

March 2021

Pages-1 to 28



Roll No.

Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (CSE/IT) (2018 & Onwards)/  
(Artificial Intelligence & Machine Learning / Cyber Security) (Sem.--1)

**MATHEMATICS-I**

Subject Code : BTAM-104-18

M.Code : 75362

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. Discuss the applicability of Rolle's theorem for  $f(x) = x(2+x)e^{\frac{x}{2}}$  in  $(-3, 0)$ .
2. Define Gamma function ( $\Gamma(x)$ ) and show that  $\Gamma(x) = (x-1)!$ , when  $x$  is an integer greater than 1
3. Expand  $\sin x$  in powers of  $x - \frac{\pi}{2}$
4. Compute  $AB - BA$  if  $A = \begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}$ ,  $B = \begin{bmatrix} 2 & -1 \\ 3 & 0 \end{bmatrix}$
5. Find rank of the matrix  $\begin{bmatrix} 2 & 4 & 2 \\ 1 & 2 & 1 \\ 5 & 10 & 5 \end{bmatrix}$ .
6. Define kernel of a linear transformation.
7. Prove that a set of vectors zero vector is always linearly dependent.
8. Define orthogonal matrix.

9. If  $\alpha$  is an eigen value of a non singular matrix A the show that  $\alpha^{-1}$  is eigen value of  $A^{-1}$ .
10. Find the product of eigen values of  $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$

### SECTION-B

11. a) Evaluate the integral  $\int_2^{\infty} \frac{x+3}{(x-1)(x^2+1)} dx$  if it exists.
- b) Evaluate the limit  $\lim_{x \rightarrow 0} \left( \frac{x2^x}{2^x - 1} \right)$
12. Prove that  $\beta(x, y) = \frac{\Gamma(x)\Gamma(y)}{\Gamma(x+y)}$ , where  $\beta(x, y)$  and  $\Gamma(x)$  denote beta and gamma functions respectively.

13. a) Find the inverse of the matrix  $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$  using Gauss Jordan method.

- b) Find the rank of the matrix  $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$

14. Solve the following system of equations Cramer's rule
- $$x + y + z = 6, \quad x - y + 2z = 5, \quad 3x + y + z = 8$$

### SECTION-C

15. Let  $\mathbb{R}^+$  be the set of all +ve real numbers. Operations vector addition '+' and scalar multiplications '.' are defined as
- $$u + v = uv, \quad u, v \in \mathbb{R}^+, \quad \alpha.u = u^\alpha, \quad \alpha \in \mathbb{R}, \quad u \in \mathbb{R}^+.$$
- Determine whether  $\mathbb{R}^+$  form a real vector space or not?

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16. a) Examine whether the set of vectors  $\{(3, 2, 1), (1, 1, 1), (-1, 0, 1)\}$  in  $V_3$  forms a basis or not?
- b) Check whether the transformation  $T : V_3 \rightarrow V_2$  defined by  $T(x, y, z) = (x - y, x + y)$  represent a Linear transformation or not?
17. Find the Eigen values and Eigen vectors for the matrix.

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

18. a) Prove that any square matrix can be written as sum of symmetric and skew-symmetric matrices.
- b) Prove that similar matrices have same characteristic polynomial.

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Roll No.

Total No. of Questions : 18

Total No. of Pages : 02

B.Tech. (2018 & Onwards) (Sem.-1)  
B.Tech. (Agriculture Engg./Automation Robotics/  
(Automobile Engg./BT/Civil Engg./Computer Engg./CSE/  
Electrical & Electronics Engg./Electrical Engg./ECE/  
Electronics & Electrical Engg./FT/IT/ME)

**PROGRAMMING FOR PROBLEM SOLVING**

Subject Code : BTPS-101-18

M.Code : 75346

Time : 3 Hrs.

Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

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4. Select atleast TWO questions from SECTION - B & C.

**SECTION-A**

Write briefly :

1. What is the syntax of nested If statement?
2. How many byte are required for Int a[20] statement?
3. What is an algorithm?
4. What is the structure of a C program?
5. What is the Scope of a variable?
6. What are the logical operators available in C?
7. What are the syntax of Scanf statements of C?
8. What are the various types of software used in computers?
9. What is ROM?
10. What are the usage of USB port?

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### SECTION-B

11. What are the steps in execution of a C program? Explain the significance of each step.
12. What is the meaning of a Bit, byte, KB, MB & GB? Explain the difference between software & hardware giving suitable examples.
13. What are the various components of a computer? Discuss with the help of a block diagram.
14. What is a flow chart? Draw flow chart to find the largest of three numbers.

### SECTION-C

15. What are the various Control Structures available in C? Explain with example.
16. What are the various input output statements available in C?
17. What are the various applications of computers? Discuss with example.
18. Explain the algorithm for selection sort. Write the program also.

