

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)

B.Tech I Year II Semester Supplementary Examinations July / Aug -2021
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 Hours

Max. Marks: 60

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

UNIT - I

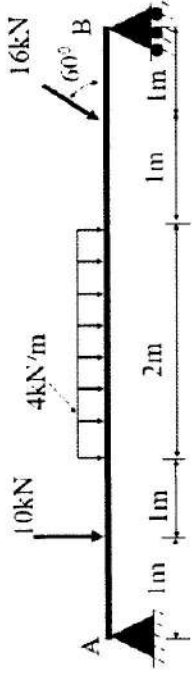
- 1 a) Draw Stress – Strain for mild steel bar subjected to tensile loading and mark salient points on the graph. 7 M
- b) A hollow cast iron cylinder 4 m long, 300 mm outer diameter, and thickness of metal 50 mm is subjected to a central load on the top when standing straight. The stress produced is $75 \times 10^3 \text{ kN/m}^2$. Assume Young's Modulus for cast iron as $1.5 \times 10^8 \text{ kN/m}^2$ and find (i) magnitude of load (ii) longitudinal strain produced, and (iii) total decrease in length. 5 M
- 2 A uniformly tapered circular bar of length l is having a diameter of d_1 at one end and the diameter is reduced to d_2 at the other end. If this bar is subjected to a tensile load of magnitude P , find the equation for the change in the length of the bar δl . 12 M

UNIT - II

- 3 A cantilever of 14 m span carries loads of 6 kN, 4 kN, 6 kN and 4 kN at 2 m, 4 m, 7 m and 14 m respectively from the fixed end. If also has a uniformly distributed load of 2 kN/m run for the length between 4 m and 10 m from the fixed end. Draw the shear force and bending moment diagrams 12 M

OR

- 4 a) A simply supported beam is shown in the figure. Draw the shear force and bending moment diagrams for the loads shown in figure. 12 M



UNIT - III

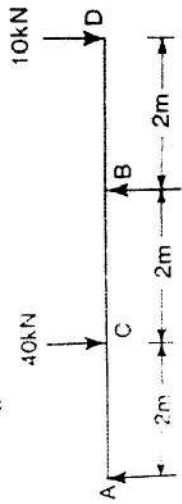
- 5 A timber beam of rectangular section supports a load of 20 kN uniformly distributed over a span of 3.6 m. If depth of the beam section is twice the width and maximum stress is not to exceed 7 MPa, find the dimensions of the beam section. 12 M

OR

- 6 Draw the shear stress distribution of triangular section of width 'b' and height 'h'. Prove that the maximum shear stress is 1.5 times the average shear stress. 12 M

UNIT - IV

- 7 Determine the deflection under the loads in the beam shown in figure. Take flexural rigidity as EI throughout. 12 M



OR

- 8 Derive the expression for slope and deflection of a cantilever beam carrying a point load at the free end by Moment Area method. 12 M

UNIT - V

- 9 Compare the Euler crippling loads of two columns-one of solid circular section and the second of hollow circular section of internal diameter 70% of the external diameter if they are of the same material, same length, same area, and same end conditions. 12 M

OR

- 10 A 2m long pin ended column of square cross-section is to be made of wood. Assuming $E = 12 \text{ GPa}$ and allowable stress being limited to 12 MPa, determine the size of the column to support the following loads safely. (i) 95 kN (ii) 20 kN. Use factor of safety of 3 and Euler's crippling load for buckling. 12 M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech I Year II Semester Supplementary Examinations July/ Aug 2021
MATERIALS ENGINEERING
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

- 1 Explain the effect of grain boundaries on the properties of alloys, also determine the grain size. 12M

OR

- 2 a) Draw a neat sketch of FCC crystal structure and calculate its packing factor, coordinate number. 6M
b) Draw a neat sketch of BCC crystal structure and calculate its packing factor, coordinate number. 6M

UNIT-II

- 3 a) What is Phase? What are different types of phase diagram? 6M
b) Define invariant reactions in phase Diagram with an example. 6M

OR

- 4 a) Draw the Eutectoid system diagram. 4M
b) Draw and explain the Fe-Fe₃C phase diagram invariant reactions? 8M

UNIT-III

- 5 Explain the structure and properties of Titanium and its alloys? 12M

OR

- 6 a) Explain the structure and properties of malleable cast iron. 5M
b) Explain the structure and properties of Ductile cast iron. 7M

UNIT-IV

- 7 Write about Annealing, normalizing, Hardening. Draw and explain the structures. 12M

OR

- 8 What are TTT diagrams? How they prepared? What is their significance? 12M

UNIT-V

- 9 a) What are glasses? How they manufacture? 6M
b) Discuss about the Glass micro structure and properties. 6M

