What are the types of semiconductor photo detectors?

SECTION B

2. Define Fermi energy. Derive an expression for Fermi energy of a system of free electrons. (2+6)
3. Discuss the Kronig-Penny model for the motion of an electron in a periodic potential. (8)
4. Derive an expression for the densities of electrons and holes in the conduction and valence bands respectively of an intrinsic semiconductor. (8)
5. a) What do you mean by intrinsic and extrinsic semiconductors? (4)
b) What do you mean by direct and indirect band gaps materials? (4)

SECTION-C

6. Describe the construction and working of a semiconductor laser with necessary diagram. (8)
7. What are light emitting diodes? Discuss the structure and characteristics of LEDs. (2+6)
8. What are photodiodes? Find an expression for total steady state diode photocurrent density for long diode. (2+6)
9. Illustrate with proper diagram about the measurement of carrier density and resistivity by four probe method. (8)

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.

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Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 1,2)
SEMI-CONDUCTOR PHYSICS

Subject Code: BTPH-104-18

M Code: 75360

Date of Examination : 20-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Write briefly:

- a) Describe the main drawbacks of classical free electron theory.
- b) What do you understand by Fermi level? Explain its significance in semiconductors.
- c) What do you mean by effective mass of an electron?
- d) Enumerate some of the properties of semiconductors.
- e) What are Brillouin zones?
- f) Explain the terms: spontaneous and stimulated emission of radiation.
- g) What property of materials can be measured with Hot-point probe?
- h) Discuss salient characteristics of laser beam.
- i) What do you mean by population inversion?
- j) What do you mean by photovoltaic effect?

SECTION-B

2. Derive an expression for Fermi energy of a system of free electrons. Discuss briefly the effect of temperature. (6+2)
3. Discuss the Kronig-Penny model. Using the model show the energy spectrum of electron consisting of a number of allowed energy bands separated by forbidden bands. (8)
4. Derive an expression for the densities of electrons and holes in the conduction and valence bands respectively of an intrinsic semiconductor. (8)
5. a) Distinguish between intrinsic and extrinsic semiconductors with suitable examples. (4)
b) What do you mean by direct and indirect band gaps materials. (4)

SECTION-C

6. Discuss Einstein's coefficient. Derive relation between them. (8)
7. How does a semiconductor laser differ from other laser? Explain main features of the semiconductor laser and its applications. (8)
8. Describe a method for the measurement of divergence and wavelength of light. What physical parameters can be extracted from current-voltage characteristics. (5+3)
9. Explain with a proper diagram about the measurement of carrier density and resistivity by four probe method. (8)

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 Questions: 09

Total No. of Pages: 03

B.Tech (Sem. - 1,2)
BASIC ELECTRICAL ENGINEERING

Subject Code: BTEE-101-18

M Code: 75339

Date of Examination : 13-01-2023



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

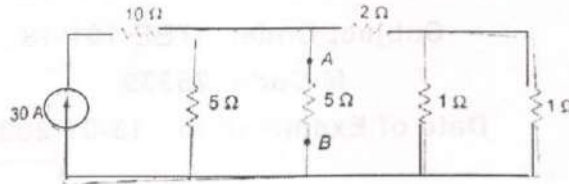
1. Write briefly:

- a) State Thevenin's theorem.
- b) What do you mean by the term time domain analysis? Explain.
- c) What do you mean by real power? Explain.
- d) What do you mean by power factor? Explain its importance.
- e) Define peak and rms value.
- f) What is the need of a battery? List its different types.
- g) What do you mean by energy consumption? Explain.
- h) Discuss the principle of a dc motor.
- i) Define the term efficiency.
- j) Explain the principle of a transformer.

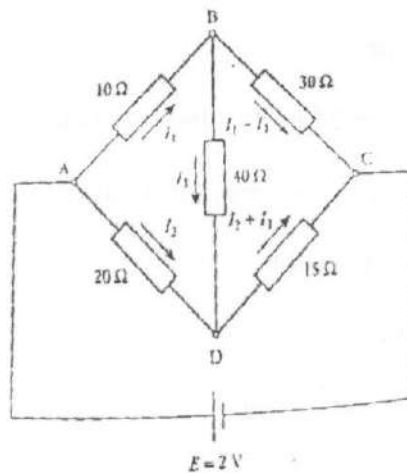
Jan 2023

SECTION-B

2. Determine the current flowing through the 5 ohm resistor in the circuit given below using Norton's theorem.



3. Explain the following:
- Series resonance
 - Three phase balanced circuits
4. A circuit having a resistance of 12 ohm, an inductance of _____ and a capacitance of _____ in series, is connected across a _____ supply. Calculate
- Impedance
 - Current
 - The voltage across R, L and C
 - The phase angle between the current and the supply voltage
5. Determine the value and direction of the current in BD using Kirchoff's Laws for the Wheatstone bridge shown below:



