

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY::PUTTUR  
 B.Tech I Year I Semester Supplementary Examinations Aug-2021  
 ALGEBRA AND CALCULUS

(Common to all)

Time: 3 Hours

Max. Marks: 60

Answer one question from each unit (5 x 12 = 60 Marks)

**UNIT-I**

- 1 a) If 2, 3 and 5 are the Eigen values of the matrix  $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$ , then determine

6M

the corresponding Eigen vectors.

- b) Find the index and signature of the quadratic form  $x_1^2 + 2x_2^2 - 3x_3^2$ .

6M

OR

- 2 a) Find the Eigen values of  $A^2 - 2A + 5I$ , where  $A = \begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}$ .

6M

- b) Solve the system following linear system

$$x + 3y + 6z = 2; 3x - y + 4z = 9; x - 4y + 2z = 7.$$

6M

**UNIT-II**

- 3 a) Find the value(s) in (0, 3) where the function  $f(x) = \begin{cases} -x^2 + 3x + 3, & 0 \leq x \leq 1 \\ x + 4, & 1 < x \leq 3 \end{cases}$

6M

satisfy the mean value theorem.

- b) Find the Maclaurin's series of  $f(x) = \frac{1}{1+x}$ .

6M

OR

- 4 a) Check the validity of Cauchy's mean value theorem for the functions

$$f(x) = x^3 \text{ and } g(x) = \tan^{-1}x \text{ on the interval } [0, 1].$$

6M

- b) Compute the third order Taylor's approximation of  $f(x) = \cos \frac{x}{4}$  about  $x = \pi$  and hence use it to approximate the value of  $f(3)$ .

6M

**UNIT-III**

- 5 a) Check whether  $u = y + z, v = x + 2z^2, w = x + y + z$  are functionally dependent? If so, find the relationship.

6M

- b) Find the maximum and minimum values of the function

$$f(x, y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$$

6M

OR

- 6 a) Let  $u = x^2 - 2y^2, v = 2x^2 - y^2$  where  $x = r \cos \theta, y = r \sin \theta$ . Use chain rule of

6M

Jacobian to show that  $\frac{\partial(u, v)}{\partial(x, y)} = 6r^2 \sin 2\theta$ .

- b) Find all the local extrema and saddle points if any for the function

$$f(x, y) = x^3 + 3xy^2 - 15x + y^3 - 15y.$$

6M

**UNIT-IV**

- 7 a) Find the value of the integral  $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$ .

6M

- b) Evaluate the integral  $\int_{x=0}^1 \int_{y=0}^{\sqrt{1-x^2}} y dy dx$  by changing the Cartesian to polar coordinates.

6M

OR

- 8 a) Evaluate the integral  $\iint_{xy(x+y)} dx dy$  over the area between  $y = x^2$  and  $y = x$ .

6M

- b) Evaluate  $\int_{x=0}^1 \int_{y=0}^{2-y} (x+y) dy dx$  by changing the order of integration.

6M

**UNIT-V**

- 9 a) Express the integral  $\int_0^1 \frac{dx}{\sqrt{1-x^4}}$  in gamma function.

6M

- b) Evaluate  $\int_0^{\infty} e^{-x} x^2 dx$

6M

OR

- 10 a) Express the integral  $\int_0^1 \sqrt{\cot \theta} d\theta$  in gamma function.

6M

- b) Evaluate  $\int_0^1 \sin^2 \theta \cos^3 \theta d\theta$ .

6M

Code: 18HS0830

R18

SIDDARTHATHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR

(AUTONOMOUS)

B.Tech I Year I Semester (R18) Regular Examinations August - 2021

MATHEMATICS - I

(Common to All)

Time: 3 hours

Max. Marks: 60

**PART - A**

**(Compulsory Questions)**

Answer the following: (5 X 2 = 10 Marks)

1. (a) Define Symmetric & Skew-symmetric matrices.
- (b) Evaluate the improper integral  $\int_{-1}^1 \frac{1}{x^2} dx$ .
- (c) Find the stationary points of  $f(x, y) = x^2 + y^2 - 3axy$ .
- (d) Define Sequence and Series.
- (e) Find the half-range sine series for  $f(x) = 1$  in  $(0, \pi)$ .

**PART - B**

(Answer all five units, 5 x 10 = 50 Marks)

**UNIT - I**

2. (a)

$$A = \begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$$

Find the rank of the matrix A

(b)

Determine the Eigen values of  $A^{-1}$  where  $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ .