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Total No. of Pages : 02

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B.Tech. (Automation & Robotics)/EE/ECE (Sem.-1)  
Automobile Engg./BT/CE/CSE/Electrical & Electronics Engg./Electronics  
& Electrical Engg./FT/IT/ME (2018 & Onwards)

**BASIC ELECTRICAL ENGINEERING**

Subject Code : BTEE-101-18

M.Code : 75339



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.
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4. Select atleast TWO questions from SECTION - B & C.

**SECTION-A**

Answer following questions in brief :

1. State KVL and KCL.
2. Define power factor of A.C.
3. Differentiate reactive power and apparent power.
4. What are various BH characteristics?
5. Differentiate ideal transformer and practical transformer.
6. What do you mean by source? List various voltage and current sources.
7. What do you mean by sinusoidal modulation?
8. What are the uses of ELCB and MCCB?
9. State superposition theorem.
10. Significance of power converters.

## SECTION-B

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11. What are the basic differences between a 3- $\phi$  synchronous motor and 3- $\phi$  Induction motor?
12. Explain with diagram the operating principal of DC Motor.
13. Write a short note on :
  - a) Important characteristics of Batteries
  - b) SFU&MCB
14. Derive the voltage and current equation of single phase A.C. Circuit consisting RL and RC. Also draw its phasor diagram.

## SECTION-C

15. What is energy resource management? Explain elementary calculations for energy consumptions.
16. A single phase transformer has 350 primary and 1050 secondary turns. The net cross-sectional area of the core is 55 cm<sup>2</sup>. If the primary winding be connected to a 400V, 50 Hz single phase supply. Calculate :
  - a) The maximum value of flux density in the core.
  - b) The voltage induced in the secondary winding.
17. Critically examine the time domain analysis of first order RL and RC circuits.
18. Explain the construction and working of three phase induction motor.

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March 2021



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B.Tech.(CE/ME/ECE/EE) (2018 & Onward) (Sem.-1)

**MATHEMATICS-I**

Subject Code : BTAM-101-18

M.Code : 75353

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. Discuss the applicability of Rolle's theorem on  $(x) = x + \frac{1}{x}$  on  $\left[\frac{1}{2}, 2\right]$
2. Find Taylor's series of  $f(x) = \sin x$  about  $x = \frac{\pi}{4}$
3. Show that  $\lim_{(x,y) \rightarrow (0,0)} \frac{x+y}{x-y}$  does not exist.
4. Find local maxima, local minima, and saddle point for  $f(x, y) = x^2 + xy + 3x + 2y + 5$
5. Evaluate  $\int_0^1 \int_0^{3-3x} \int_0^{3-3x-y} dz dy dx$
6. State Leibniz's test for convergence of an alternating series.
7. Find the value of  $b$  for which  $1 + e^b + e^{2b} + e^{3b} + \dots = 9$ .
8. Find rank of the matrix  $\begin{bmatrix} 1 & 4 & 2 \\ -1 & -2 & 1 \\ 9 & 34 & 15 \end{bmatrix}$
9. Define orthogonal matrix.
10. State rank-nullity theorem.



## SECTION-B

11. a) Using Mean value theorem show that  $|\sin b - \sin a| \leq |b - a|$  for any numbers  $a$  and  $b$ .
- b) Use L'Hospital's rule to find the limit  $\lim_{x \rightarrow 0} \left( \frac{\sin x - x}{x^3} \right)$ .
12. a) Evaluate the integral  $\int_{-\infty}^2 \frac{2dx}{x^2 + 4}$ , if it exists.
- b) Find the area of the surface generated by revolving the curve  $y = x^3$ ,  $0 \leq x \leq \frac{1}{2}$  about the  $x$ -axis.
13. a) If  $u = f(y - z, z - x, x - y)$ , then prove that  $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$ .
- b) Find the tangent plane and normal line of the surface :  $f(x, y, z) = x^2 + y^2 + z - 9 = 0$  at the point  $(1, 2, 4)$
14. a) Find the area of the region bounded between the curve  $x = -y^2$  and the lines  $y = x + 2$ .
- b) Evaluate the integral  $\int_0^\pi \int_x^\pi \frac{\sin y}{y} dx dy$ , by changing the order of integration.

## SECTION-C

15. a) Discuss the convergence or divergence of the series  $\sum_{n=1}^{\infty} \frac{6n}{(2n-1)(2n+1)}$
- b) Discuss the convergence or divergence of the series  $\sum_{n=1}^{\infty} \frac{8 \tan^{-1} n}{n^2 + 1}$ .
16. For the series  $\sum_{n=0}^{\infty} \frac{n(x+3)^n}{5^n}$  find
- a) For what values of  $x$  does the series converge absolutely?
- b) For what values of  $x$  does the series converge conditionally?
- c) Find the interval of convergence.

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17. For what values of  $\lambda$  the given system of equations possess (a) unique solution  
b) infinite solution consistent or not?  $3x - y + 4z = 3, x + 2y - 3z = -2, 6x + 5y + \lambda z = -3$ .  
Find the solution in each case.
18. Find the eigen values and eigen vectors of the following matrix :

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

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