SECTION-C

6. Explain the principle, construction, and working of an autotransformer in detail. How is it different from an ordinary transformer?
7. Discuss the construction and working of synchronous generators.
8. Explain:
 - a) MCB
 - b) ELCB
9. Discuss:
 - a) Types of wires and cables
 - b) Power factor improvement and battery backup

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Roll No.

Total No. of Pages: 03

Total No. of Questions: 09

B.Tech All (Sem. - 2)

MATHEMATICS-II

Subject Code: BTAM- 204-18

M Code: 76257

Date of Examination : 23-01-23



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, carrying EIGHT marks each.
3. Students have to attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Answer the following:

- a) Name any four measures of dispersion.
- b) Define kurtosis.
- c) Two cards are drawn at random from a well-shuffled pack of 52 cards. What is the probability of drawing two aces?
- d) Give the formula of mean and standard deviation for Poisson distribution.
- e) Write any four properties of normal distribution.
- f) Find the coefficient of correlation of two independent variables x and y .
- g) Write the normal equations for the curve $x=b+cy$.
- h) Define standard error of mean and level of significance.
- i) Define Type-II error.
- j) Define null hypothesis.

SECTION-B

2. a) Calculate standard deviation from the table giving marks distribution of 112 students:

Marks	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90
No. of students	5	14	24	27	18	15	9

- b) The first four moments of distribution about the value 5 of the variable are 2, 20, 40 and 50. Obtain the moments about mean.
3. a) Two unbiased dice are thrown. Find the expected values of the sum of numbers of points on them.
- b) A and B take turns in throwing two dice, the first to throw 10 being awarded the prize. If A starts first, find their chances of winning.
4. a) A man tosses a fair coin 10 times. Find the probability that he will have:
- i) Not more than 5 heads
- ii) A minimum of 4 heads
- b) A manufacturer of cotter pins knows that 5% of his product is defective. If he sells cotter pins in boxes of 100 and guarantees that not more than 10 pins will be defective, what is the approximate probability that a box will fail to meet the guaranteed quality?
5. a) If X is normally distributed and the mean of X is 30 and the standard deviation is 5. Find out the probability of the following:
- i) $X \geq 45$
- ii) $26 \leq X \leq 40$
- b) Marks obtained by 10 students in Mathematics and Statistics are given below. Find the coefficient of correlation between the two subjects.

Mathematics	75	30	60	80	53	35	15	40	38	48
Statistics	85	45	54	91	58	63	35	43	45	44

SECTION-C

6. A continuous random variable X has a probability density function $f(x) = 3x^2, 0 \leq x \leq 1$. Find a and b such that
- i) $P\{X \leq a\} = P\{X > a\}$
- ii) $P\{X > b\} = 0.05$
7. Fit a parabola of second degree to the data:

Time (sec)	1	2	3	4	5
Distance (feet)	15	70	140	250	380

8. a) The mean produce of wheat of a sample of 100 fields is 200kg per acre with a standard deviation of 10kg. Another sample of 150 fields has the mean at 220kg with a standard

deviation of 12kg. Assuming the standard deviation of the yield at 11kg, find out if there is a significant difference between the mean yields of the two samples.

- b) A random sample of 500 pineapples was taken from a large consignment and 65 were found to be bad. Find the standard error of the proportion of bad ones in a sample.
9. a) Test whether the colour of the son's eyes is associated with that of the father's as per the data given below:

		Eye colour of sons	
		Black	Brown
Eye colour of fathers	Black	2	10
	Brown	6	6

(Take $\chi_{0.05}^2$ for 1 degree of freedom = 3.841)

- b) The mean height of 50 male students who participate in college athletics was 68.2 inches with a standard deviation of 2.5 inches; while 50 male students who do not participate in athletics had a mean height of 67.5 inches with a standard deviation of 2.8 inches. Test the hypothesis that male students who participate in college athletics are taller than other male students.