OR

- 10 What is the polymer? Explain the polymer matrix composite. 12M

SIDDARATHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR

(AUTONOMOUS)

B.Tech I Year II Semester Supplementary Examinations July / Aug -2021

ELECTRICAL CIRCUITS - I

(EEE)

Time: 3 Hours

Max. Marks: 60

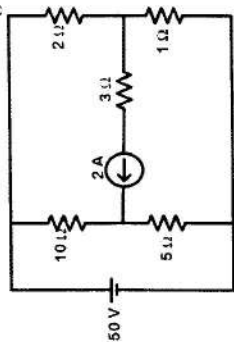
Answer one question from each unit (5 x 12 = 60 Marks)

UNIT - I

1 Explain various types of energy sources with suitable diagrams. 12M

OR

2 Determine the current in the 5Ω resistor in the network given in Fig. 12M



UNIT - II

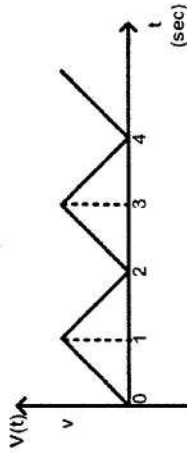
3 Derive the expression for equivalent inductance when the coupled inductors are connected in series aiding and series opposition. 12M

OR

4 Derive the expression for equivalent inductance when the coupled inductors are connected in parallel aiding and parallel opposition. 12M

UNIT - III

5 Find the form factor for the following waveform shown in Fig. 12M



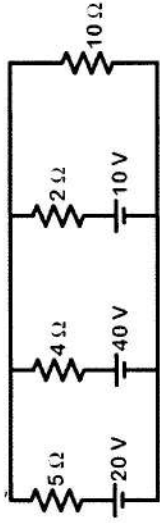
OR

6 A Capacitor of 1μF is connected across an AC Voltage of $V=170 \sin(400t)$. Determine, 12M

- (a) Capacitive Reactance
- (b) Sinusoidal expression for current
- (c) Maximum current.

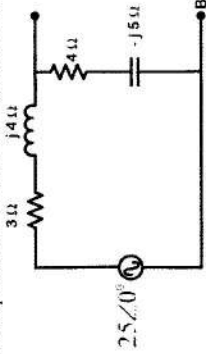
UNIT - IV

7 Using Millmann's theorem, find the current in the 10Ω Resistor for the circuit shown in Fig. 12M



OR

8 Determine the Norton's equivalent circuit for the circuit shown in Fig. 12M



UNIT - V

9 Obtain the expression for resonant frequency, bandwidth and Q-factor for parallel R-L-C circuit. 12M

OR

10 Derive and draw the Locus diagram of a Series RL Circuit. 12M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)

B.Tech I Year II Semester Supplementary Examinations July/Aug 2021

BASIC ELECTRICAL ENGINEERING

(ECE)

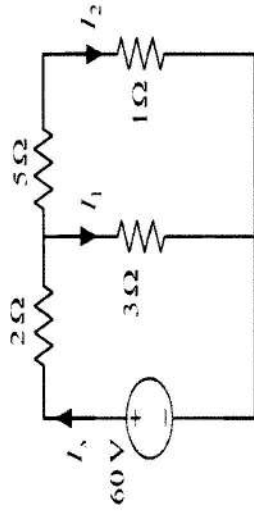
Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) State and explain Kirchhoff's laws.
- b) Find the currents I_1 and I_2 in the circuit shown below.



OR

- 2 a) State and explain Superposition Theorem. 6M
- b) State and explain Norton's Theorem. 6M

UNIT-II

- 3 a) Explain the terms: Impedance, Power factor and Real Power. 6M
- b) The voltage applied to a series circuit is $v(t) = 200 \sin(\omega t)$ and the current flowing through the circuit is $i(t) = 20 \sin(\omega t + 45)$. Determine impedance, resistance, reactance, power factor and real power. 6M

OR

- 4 a) Explain the concept of resonance in an RLC series circuit and write the condition for resonance. 6M
- b) Compare star- and delta-connected 3-phase systems. 6M

UNIT-III

- 5 a) What are the main constructional parts of a DC machine. 6M
- b) In a given DC machine, if $P = 8$, $Z = 400$, $N = 300$ rpm, and $\phi = 0.1$ Wb, calculate the generated emf E_g with winding (i) lap connected and (ii) wave connected. 6M

OR

- 6 a) Mention the various types of DC motors and write any one application of each type of motor. 6M
- b) Explain the armature voltage control method to control the speed of a DC Shunt Motor. 6M

UNIT-IV

- 7 a) What are the various losses in a Transformer and write the condition for maximum efficiency. 6M
- b) What is an autotransformer? How does it differ from conventional two-winding transformer? 6M