OR

3.

Diagonalise the matrix  $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ -4 & 4 & 3 \end{bmatrix}$  and hence find  $A^4$ .

**UNIT - II**

4. (a)

Find the surface area of the sphere of radius 'a'.

(b)

Find the volume of the reel-shaped solid formed by the revolution about the y-axis, of the part of the parabola  $y^2 = 4ax$  cut off by the latus-rectum.

OR

5. (a)

Prove that  $\int_0^{\sqrt{\pi}} e^{-x^2} dx = \frac{\sqrt{\pi}}{2}$ .

(b)

Evaluate  $\int_0^{\sqrt{\pi}} \sqrt{x} e^{-x^2} dx$ .

**UNIT - III**

5M

6. (a) If  $u = \tan^{-1} \left[ \frac{2xy}{x^2 - y^2} \right]$ , prove that  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ .

5M

(b) If  $U = \log(x^2 + y^2 + z^2 - 3xyz)$  prove that  $\left( \frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z} \right)^2 U = \frac{-9}{(x+y+z)^2}$ .

OR

5M

7. (a) Find the shortest distance from origin to the surface  $xyz^2 = 2$ .

5M

(b) Find the minimum value of  $x^2 + y^2 + z^2$  given  $x + y + z = 3a$ .

**UNIT - IV**

8. Examine the following sequences for convergence:

5M

(i)  $a_n = \frac{n^2 - 2n}{3n^2 + n}$

OR

5M

(a) Discuss the convergence of the series  $\sum \frac{1}{\sqrt{n}} \tan \frac{1}{n}$ .

5M

(b) Test for convergence of the series  $\sum \log \left( 1 + \frac{1}{n} \right)$ .

**UNIT - V**

10M

10. Find a Fourier series to represent the function  $f(x) = e^x$  for  $-\pi < x < \pi$  and hence derive a series for  $\frac{\pi}{\sinh \pi}$ .

OR

5M

11. (a) Find the half range sine series expansion of  $f(x) = x^2$  when  $0 < x < 4$ .

5M

(b) Find the half range cosine series expansion of  $f(x) = x(2-x)$  in  $0 \leq x \leq 2$ .

## SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR

B.Tech I Year I Semester Supplementary Examinations August 2021

**APPLIED CHEMISTRY**

(Common to EEE &amp; ECE)

Time: 3 Hours

Max. Marks: 60

Answer one question from each unit (5 x 12 = 60 Marks)

**UNIT-I**

- 1 Define Electrode Potential. Derive the Nernst equation for a single electrode potential and write its applications. 12M

OR

- 2 Define Photovoltaic cell. Explain construction, working and applications of photovoltaic cell. 12M

**UNIT-II**

- 3 Explain the energy level diagrams of CO and NO molecule. Explain their magnetic nature and Bond order. 12M

OR

- 4 a) Explain the band theory of solids. 6M  
b) What is doping? Explain the role of doping on band structures. 6M

**UNIT-III**

- 5 a) What is functionality of monomer? 6M  
b) Write a note on nomenclature of polymers. 6M

OR

- 6 a) Describe the preparation, properties and uses of Nylon-6,6. 5M  
b) Describe the preparation, properties and uses of Carbon Fibers 7M

**UNIT-IV**

- 7 Give an account on principle and instrumentation of IR spectroscopy. Explain stretching and bending vibrations. 12M

OR

- 8 Which methods are you using to separate from the Gaseous Mixtures? 12M

**UNIT-V**

- 9 Explain in detail about principle and application of semiconductors? 12M

OR

- 10 a) Write an account on Carbon Nano Tubes. 6M  
b) Write a note on Fullerenes 6M

## ADVANCED PHYSICS

(MECH)

Time: 3 Hours

Max. Marks: 60

Answer one question from each unit (5 x 12 = 60 Marks)

**UNIT-I**

- 1 a) State and explain principle of interference? 6M  
b) Mention important conditions to get interference? 6M

OR

- 2 a) Write brief note on grating spectrum? 6M  
b) How you determine the wavelength of light using grating spectrum? 6M

**UNIT-II**

- 3 a) Define absorption coefficient of sound and derive it? 6M  
b) A class room of volume  $360 \text{ m}^3$  has a reverberation time 1.6 seconds. Calculate the total sound absorption coefficient of the class room? 6M