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Roll No.

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (Sem.-2)

MATHEMATICS-II

Subject Code : BTAM-201-18

M.Code : 76254

Date of Examination : 23-01-23

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) Is this differential equation $\frac{d^2y}{dx^2} = \left[1 + \left(\frac{dy}{dx}\right)^2\right]^{3/2}$ linear ?

b) Is this differential equation $(2x^2 + 3y^2 - 7) x dx - (3x^2 + 2y^2 - 8) y dy = 0$ exact ?

c) Write the solution of the Clairaut's equation $y = px - a^2p / (p + 1)$.

d) Find the wronskian from $\frac{d^2y}{dx^2} - y = \frac{2}{1 + e^x}$.

e) Find complementary function of $\frac{\partial^2 z}{\partial t^2} - a^2 \frac{\partial^2 z}{\partial x^2} = E \sin pt$

f) Find particular integral of $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x$.

g) Write one dimensional diffusion equation.

h) Classify the equation $y^2 u_{xx} - 2xyu_{xy} + x^2 y_{yy} + 2u_x - 3u = 0$.



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- i) What is a boundary value problem?
 j) Write Laplace equation in spherical coordinates.

SECTION-B

2. Solve :

a) $(1 + e^{x/y}) + e^{x/y} \left(1 - \frac{x}{y}\right) \frac{dy}{dx} = 0$

b) $x \frac{dy}{dx} + y \log y = xye^x$.

3. Solve :

a) $(D^2 - 4D + 3)y = 2xe^{3x} + \cos 2x$

b) Find the power series solution of the differential equation $(xD^2 + D - 1)y = 0$

4. Solve :

(a) $(z - y)p + (x - z)q = (y - x)$ (b) $z(xp - yq) = y^2 - x^2$

5. a) **Solve the PDE** $(4D^2 + 12DD' + 9D'^2)z = e^{3x-2y}$.

b) **Solve the PDE** $(D^2 - DD' + D' - 1)z = \cos(x + 2y)$.

SECTION-C

6. Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial y} + u$ by method of separation of variables. Given that $u = 6e^{-3x}$ when $x=0$.

7. Solve the BVP $\frac{\partial^2 u}{\partial t^2} = 4\frac{\partial^2 u}{\partial x^2}$ using D' Alembert's technique subject to the conditions

$$u(0, t) = u(5, t) = 0, u(x, 0) = 0 \text{ and } \left. \frac{\partial u}{\partial t} \right|_{t=0} = 3 \sin 2\pi x - 2 \sin 5\pi x.$$

8. Solve the BVP $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ using separation of variables method subject to the conditions $u(0, t) = 1$, $u(\pi, t) = 3$, $u(x, 0) = 1$ where $0 < x < \pi$, $t > 0$.
9. The bounding diameter of a semi-circular plate of radius a is kept at 0°C and the temperature along the semi-circular boundary is given by

$$u(a, \theta) = \begin{cases} 50\theta, & \text{when } 0 < \theta \leq \pi/2 \\ 50(\pi - \theta), & \text{when } \pi/2 < \theta < \pi \end{cases}$$

Estimate the steady state temperature in the plate using Laplace equation

$$r^2 \frac{\partial^2 u}{\partial r^2} + r \frac{\partial u}{\partial r} + \frac{\partial^2 u}{\partial \theta^2} = 0.$$

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Total No. of Pages: 02

Total No. of Questions: 09

B.Tech All (Sem. - 2)

MATHEMATICS-II

Subject Code: BTAM- 203-18

M Code: 76256

Date of Examination : 23-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Answer the following:

- a) Solve $y+px = x^4p^2$
- b) Solve $(y - px)(p - 1) = p$
- c) Find the particular integral of $\frac{d^3y}{dx^3} + 4\frac{dy}{dx} = \sin 2x$
- d) Solve $\frac{d^2x}{dt^2} + 5\frac{dx}{dt} + 6x = 0$ given $x(0) = 0, \frac{dx}{dt}(0) = 15$.
- e) Solve $\frac{dy}{dx} + 2xy = x$.
- f) Define harmonic function.
- g) Find the residue at $z = 0$ of $z \cos \frac{1}{z}$.
- h) State Liouville's theorem.
- i) Find all the values of z such that $e^z = -2$.
- j) Show that e^z is nowhere analytic.