OR

- 8 a) Derive the E.M.F equation of an alternator. 6M
- b) Classify the types of 3-phase induction motors based on rotor construction and compare them. 6M

UNIT-V

- 9 a) What are the advantages and disadvantages of Conduit Wiring. 6M
- b) Write the list of various protective devices used in domestic wiring. 6M

OR

- 10 What is the necessity of earthing and what are the different earthing methods and explain any one method in detail with a neat diagram. 12M

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SIDDARTH INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)

B.Tech I Year II Semester (R18) Regular Examinations July / Aug 2021
BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(CSE)

Time: 3 hours

Max.Marks: 60

PART-A

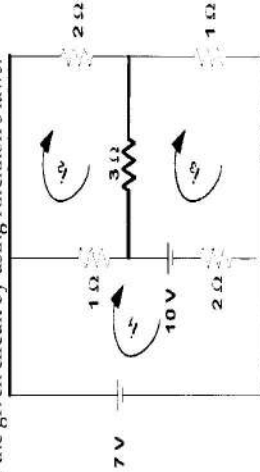
(Answer all Three units, 3 x 10 =30 Marks)
Note: for Part-A, use first 16 pages...for Part-B, use 17 page onwards

UNIT - I

- Three resistances of values 20, 30 and 50 are connected in series across 20 V DC supply. Calculate,
 - Equivalent resistance of the circuit.
 - Total current from the supply.
 - Voltage drop across each resistor.
 - Power dissipated in each resistor.

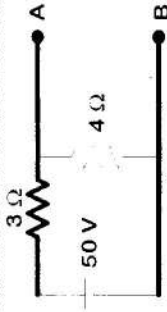
OR

- (a) State and prove Kirchhoff's laws with suitable examples.
(b) Find i_1 , i_2 , i_3 for the given circuit by using Kirchhoff's laws?



UNIT - II

- (a) State Norton's theorem.
(b) Find Norton's equivalent circuit across AB for the circuit shown.



OR

- State and prove Reciprocity theorem with suitable example.

UNIT - III

- (a) Derive Torque equation of dc motor. 5M
(b) The counter emf of Shunt motor is 227 V. The field resistance is 160Ω and field current 1.5A. If the line current is 36.5A, find the armature resistance also find armature current when the motor is stationary. 5M

OR

- (a) Derive the condition for maximum efficiency of the transformer. 5M
(b) Discuss about the voltage regulation of the transformer. 5M

PART - B

(Answer all Three units, 3 x 10 =30 Marks)

UNIT - I

- Distinguish between intrinsic and extrinsic semiconductors and explain the process of conduction in each of them. 10M

OR

- (a) With neat diagram, explain the working principle of Half Wave Rectifier. Draw its input and Output waveforms. 5M
(b) Derive the expression for Ripple factor and Efficiency of Half Wave Rectifier. 5M

UNIT - II

- (a) Describe in detail the working of an NPN bipolar junction transistor. Why is it called Bipolar? 5M
(b) Explain with the help of diagrams various types of circuit configurations, which can be obtained from a bipolar junction transistor. 5M

OR

- (a) Derive the relationship between I_C, I_B, I_E of BJT configurations. 10M
(b) A transistor operating in CB configuration has $I_C = 2.98\text{mA}$, $I_E = 3.00\text{mA}$ and $I_{CO} = 0.01\text{mA}$. What current will flow in the collector circuit for this transistor when connected in CE configuration with a base current of $30\mu\text{A}$?

UNIT - III

- (a) Explain the construction and principle of operation of N-channel JFET. 5M
(b) Define the JFET Volt-Ampere Characteristics and determine FET parameters. 5M

OR

- (a) Draw the construction of EMOSFET and explain its operation 5M
(b) Explain the operation DMOSFET 5M

R18

10M

5M
5M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)

B.Tech I Year II Semester Supplementary Examinations July/ Aug 2021

PYTHON PROGRAMMING
(Common to CE, EEE & MECH)

Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) Explain about the Single-Valued data types in python. L2 6M
b) Explain variable assignment with suitable example. L2 6M

OR

- 2 a) Differentiate between the tuple and sets in python. L2 6M
b) Implement the python program to calculate total and average marks based on input. L5 6M

UNIT-II

- 3 a) If the age of Ram, Sam, and Khan are input through the keyboard, write a python program to determine the eldest and youngest of the three. L3 6M
b) Explain break and continue statement with the help of for loop with an example. L2 6M

OR

- 4 a) Develop a program to find the largest among three numbers. L6 6M
b) Write a python program to print factorial of a given number L3 6M

UNIT-III

- 5 a) Compare class and object with python code L5 6M
b) Narrate scope of a variable in a function L2 6M

OR

- 6 a) How do we achieve code reusability in python? Write a python code to Explain code reusability L1 6M
b) What is inheritance? Illustrate types of inheritance with python code L1 6M