OR

- 4 a) Write the properties of Ultrasonic waves. 6M  
b) Explain the detection methods of Ultrasonic waves. 6M

**UNIT-III**

- 5 a) Describe the classification of magnetic materials based on spin magnetic moments. 6M  
b) Discuss the applications of soft magnetic materials. 6M

OR

- 6 a) Describes the different types of polarization? 5M  
b) What are the advantages of dielectric materials 7M

**UNIT-IV**

- 7 a) Explain the construction and working principle of He-Ne laser with suitable energy level diagram. 6M  
b) Write few advantages of He-Ne laser. 6M

OR

- 8 a) Differentiate step index and graded index fibers. 6M  
b) Write brief note on attenuation in optical fibers. 6M

**UNIT-V**

- 9 a) What is Quantum Confinement? 5M  
b) Write the applications of nanomaterial? 7M

OR

- 10 a) What are the differences between nanotechnology and NanoScience? 6M  
b) Define Condensation, Crystal growth and Nucleation? 6M

**SEMICONDUCTOR PHYSICS**

(CSE)

Time: 3 Hours

Max. Marks: 60

Answer one question from each unit (5 x 12 = 60 Marks)

**UNIT-I**

- 1 a) Describe the electrical conductivity in a metal using quantum free electronic theory. 6M  
 b) Write advantages quantum free electron theory over classical free electron theory. 6M

OR

- 2 a) Write brief note on Fermi Dirac distribution? 6M  
 b) What is the effect of temperature on Fermi Dirac distribution function? 6M

**UNIT-II**

- 3 a) Explain n-type semiconductor. 6M  
 b) Derive the expression for current generated due to drifting of charge carriers in semiconductors in the presence of electric field. 6M

OR

- 4 a) Describe the Hall Effect in semiconductors. 6M  
 b) Write the applications of Hall Effect. 6M

**UNIT-III**

- 5 a) Derive Schrödinger's time independent wave equation. 6M  
 b) Explain the physical significance of wave function. 6M

OR

- 6 Write Maxwell's equations in differential and integral form and derive an expression for energy flow by electromagnetic waves? 12M

**UNIT-IV**

- 7 a) Derive the relation between the various Einstein's coefficients of absorption and emission of radiation. 6M  
 b) Explain population inversion? 6M

OR

- 8 a) Explain the different pumping mechanisms in laser. 6M  
 b) Mention the application of laser in different fields. 6M

**UNIT-V**

- 9 a) Explain the concept of Quantum Confinement in nano materials. 5M  
 b) Write the applications of nanomaterial in industries and information technology. 7M

OR

- 10 a) What are carbon nanotubes? Mention its structures? 6M  
 b) Write brief note on applications of Carbon nanotubes? 6M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR

B.Tech I Year I Semester Supplementary Examinations August 2021

**THERMAL AND FLUID ENGINEERING**

(EEE)

Time: 3 Hours

Max. Marks: 60

Answer one question from each unit (5 x 12 = 60 Marks)

**UNIT-I**

- 1 What are the different type of feed water treatments in thermal power plant and explain any two with neat sketch. 12M

OR

- 2 Draw the neat sketch of thermal power plant and explain coal storage system. 12M

**UNIT-II**

- 3 What is meant by thermodynamics equilibrium? Explains its types briefly. 12M

OR

- 4 a) State and explain second law of thermodynamics. 6M  
b) Establish the equivalence of Kelvin-Planck and Clausius statements. 6M

**UNIT-III**

- 5 a) Describe the different operations of Rankine cycle. Derive also the expression for its efficiency 6M  
b) A steam power plant works between 40 bar and 0.05 bar. If the steam supplied is dry saturated and the cycle of operation is Rankine, Find (i) cycle efficiency, (ii) Specific steam consumption. 6M

OR

- 6 Explain the terms with neat sketch. 12M  
(i) Economizer, (ii) Air preheater, (iii) Convective super heater

**UNIT-IV**

- 7 a) Define the equation of continuity. Obtain an express for continuity equation for a one-dimensional flow. 6M  
b) Water is flowing through a pipe having diameters 30 cm and 15 cm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 29.43 N/cm<sup>2</sup> and the pressure at the upper end is 14.715 N/cm<sup>2</sup>. Determine the difference in datum head if the rate of flow through pipe is 50 lit/s. 6M