SECTION-B

2. a) Solve $xy(1 + xy^2)\frac{dy}{dx} = 1$
b) Solve $e^{4x}(p - 1) + e^{2y}p^2 = 0$

3. Solve $x(1 - x^2) \frac{dy}{dx} + (2x^2 - 1)y = x^3$

4. a) Using method of variation of parameters, solve $\frac{d^2y}{dx^2} - 2 \frac{dy}{dx} + y = e^x \log x$.

b) Solve $y'' + 6y' + 13y = 0, y(0) = 3, y'(0) = -1$.

5. Solve $x^2 \frac{d^2y}{dx^2} + 3x \frac{dy}{dx} + y = \frac{1}{(1-x)^2}$

SECTION-C

6. a) Evaluate $\oint_C \frac{e^z}{(z^2 + \pi^2)^2} dz$ where C is $|z| = 4$.

b) Find Laurent's expansion of $f(z) = \frac{7z-2}{(z+1)z(z-2)}$ in region $1 < z + 1 < 3$.

7. If $\frac{(1+i)^{x+iy}}{(1-i)^{x-iy}} = \alpha + i\beta$, prove that one of the values of $\tan^{-1} \frac{\beta}{\alpha} = \frac{1}{2} \pi x + y \log 2$.

8. Find the residue of $f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)}$ at its poles and evaluate $\oint_C f(z) dz$, where C is the circle $|z| = 2.5$.

9. Find the analytic function whose real part is $e^{2x}(x \cos 2y - y \sin 2y)$.

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Roll No.

Total No. of Pages: 02

Total No. of Questions: 09

B.Tech All (Sem. - 2)

MATHEMATICS-II

Subject Code: BTAM-202-18

M Code: 76255

Date of Examination : 23-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Answer the following:

- a) Is this differential equation $\left[1 + \left(\frac{dy}{dx}\right)^2\right]^3 = \left(\frac{d^2y}{dx^2}\right)^2$ linear?
- b) Is this differential equation $3e^x \tan y dx + (1 - e^x) \sec^2 y dy = 0$ exact ?
- c) Write the solution of the Clairaut's equation $y = px + ap/(bp + c)$.
- d) Find the complete solution of $\frac{\partial^2 z}{\partial x^2} - 7 \frac{\partial^2 z}{\partial x \partial y} + 6 \frac{\partial^2 z}{\partial y^2} = 0$.
- e) Find particular integral of $\frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = e^{2x+3y}$.
- f) Establish the Newton Raphson method.
- g) Give the Gauss's backward interpolation formula.
- h) Write the formula for Simpson's $\frac{3}{8}$ rule.
- i) Give the Milne's predictor corrector formula.
- j) Write the one dimensional wave equation.

SECTION-B

2. Solve:

- a) $\frac{dy}{dx} = \frac{5x^4 + 3x^2y^2 - 2xy^3}{5y^4 + 3x^2y^2 - 2x^3y}$
- b) $\frac{dy}{dx} - \frac{\tan y}{1+x} = (1+x)e^x \sec y$.

3. a) Solve $(x^2D^2 + 4xD + 2)y = e^{e^x}$.

b) Solve using method of variation of parameters $\frac{d^2y}{dx^2} - 4y = e^{2x}$.

4. Solve::

a) $x(y - z)p + y(z - x)q = z(x - y)$

b) $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin(x - 2y)$

5. a) Solve the PDE $(D^2 - D')z = \text{Acos}(lx + my)$.

b) Using method of separation of variables, solve $\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y}$ with $u(0, y) = 8e^{-3y}$.

SECTION-C

6. a) Find a root of $x^3 - 2x - 5 = 0$ using bisection method correct upto three decimal places.

b) Using interpolation, estimate number of students who got marks between 40 to 45 :

Marks	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of students	31	42	51	35	31

7. a) Estimate $f(22)$; using Gauss forward difference formula:

x	20	25	30	35	40	45
$f(x)$	354	332	291	260	231	204

b) Estimate $\int_0^{0.6} e^{-x} dx$, using Simpson's $\frac{1}{3}$ rule by taking 7 ordinates.