UNIT-IV

- 7 a) What are packages? Give an example of package creation in Python L1 6M
b) Describe about Handling Exceptions in detail with examples. L4 6M

OR

- 8 a) Describe the any one regular expression L4 6M
b) Write a small code to illustrate try and except statements in Python. L3 6M

UNIT-V

- 9 a) Explain about reading and writing files in python L2 6M
b) Explain about Python Runtime Services L2 6M

OR

- 10 a) Explain in detail about Iterators and Generators? L2 6M
b) Discuss in detail about Data Compression with suitable example L2 6M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)

B.Tech I Year II Semester Supplementary Examinations July / Aug 2021
SWITCHING THEORY AND LOGIC DESIGN

(ECE)

Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) Convert the given octal number 234.75 to Binary, Decimal and Hexadecimal form L1 6M
- b) Represent +15, -15 and -27 in 1's and 2's complement forms L3 6M

OR

- 2 a) Write a short note on logic gates and their truth tables L2 6M
- b) Simplify the following Boolean expressions to a minimum number of literals 6M

- i) $ABC + A'B + ABC'$
- ii) $(X+Y)'(X'+Y')$

UNIT-II

- 3 a) Simplify the following expression using K-map. 6M
 $Y = AB'C + A'BC + A'B'C + A'B'C'$
- b) What is meant by Don't care combinations and simplify the given Boolean function (F) together with the Don't cares (d) 6M
 $F(x,y,z) = \pi(0,1,2,4,5) + d(3,7)$

OR

- 4 Simplify the following Boolean function, 12M
 $f(W,X,Y,Z) = \sum m(0,1,2,6,8,9,10,11,14,15)$ using Quine McClukey method
- 5 a) with a neat diagram explain operation of 2-bit magnitude comparator 6M
- b) Realize full adder using two level basic gates. 6M

OR

- 6 a) Implement given function using 8X1 multiplexer $F = \sum(0,1,5,6,7)$ 6M
- b) Design 8X3 encoder using basic gates and explains basic operation 6M
- 7 a) Differences between combinational and sequential circuits 6M
- b) With a suitable diagrams explain the operation of 4-bit Ring counter 6M

OR

- 8 a) Describe the operation of D and T-FFs 6M
- b) What is meant by race around condition in JK-FF? How to avoid it. 6M
- 9 a) compare Mealy and Moore machines 6M
- b) Explain architecture of programmable logic arrays 6M

OR

- 10 a) Determine a minimal state table equivalent to the given state table using state reduction technique 8M

PS	NS,Z	
	X=0	X=1
1	1,0	1,0
2	1,1	4,1
3	4,0	5,0
4	1,0	1,0
5	2,0	3,0

- b) Differences between ROM and PAL 4M

SIDDARTH INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)

B.Tech I Year II Semester Supplementary Examinations July / Aug 2021

ENGINEERING GRAPHICS

(Common to CE, EEE & ME)

Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) Construct an ellipse having major axis is equal to 100 mm and the minor axis is equal to 70 mm, use the concentric circle method. L2 6M
- b) Develop the involute of a regular hexagon of side 20 mm. Draw a tangent and normal to the curve at a distance of 100 mm from the centre of the hexagon. L3 6M

OR

- 2 Draw an Epi-cycloid of rolling circle of diameter 40 mm which rolls outside another circle (base circle) of 150 mm diameter for one revolution and construct a tangent and normal at any point on the curve. L3 12M

UNIT-II

- 3 A point E is 20 mm below HP and 30mm behind VP. Another point F is Infront of VP and above the HP. The distance between the projectors of the points is 60 mm. Determine the point F and Point E. if the length of line joining their top views and front views are 80 & 90. L2 12M

OR

- 4 a) Identify the relative positions of the projections of the following points with respect to xy
A - In the second quadrant L1 6M
B - In the third quadrant
C - In the first quadrant p
D - In the fourth quadrant
- b) Draw the projections of a straight-line AB of 70 mm long, in the following L2 6M positions:
i) Inclined at 30° to VP, in HP and one end on VP.
ii) Inclined at 45° to HP, one end 20 mm above HP and parallel to and 30 mm in front of VP.

UNIT-III

- 5 A thin 30° - 60° set-square has its longest edge (diagonal) on HP and inclined at 30° to VP. Its surface makes an angle of 45° with HP. Draw the L3 12M projections, choosing suitable size for the set-square.

OR

- 6 A pentagonal prism of base side 30 mm and axis 60mm is resting on one of L3 12M its rectangular faces on HP, with the axis parallel to VP. Draw its projections.