OR

- 8 a) Derive an expression for the force exerted by a flowing fluid on a pipe-bend 6M  
b) If 5 m<sup>3</sup> of a certain oil weighs 50 kN, calculate specific weight, density and specific gravity of oil. 6M

**UNIT-V**

- 9 a) What is a venturimeter? Derive an expression for the discharge through a venturimeter. 6M  
b) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to inlet and throat is 10 cm of mercury. Determine the rate of flow. Take  $C = 0.98$ . 6M

OR

- 10 a) Explain flow through nozzle and derive equation. 6M  
b) A horizontal venturimeter with inlet diameter 20 cm and throat diameter 10 cm is used to measure the flow of water. The pressure at inlet is 17.658 N/cm<sup>2</sup> and the vacuum pressure at the throat is 30 cm of mercury. Find the discharge of water through venturimeter. Take  $C_d = 0.98$  6M

SIDDARTH INSTITUTE OF SCIENCE AND TECHNOLOGY::PUTTUR  
(AUTONOMOUS)

B.Tech I Year I Semester Supplementary Examinations Aug-2021

**ENGINEERING GRAPHICS**

(ECE & CSE)

Time: 3 Hours

Max. Marks: 60

Answer one question from each unit (5 x 12 = 60 Marks)

**UNIT-I**

- 1 a) Construct a hyperbola with the distance between the focus and Directrix as 50 mm and eccentricity as  $3/2$ . 6M
- b) A thread of length 165 mm is wound round a circle of 40 mm diameter. Trace the path of end point of the thread. 6M

OR

- 2 a) The major and minor axes of ellipses are 120 mm and 80 mm. Draw the ellipse by using concentric circles method. 6M
- b) Construct a cycloid, given the diameter of the generating circle as 40 mm. Draw the tangent to the curve at a point on it, 35 mm from the line. 6M

**UNIT-II**

- 3 a) Draw the projections of the following points, keeping the distance between the projectors as 25 mm on the same reference lines.  
A - 20 mm above HP and 30 mm in front of VP  
B - 20 mm above HP and 30 mm behind VP  
C - 20 mm below HP and 30 mm behind VP  
b) A regular pentagon of 30 mm side is resting on one of its edges on H.P, which is inclined at  $45^\circ$  to V.P. Its surface is inclined at  $30^\circ$  to H.P. Draw its projections. 6M

OR

- 4 a) A line AB of 100 mm long is inclined at an angle  $30^\circ$  to H.P and  $45^\circ$  to V.P. A point A is 15 mm above H.P and 20 mm in front of V.P. Draw the projections of the line. 6M
- b) A square plane of side 40 mm has its surface parallel to and 20 mm above HP. Draw its projections when  
a) side is parallel to VP b) a side inclined at  $30^\circ$  to VP. 6M

**UNIT-III**

- 5 Draw the projections of a hexagonal prism of side of base 25 mm and axis 60 mm long, when it is resting on one of its corners of the base on H.P. The axis of the solid is inclined at  $45^\circ$  to H.P. 12M

OR

- 6 A cone with base 60 mm diameter and axis 75 mm long, is resting on its base on H.P. It is cut by a section plane parallel to H.P and passing through the mid-point of the axis. Draw the projections of the cut solid. 12M

**UNIT-IV**

- 7 A hexagonal prism side of base 30 mm and axis 75 mm long, is resting on its base on H.P such that, a rectangular face is parallel to V.P. It is cut by a section plane, 12M

perpendicular to V.P and inclined at  $30^\circ$  to H.P. The section plane is passing through the top end of an extreme lateral edge of the prism. Draw the development of the lateral surface of the cut prism.

OR

- 8 A cylinder of base diameter 40 mm and axis 55 mm long is resting on its base on HP. Its cut by a section plane perpendicular to VP and inclined at  $45^\circ$  to HP. The section plane is passing through the top end of an extreme generator of the cylinder. Draw the development of lateral surface of the cut cylinder 12M

**UNIT-V**

- 9 Draw the isometric view of a pentagonal pyramid side of base 25 mm and axis 60 mm long. The pyramid is resting on its base on H.P, with an edge of the base away from the observer and parallel to V.P. 12M

OR

- 10  12M

Draw three views of the blocks shown pictorially in figure according to first angle projection. All Dimensions are in mm.