8. a) Use Euler's modified method to find the value of y at $x = 0.2$ upto 3 decimals, where $y(0) = 2, \frac{dy}{dx} = \log(x + y)$. (Take $h = 0.1$)

b) Use Runge-Kutta method of order 4 to find the value of y at $x = 0.1$ upto 3 decimals, where $y(0) = 1, \frac{dy}{dx} = x + y^2$.

9. Using Bendre-Schmidt method, solve the PDE $2\frac{\partial^2 f}{\partial x^2} = \frac{\partial f}{\partial t}; 0 < t < 1.5, 0 < x < 4$ subject to conditions $f(x, 0) = 50(4 - x), f(0, t) = 0, f(4, t) = 0$.

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Roll No.

Total No. of Pages: 02

Total No. of Questions: 09

B.Tech (Sem. – 2)
ENGINEERING MATHEMATICS-II

Subject Code: BTAM-102

M Code: 54092

Date of Examination : 17-01-23



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, carrying EIGHT marks each.
3. Attempt any FIVE questions from SECTION B & C, selecting atleast TWO questions from each of these SECTIONS B & C.

SECTION-A

1. Answer the following:

- a) Define Exact differential equation and write necessary condition for the differential equation $Mdx + Ndy = 0$ to be exact.
- b) Find the Integrating factor of $ydx - xdy + 3x^2y^2e^{x^3}dx = 0$
- c) Solve the differential equation $\frac{d^4y}{dx^4} + 8\frac{d^2y}{dx^2} + 16y = 0$
- d) Define Legendre's linear differential equation.
- e) Find the rank of the matrix $\begin{bmatrix} 1 & 3 & 4 & 5 \\ 1 & 2 & 6 & 7 \\ 1 & 5 & 0 & 10 \end{bmatrix}$.
- f) If A and B are hermitian, show that $AB - BA$ is a skew hermitian.
- g) Test the convergence of $\frac{1}{5} + \frac{\sqrt{2}}{7} + \frac{\sqrt{3}}{9} + \frac{\sqrt{4}}{11} + \dots \infty$.
- h) Define absolute convergence of a series.
- i) Find the cube roots of unity.
- j) Separate in real and Imaginary part of $\tan(x + iy)$.

SECTION-B

2. Sum the series $\cos\theta - \frac{1}{2}\cos2\theta + \frac{1}{3}\cos3\theta - \dots \dots \dots \infty$
3. For what value of K , the equations $x + y + z = 1, 2x + y + 4z = k, 4x + y + 10z = k^2$ have a solution and solve them completely in each case.
4. Discuss the convergence of the series:

$$1 + \frac{\alpha \cdot \beta}{1 \cdot v} x + \frac{\alpha(\alpha + 1)\beta(\beta + 1)}{1 \cdot 2 \cdot v \cdot (v + 1)} x^2 + \frac{\alpha(\alpha + 1)(\alpha + 2)\beta(\beta + 1)(\beta + 2)}{1 \cdot 2 \cdot 3 \cdot v(v + 1)(v + 2)} x^3 + \dots$$

5. a) Express $\log(\text{Log}i)$ in the form $A + iB$. (4)
- b) Discuss the convergence of series $\sum_{n=2}^{\infty} \frac{1}{n(\log n)^p} (p > 0)$ (4)

SECTION-C

6. Solve $((2x^2y^2 + y)dx + (3x - x^3y)dy = 0$
7. a) Solve $xy(1 + xy^2) \frac{dy}{dx} = 1$ (4)
 b) Find the general solution of the equation $y'' + 16y = 32\sec 2x$ using method of variation of parameters. (4)
8. Solve $x^2 \frac{d^2y}{dx^2} + 3x \frac{dy}{dx} + y = \frac{1}{(1-x)^2}$.
9. A constant electromotive force E volts is applied to a circuit containing a constant resistance R ohms in series and a constant inductance L henries. If the initial current is zero, show that the current builds up to half its theoretical maximum in $(L \log 2)/R$ seconds.