UNIT-IV

- 7 A pentagonal pyramid with edge of base 25 mm and axis 65 mm long, its L3 12M base is resting on HP. It is cut by a section plane, inclined at 60° to HP and perpendicular to VP at bisect the axis. Draw the projections and obtain the

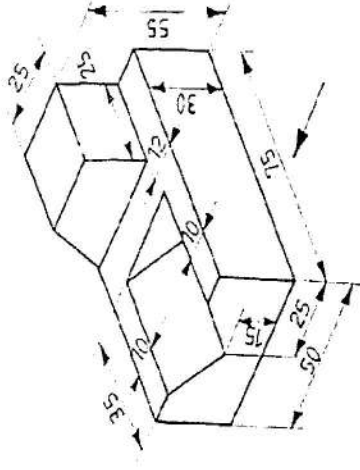
true shape of the section.

OR

- 8 A cone of 50 mm diameter and axis 70 mm long. Its base is on HP. It is cut by L3 12M a sectional plane perpendicular to VP and inclined to HP at 45° from apex 32mm. Draw the projections of F.V, S.T.V, True shape.

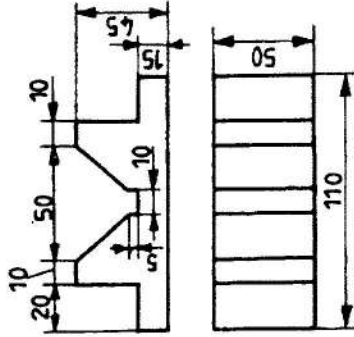
UNIT-V

- 9 Draw three views of the blocks shown pictorially in figure according to first L3 12M angle projection.



OR

- 10 Show the isometric view of the following sketch. L3 12M



SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)
B.Tech I Year II Semester Supplementary Examinations July/ Aug 2021
DIGITAL LOGIC DESIGN
(CSE)

Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) Represent the decimal number 3452 in i)BCD ii) Excess-3 6M
b) Convert the following to binary and then to gray code (AB33)₁₆ 6M

OR

- 2 a) Explain the difference between analog and digital systems L2 6M
b) Explain the Standard Canonical forms with examples L2 6M

UNIT-II

- 3 a) Reduce the expression $f(x,y,z,w) = \prod M(0,2,7,8,9,10,11,15)$.d (3,4) using K-Map? 6M
b) Determine the minimal sum of product form of $f(w,x,y,z) = \sum m(4,5,7,12,14,15) + d(3,8,10)$ 6M

OR

- 4 a) Simplify the Boolean expressions to minimum number of literals 6M
 $X' + XY + XZ' + XYZ'$ ii) $(X+Y)(X+Y')$
b) Simplify the Boolean expression using K-map and implement using NAND gates $F(A,B,C,D) = \sum m(0,2,3,8,10,11,12,14)$ 6M

UNIT-III

- 5 a) Design the combinational circuit binary to gray code? 6M
b) Design a 4 bit adder-subtractor circuit and explain the operation in detail? 6M

OR

- 6 a) Design the combinational circuit of 4 Bit Parallel Adder? 6M
b) Implement BCD to 7-segment decoder for cathode type using 4:16 decoder? 6M

UNIT-IV

- 7 a) Explain the Logic diagram of SR flip-flop? L2 6M
b) Explain the design of a 4 bit binary counter with parallel load in detail? L2 6M

OR

- 8 a) Design 4 bit binary synchronous counters with D-flip flop? 6M
b) Explain synchronous and ripple counters compare their merits and demerits? L2 6M

UNIT-V

- 9 a) Design PAL for a combinational circuit that squares a 3 bit number? 6M
b) Construct the PROM using the conversion from BCD code to Excess-3 code? 6M

OR

- 10 a) Explain about memory decoding error detection and correction? L2 6M
b) Encode the 11-bit code 10111011101 into 15 bit information code? 6M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)

B.Tech I Year II Semester Supplementary Examinations July/ Aug 2021

Engineering Chemistry
(Common to CE & MECH)

Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) Explain the process of scale and sludge formation in boilers 8M
b) What is the principle of EDTA Method? 4M

OR

- 2 a) What are guidelines of drinking water quality as per World health Organization (WHO). 4M
b) Explain the process of reverse osmosis. Reverse osmosis is more advantageous over ion exchange process. Justify. 8M

UNIT-II

- 3 Derive Nernst equation giving the emf of a cell in terms of concentrations of reactants and products of the cells. 12M

OR

- 4 a) Discuss the various factors which influence corrosion. 6M
b) Define electroplating. Explain electroplating of Nickel. 6M

UNIT-III

- 5 a) Distinguish between thermoplastics and thermosetting plastics. 6M
b) Write note on preparation, properties and applications of Buna-S. 6M

OR

- 6 a) A sample of coal has composition by mass C=70%, O=8%, H=10%, N=3%, S= 2%. Calculate High and Low calorific value (H.C.V & L.C.V) 6M
b) What do you understand with the knocking of a fuel? Report the ways to improve the anti knocking characteristics of fuel. 6M