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY; PUTTUR  
 B.Tech I Year I Semester Supplementary Examinations August 2021  
**ENGINEERING MECHANICS**  
 (Common to CE & MECH)

Time: 3 Hours  
 Answer one question from each unit (5 x 12 = 60 Marks)  
 Max. Marks: 60

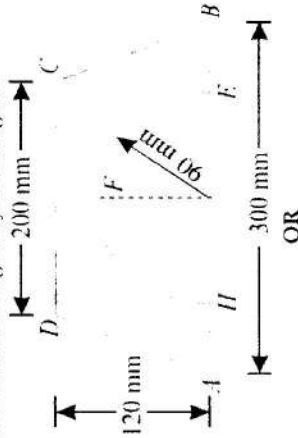
- 1 State and prove Varignon's theorem. 12M
- 2 A system of connected flexible cable shown in Fig.3 is supporting two vertical forces 200 N and 250 N at points B and D. Determine the forces in various segments of the cable. 12M
- 3 A body, resting on a rough horizontal plane, required a pull of 180 N inclined at 30° to the plane just to move it. It was found that a push of 220 N inclined at 30° to the plane just moved the body. Determine the weight of the body and the coefficient of friction. 12M

OR

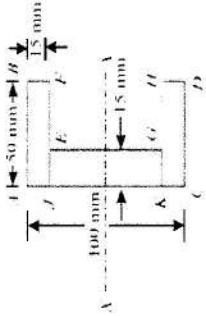
- 4 A ladder 5 meters long rests on a horizontal ground and leans against a smooth vertical wall at an angle 70° with the horizontal. The weight of the ladder is 900 N and acts at its middle. The ladder is at the point of sliding when a man weighing 750N stands on a rung 1.5 metre from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the floor. 12M

UNIT-III

- 5 A semicircle of 90 mm radius is cut out from a trapezium as shown in Figure. Find the position of the centre of gravity of the figure. 12M



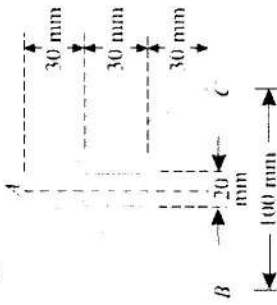
- 6 Find the centre of gravity of a channel section 100 mm × 50 mm × 15 mm as shown in Figure 12M



UNIT-IV

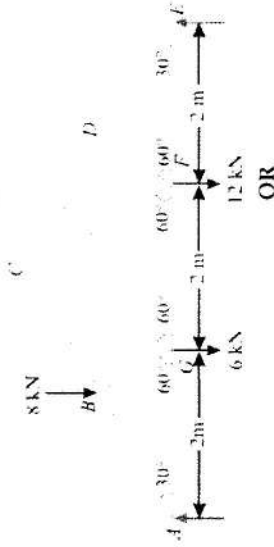
- 7 Prove the parallel axis theorem in the determination of moment of inertia of areas with the help of a neat sketch. 12M
- 8 A rectangular hole is made in a triangular section as shown in figure. Determine the moment of inertia of the section about X-X axis passing through its centre of gravity and the base BC. 12M

OR



UNIT-V

- 9 An inclined truss loaded as shown figure 12M



OR

- 10 Explain the procedure to find forces in members of truss by using method of joints. 12M



SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR  
B.Tech I Year I Semester Supplementary Examinations August - 2021  
**PYTHON PROGRAMMING**  
(Common to CSE & ECF)

Time: 3 Hours

Max. Marks: 60

Answer one question from each unit (5 x 12 = 60 Marks)

**UNIT-I**

- 1 Explain about the input and output statements or methods with example. 12M

**OR**

- 2 a) What is dictionary? Explain the methods available in dictionary. 6M  
b) Differentiate between the tuple and sets in python. 6M

**UNIT-II**

- 3 Explain in detail about Control flow structures in python. 12M

**OR**

- 4 a) Develop a program to find the largest among three numbers. 6M  
b) Explain break and continue statement with the help of for loop with an example. 6M

**UNIT-III**

- 5 a) Compare class and object with python code. 6M  
b) Narrate scope of a variable in a function. 6M

**OR**

- 6 a) Write a function to display ASCII Code of entered character 6M  
b) Describe how an object is passed as parameter to a method 6M

**UNIT-IV**

- 7 What is package? How to create package explain with example? 12M

**OR**

- 8 What is user defined exception and explain with example program. 12M

**UNIT-V**

- 9 Demonstrate about the GUI programming in Python. 12M

**OR**

- 10 What is mean by Functional Programming? Write about map and filter in Python. 12M