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Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (Sem.-2)
MATHEMATICS-II

Subject Code : BTAM-204-18

M.Code : 91960

Date of Examination : 23-01-2023



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

I. Write short notes on :

- a) Prove that $(x_1 - \bar{x}) + (x_2 - \bar{x}) + \dots + (x_n - \bar{x}) = 0$.
- b) What is Kurtosis? How does it differ from skewness?
- c) Two unbiased dice are thrown. Find the expected values of the sum of numbers of points on them.
- d) If a leap year is selected at random, what is the chance that it will contain 53 Mondays?
- e) The number of emergency admissions each day to hospital is found to have Poisson distribution with mean 4. Find the probability that on a particular day there will be no emergency admission.
- f) If $n = 8$ and $\sum D^2 = 240$, what is the coefficient of Rank Correlation?
- g) Calculate the regression equation Y on X from the following data:
 $\sum X = 61, \sum Y = 139, \sum XY = 1817, \sum X^2 = 777, \sum Y^2 = 4315, N = 5$.
- h) Fit a linear curve to the data $\sum X = 15, \sum Y = 42, \sum XY = 141, \sum X^2 = 55, N = 5$.

- i) Find the constant c so that $f(x)$ satisfies the conditions of being a probability density function of one random variable x :

$$f(x) = \begin{cases} cxe^{-x}, & 0, x, \infty \\ 0, & \text{elsewhere} \end{cases}$$

- j) A normal population has a mean of 6.8 and standard deviation of 1.5. A sample of 400 members gave a mean 6.75. Is the difference significant?

SECTION-B

2. a) The first three moments of a distribution about the value 5 of the variable are 2, 20, and 40. Find the mean, the variance and the third moment about mean.
- b) If X denotes the profit that a man can make in business. He may earn Rs. 2,800 with probability $\frac{1}{2}$, he may lose Rs. 5,000 with probability $\frac{3}{10}$ and he may neither lose nor gain with probability $\frac{1}{5}$. Find his expected gain of loss.

3. a) Calculate Karl Pearson's coefficient of skewness from the following data:

Profit (Rs. lakhs) below :	20	40	60	80	100
No. of companies :	8	20	50	64	70

- b) Five defective bulbs are accidentally mixed with twenty good ones. It is not possible to just look at a bulb and tell whether or not a bulb is defective. Four bulbs are drawn at random from this lot. Find the mean number of defective bulbs drawn.
4. a) Box I contains 3 red and 2 blue marbles while Box II contains 2 red and 8 blue marbles. A fair coin is tossed. If the coin turns up heads, a marble is chosen from Box I.; if it turns up tails, a marble is chosen from Box II. Find the probability that a red marble is chosen.
- b) Find the binomial distribution whose mean is 10 and standard deviation $2\sqrt{2}$.

5. a) Suppose that X has Poisson distribution. If $P(X = 2) = \frac{2}{3} P(X = 1)$ then find $P(X = 0)$.

- b) Calculate the correlation coefficient from the following data:

$$N=10, \sum X=350, \sum Y=310, \sum (X - 35)^2 = 162, \sum (Y - 31)^2 = 222, \sum (X - 35)(Y - 31) = 92.$$

SECTION-C

6. a) Suppose that the probability density function of a random variable X is as follows:

$$f(x) = \begin{cases} cx & \text{for } 0 < x < 4 \\ 0 & \text{elsewhere} \end{cases}$$

where c is a given constant. Determine the value of c and the values of $P(1 \leq X \leq 2)$.

- b) A coin is tossed 400 times and it turns up head 216 times. Test the hypothesis that coin is unbiased.
7. Find the parabola of the form $y = a + bx + cx^2$ which fits most closely with the observations

x	-3	-2	-1	0	1	2	3
y	4.63	2.11	0.67	0.09	0.63	2.15	4.58

8. Fit a straight line trend to the given data

x	1	2	3	4	5
y	14	27	40	55	68

9. In two large populations, there are 30% and 25% respectively of fair people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two proportions.

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Dec 2023

Roll No.

Total No. of Pages : 03

Total No. of Questions : 09

B.Tech. (Sem.-2)

MATHEMATICS-II

Subject Code : BTAM-203-18

M.Code : 91959

Date of Examination : 23-01-2023



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) Solve $p = \log(px - y)$

b) Find Integrating factor of $(x^2y^2 + xy + 1)ydx + (x^2y^2 - xy + 1)xdy = 0$.

c) Find non-ordinary (singular) points of equation $(1-x^2)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + m(m+1)y = 0$,
 m is any real or complex number.

d) Solve : $\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0$.

e) Solve $\frac{dy}{dx} + \frac{y}{x} = e^x$. ($x > 0$)

f) For what values of z , the function $w = u + iv$ defined by $z = e^{-v}(\cos u + i \sin u)$ ceases to be analytic.

g) Prove that the function $v = e^{-x}(x \cos y + y \sin y)$ is harmonic.

h) Prove that the image of the straight line $y = mx$ is an equiangular spiral under the transformation $w = e^z$.

i) Evaluate $\int_C (3z^2 + 2z + 1) dz$, where C is the arc of the cycloid $x = a(\theta + \sin \theta)$, $y = a(1 - \cos \theta)$, between $\theta = 0$ to $\theta = 2\pi$.

j) State Cauchy-Goursat Theorem.