UNIT-IV

- 7 a) What are important applications of composites? Give some specific examples. 7M
b) What is meant by lubricant? How are lubricants classified? Give examples. 5M

OR

- 8 With the help of flow diagram explain the manufacture of Portland cement by Dry & wet process 12M

UNIT-V

- 9 a) Elucidate any one method of colloids. 7M
b) Discuss the working principle of Scanning Electron Microscopy. 5M

OR

- 10 a) What are the factors influencing Adsorption of gases on solids? 6M
b) Write the applications of nanomaterials in various fields. 6M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)

B.Tech I Year II Semester Supplementary Examinations July/ Aug 2021

APPLIED PHYSICS

(EEE)

Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) What is a simple harmonic oscillator? Derive the equation of motion of simple harmonic oscillator. 8M
b) A particle executes SHM with a period of 0.002 sec and amplitude of 10 cm. Find its acceleration when it is 4 cm away from its mean position and also obtain its maximum velocity. 4M

OR

- 2 a) Explain different types of damped oscillations with suitable examples. 8M
b) A point performs damped oscillations according to the law $x = a_0 e^{-bt} \sin \omega t$. Find the amplitude of oscillation and velocity of the particle at the moment $t=0$. 4M

UNIT-II

- 3 a) What are matter waves? Write their properties. 6M
b) Show that the product of uncertainty of pair of variables describing the motion of particles is always not less than $h/4\pi$. 6M

OR

- 4 a) Deduce Schrodinger time independent wave equation. 8M
b) Write the physical significance of wave function ψ . 4M

UNIT-III

- 5 a) Write the Fermi-Dirac distribution function. 4M
b) Explain the effect of temperature on Fermi-Dirac distribution. 8M

OR

- 6 a) What is Hall Effect? 2M
b) Obtain an expression for Hall coefficient. Write the applications of Hall Effect. 10M

UNIT-IV

- 7 a) Explain the pumping mechanisms to achieve population inversion. 4M
b) Explain the construction and working of He-Ne laser with a neat diagram. 8M

OR

- 8 a) Outline the optical fiber communication system. 6M
b) Write any four applications of optical fibers. 6M

UNIT-V

- 9 a) What are nanomaterials? Explain the basic principles of nanomaterials. 6M
b) Outline the properties of nanomaterials that are affected due to increased surface area to volume ratio. 6M

OR

- 10 a) Explain the principle of Scanning Electron Microscopy (SEM). 8M
b) Write any two applications of SEM. 4M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
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B.Tech I Year II Semester Supplementary Examinations July/ Aug 2021

SEMICONDUCTOR PHYSICS

(ECE)

Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) Discuss the origin of electrical resistance in metals. 6M
b) Distinguish between classical free electron theory and quantum free electron theory of metals. 6M

OR

- 2 a) Explain Fermi-Dirac distribution function in metals. Discuss its variation with temperature. 6M
b) Write a short note on effective mass of an electron. 6M

UNIT-II

- 3 a) Distinguish between intrinsic and extrinsic semiconductors with suitable examples. 6M
b) Derive the expression for energy band gap of an intrinsic semiconductor. 6M

OR

- 4 a) Develop the Einstein's relation in semiconductor materials. 6M
b) Explain the Hall effect. Give their applications. 6M

UNIT-III

- 5 a) What are matter waves? Derive the expression for de-Broglie's wavelength of an electron. 6M
b) Derive the expression for Schrodinger time independent wave equation. 6M

OR

- 6 a) Explain the divergence and curl of an electric and magnetic fields. 8M
b) Write a short note on Stokes' theorem. 4M

UNIT-IV

- 7 a) Explain the construction of Nd:YAG laser. With neat energy level diagram, explain the working mechanism of Nd:YAG laser. 9M
b) Calculate the wavelength of light emitted by the GaAs laser, whose energy gap is 1.44eV. 3M

OR

- 8 a) Classify the optical fibers based on the refractive index profiles. Describe the transmission of light through those fibers. 8M
b) List the applications of optical fiber. 4M

UNIT-V

- 9 a) Explain the terms nanoscience and nanotechnology. 6M
b) Why the nanomaterials exhibits enhanced properties than the bulk? Explain. 6M

OR

- 10 a) Describe the synthesis of nanomaterials by using sol-gel method. 8M
b) List the applications of nanomaterials. 4M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)
B.Tech I Year II Semester Supplementary Examinations July/ Aug 2021
APPLIED CHEMISTRY

(CSE)

Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) What are conductometric titrations? Explain the conductometric titration of strong acid and strong base with example. 6M
b) Define battery. Explain the construction and working of Lithium ion battery. 6M

OR

- 2 a) Derive the Nernst equation for an electrochemical cell. 6M
b) What are electrochemical sensors? Explain the potentiometric sensors with one example? 6M

UNIT-II

- 3 a) Explain the salient features of Crystal Field Theory. 6M
b) Write short notes on dual nature of matter. 6M

OR

- 4 a) Discuss the molecular orbital diagram of O₂ and find out its bond order. 6M
b) Draw the band diagram for conductors, semiconductors, and insulators. 6M

UNIT-III

- 5 a) What are thermosetting plastics? Explain the preparation of Bakelite. 6M
b) Explain the mechanism of addition polymerization with suitable example? 6M

OR

- 6 a) Define Co-Polymerization. Explain the preparation, properties and applications of Buna-S rubber. 6M
b) Define conducting polymer. Describe the mechanism of polyacetylene. 6M

UNIT-IV

- 7 a) State Beer's-Lambert's law and derive mathematical expression of Beer's-Lambert law. 6M
b) Explain the principle and applications of UV-Visible Spectroscopy. 6M

OR

- 8 a) Write the basic principle of IR spectroscopy. Describe various molecular vibrations in the IR technique. 6M
b) Write short notes on pH-metry. 6M

UNIT-V

- 9 a) Explain briefly about basic lock and key principle of supramolecule. 6M
b) Write short notes on self-assembly in biological systems. 6M

OR

- 10 a) Explain the applications of supramolecular devices. 6M
b) Write short notes on cation binding and anion binding. 6M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)

B. Tech I Year II Semester Supplementary Examinations July/ Aug 2021

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to CE, ECE, EEE, ME)

Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) Find the solution of $(2x - y + 1)dx + (2y - x - 1)dy = 0$ L1 6M
 b) Solve the differential equation $x \frac{dy}{dx} + y = \log x$ L3 6M

OR

- 2 a) Find the solution of the differential equation $(D^2 + 6D + 8)y = e^{-3x} \cos 2x$ L1 6M
 b) Solve the differential equation $y'' - 4y' + 4y = 8x^2$ L3 6M

UNIT-II

- 3 a) Use the method of variation of parameters, solve $(D^2 + 1)y = \tan x$ L3 6M
 b) Determine the solution of the Cauchy's linear differential equation
 $x^2y'' - 4xy' + 6y = x^2$ L5 6M

OR

- 4 a) Solve the Lagrange's linear differential equation
 $[(1+x)^2D^2 + (1+x)D + 1]y = 4 \cos[\log(1+x)]$ L3 6M
 b) Determine the solution of the simultaneous differential equations
 $Dx - y = 1$ and $Dy - x = 1$ L5 6M

UNIT-III

- 5 a) Form the partial differential equation of $(x-a)^2 + (y-b)^2 + z^2 = r^2$ by eliminating the arbitrary constants a, b L4 6M
 b) Solve the partial differential equation $\frac{\partial^2 z}{\partial x \partial y} = e^y \cos x$ by direct integration method L3 6M

OR

- 6 a) Form the partial differential equation of $z = f(x^2 - y^2)$ by eliminating the arbitrary function L4 6M
 b) Solve the partial differential equation $3u_x + 2u_y = 0, u(x, 0) = 4e^{-x}$ by the method of separation of variables. L3 6M

UNIT-IV

- 7 a) Find the angle between the normal vectors to the surface $xy = z^2$ at the points $(4, 1, 2)$ and $(3, 3, -3)$ L1 6M
 b) Evaluate $\text{div} \vec{F}$ and $\text{curl} \vec{F}$, where $\vec{F} = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$ L4 6M

OR

- 8 a) Prove that $\text{div}(\phi \vec{F}) = (\text{grad} \phi) \cdot \vec{F} + \phi(\text{div} \vec{F})$ L1 6M
 b) Test whether the vector $\vec{F} = (-x^2 + yz)\hat{i} + (4y - z^2x)\hat{j} + (2xz - 4z)\hat{k}$ is
 (a). Solenoidal vector? (b). Irrotational vector? L4 6M

UNIT-V

- 9 a) Evaluate the line integral of $\vec{F} = (5xy - 6x^2)\hat{i} + (2y - 4x)\hat{j}$ along the curve C given as $y = x^3$ in xy - plane from $(1, 1)$ to $(2, 8)$ L5 6M
- b) Using Green's theorem, evaluate $\int_C \{(x^2 - xy^3)dx + (y^2 - 2xy)dy\}$, L6 6M
where C is the square with vertices $(0, 0)$, $(2, 0)$, $(2, 2)$ and $(0, 2)$.
- OR**
- 10 a) Evaluate the surface integral of $\vec{F} = (x^2 - yz)\hat{i} + (y^2 - zx)\hat{j} + (z^2 - xy)\hat{k}$ taken over the rectangular parallelepiped $0 \leq x \leq a$, $0 \leq y \leq b$, $0 \leq z \leq c$ L5 6M
- b) Using Stroke's theorem, evaluate $\oint_C yzdx + zxdy + xydz$, where C is the curve $x^2 + y^2 = 1$, $z = y^2$ L6 6M