SECTION-B

2. a) Determine for what values of a and b , the differential equation $(y + x^3) dx + (ax + by^3) dy = 0$ is exact.

b) Solve: $x^2 \frac{d^2 y}{dx^2} + 2x \frac{dy}{dx} - 20y = (x+1)^2$.

3. a) Solve: $x^2 \left(\frac{dy}{dx}\right)^2 - 2xy \frac{dy}{dx} + 2y^2 - x^2 = 0$.

b) Solve: $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$.

4. a) Solve: $y - 2px = \tan^{-1}(xp^2)$.

b) Solve: $x \frac{dy}{dx} + y = x^3 y^6$.

5. Solve in power series, the differential equation $(1 - x^2)y'' - 2xy' + 6y = 0$.

SECTION-C

6. a) Find the analytic region of $f(z) = (x - y)^2 + 2i(x + y)$.

b) Evaluate $\int_C \frac{z+1}{z^4 - 4z^3 + 4z^2} dz$, where C is $|z - 2 - i| = 2$.

7. a) Prove that $\tan^{-1} \frac{y}{x}$ is harmonic.

b) Find the Taylor series to represent the function $\frac{z^2 - 1}{(z+2)(z+3)}$ in $|z| < 2$.

8. a) Find the analytic function $f(z) = u + iv$, whose real part u is $\frac{x}{x^2 + y^2}$.

b) Evaluate $\int_C z^2 e^{\frac{1}{z}} dz$, where C is $|z| = 1$.

9. Find the Laurent's series expansion of $f(z) = \frac{z+4}{(z+3)(z-1)^2}$ in the region $|z-1| > 4$.

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.

Jan
~~Dec~~ 2023

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (Sem.-2)
MATHEMATICS-II

Subject Code : BTAM-202-18

M.Code : 91958

Date of Examination : 23-01-2023



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. a) Find the integrating factor of differential equation: $(x^2 + y^2 + x) dx + xy dy = 0; x > 0$.
- b) Solve the differential equation: $x^2 \left(\frac{dy}{dx} \right)^2 + xy \frac{dy}{dx} - 6y^2 = 0$.
- c) Define homogeneous linear differential equation with constant coefficients.
- d) Find the differential equation of all spheres of fixed radius having centres in xy - plane.
- e) Solve the lagrange's equation: $p + q = 0$.
- f) Classify the differential equation: $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$.
- g) What are the advantages of Regula Falsie method?
- h) What is the relation between ∇ and E ?

i) What is Simpson's $\frac{1}{3}$ - rule?

j) State Euler's modified iteration formula.

SECTION-B

2. Solve $y''' - y'' + 4y' - 4y = \sin 3x$.

3. Solve the differential equation $(1-x^2) \frac{d^2y}{dx^2} - 2x \frac{dy}{dx} + 2y = 0$.

4. Solve the following Lagrange's partial differential equation :

$$(y+z)p + (z+x)q = (x+y)$$

5. Solve the equation $p^2 = q + px$ Charpit's method.

SECTION-C

6. Use bisection method to solve the equation $x^3 + x^2 + x + 7 = 0$ correct to three decimal places.

7. Given that $\sum_{11}^{20} f(x) = 44060$, $\sum_{14}^{20} f(x) = 38220$, $\sum_{17}^{20} f(x) = 27178$, and $f(20) = 8450$.

Find the value of $f(11)$.

8. Solve the initial value problem $y' = x(y-x)$, $y(2) = 3$ in the interval $[2, 24]$ using the classical Runge-Kutta fourth order with step size $h = 0.2$.

9. Tabulate the solution of $\frac{dy}{dx} = x + y$, $y(0) = 0$ for $0.4 \leq x \leq 1.0$ with $h = 0.1$ using Predictor Corrector formula.

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