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR
(AUTONOMOUS)

B. Tech I Year II Semester Supplementary Examinations July/ Aug 2021

PROBABILITY & STATISTICS

(CSE)

Time: 3 Hours

Max. Marks: 60

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

UNIT-I

- 1 a) Two cards are selected at random from 10 cards numbered 1 to 10. Find the probability that the sum is even if (i) The two cards are drawn together. (ii) The two cards drawn one after other with replacement. L2 6M
- b) The probabilities that the students A, B, C and D respectively solve a problem are $\frac{1}{3}, \frac{2}{5}, \frac{1}{5}$ and $\frac{1}{4}$. If all of them try to solve the problem, then what is the probability that the problem is solved. L3 6M

OR

- 2 a) Find the value of ' k ', mean and variance of the following probability distribution L2 6M

X	-3	-2	0	2	3
$P(X)$	$k/6$	$k/2$	$2k/3$	$k/2$	$k/6$

- b) Find the constant k such that $f(x) = \begin{cases} kx^2, & -3 < x < 3 \\ 0, & \text{otherwise} \end{cases}$ is a p.d.f. Also compute (i). $P(1 \leq x \leq 2)$, (ii). $P(x \leq 2)$ L3 6M

UNIT-II

- 3 a) If the mean and variance of a binomial distribution is 2 and $4/3$, then find the (i). Value of n , (ii). $P(X \geq 1)$ and (iii). $P(X \leq 5)$ L3 6M
- b) If a random variable X has a Poisson distribution such that $P(X = 1) = P(X = 2)$ then find the mean, $P(X = 4)$ and $P(X \geq 4)$ L5 6M

OR

- 4 a) Find the mean and variance of the normal distribution in which 31% of items are under 45 and 8% of items are over 63. L3 6M
- b) Derive the mean and variance of Poisson distribution L5 6M

UNIT-III

- 5 a) Calculate the mean for the following frequency distribution L4 6M

Class interval	0-8	8-16	16-24	24-32	32-40	40-48
Frequency	8	7	16	24	15	7

- b) The below table gives the ages (in years) of 10 married couples. Determine the coefficient of correlation between these ages. L5 6M

Husband Age	23	27	28	29	30	31	33	35	36	39
Wife Age	18	22	23	24	25	26	28	29	30	32

OR

- 6 a) Fit the regression lines of y on x and x on y for the following data. L4 6M

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

L5 6M

- b) Compute Spearman's rank correlation coefficient to the following data

Rank in Maths	3	8	9	2	7	10	4	6	1	5
Rank in Physics	5	9	10	1	8	7	3	4	2	6

UNIT-IV

- 7 a) If 'P' is the pull required to lift a load 'W' by means of a pulley block, then fit a straight line of the form $P = mW + c$ connecting P & W using the following data. Also compute P when $W = 150$ L4 6M

W	50	70	100	120
P	12	15	21	25

- b) Fit a curve of the form $y = ae^{bx}$ to the following data. L1 6M

x	77	100	185	239	285
y	2.4	3.4	7.0	11.1	19.6

OR

- 8 a) It is known that IQ of boys has S.D 10 and that IQ of girls has S.D 12. Mean IQ of 200 randomly selected boys is 99 and mean IQ of 300 randomly selected girls is 97. Can it be concluded that on an average boys and girls have the same IQ? L4 6M
- b) Among 37 B.Tech students, 3 were jobless. Among 26 B.Sc students, 4 were jobless. Test whether the proportion of jobless students is same among the B.Tech & B.Sc students? L1 6M

UNIT-V

- 9 a) Two horses A and B were tested according to the time to run a particular race with the following results. Test whether you can discriminate between two horses. L5 6M

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	---

- b) The nicotine contents in milligrams in two samples of tobacco were found to be as given below. Can it be said that two samples came from same normal population. L6 6M

Sample A	24	27	26	21	25	---
Sample B	27	23	28	31	22	36

OR

- 10 a) A certain stimulus administered to each of 12 patients resulted in the following increase of blood pressure: 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the mean of these increase in blood pressure will differ significantly from the assumed average increase of blood pressure 0? L5 6M
- b) 84 accidents that have occurred in a city in a year are tabulated according to the day of occurrence: Use χ^2 test to decide whether there is day wise equal distribution of accidents. L6 6M

Day	Sun	Mo n	Tue	Wed	Thu	Fri	Sat
Accidents	7	16	8	15	11	11	16