

Hall Ticket No :

Question Paper Code :

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

**ADVANCED NUMERICAL TECHNIQUES
(Open Elective)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT-I

- (a). Find a root of the equation $x^3 - 4x - 9 = 0$, using Bi-Section method correct to three decimal places. **(6 M)**
(b). Find the Positive root of $x^4 - x = 10$ correct to three decimal places, using Newton-Raphson method. **(6 M)**

(OR)

- (a). Find a real root of the equation $x^3 - 5x + 1 = 0$ by Regula-Falsi method correct to three decimal places. **(6 M)**
(b). Evaluate $\sqrt{5}$ by Newton - Raphson method correct to 4 decimal places. **(6 M)**

UNIT-II

- Solve by Jacobi's iteration method, the equations $10x + y - z = 11.19$, $x + 10y + z = 28.08$, $-x + y + 10z = 35.61$, correct to two decimal places. **(12 M)**

(OR)

- Solve by Relaxation method, the equations $9x - 2y + z = 50$, $x + 5y - 3z = 18$, $-2x + 2y + 7z = 19$. **(12 M)**

UNIT-III

- Given that **(12 M)**

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

Find $\frac{dy}{dx}$ at $x=1.1$. Also find the maximum and minimum value of y.

(OR)

6. (a) Use Simpson's $1/3^{\text{rd}}$ rule to find $\int_0^6 \frac{1}{1+x^2} dx$ by taking $h = 6$. (6 M)

(b) Evaluate $\int_0^1 \frac{dx}{1+x}$ applying Trapezoidal rule by taking $h = 0.1$ (6 M)

UNIT-IV

7. (a). Using Picard's process of successive approximations, obtain a solution up to the fifth approximation of the equation $\frac{dy}{dx} = y + x$ such that $y = 1$ when $x = 0$. (6 M)

(b). Employ Taylor's method to obtain approximate value of y at $x = 0.2$ for the differential equation $\frac{dy}{dx} = 2y + 3e^x$, $y(0) = 0$. (6 M)

(OR)

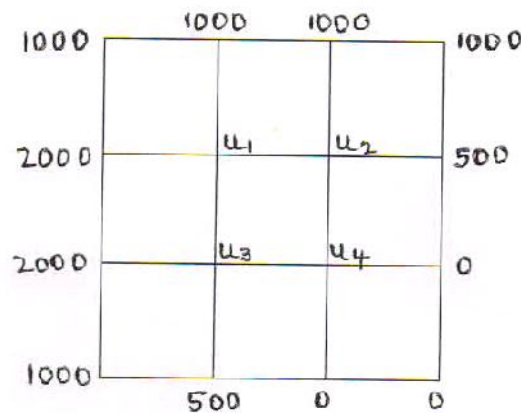
8. Using Runge-Kutta method of order four, find $y(0.2)$ for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$. Take $h = 0.2$ (12 M)

UNIT-V

9. Solve the Poisson's equation $u_{xx} + u_{yy} = -81xy$, $0 < x < 1, 0 < y < 1$ given that $u(0, y) = 0, u(x, 0) = 0, u(1, y) = 100, u(x, 1) = 100$ and $h = \frac{1}{3}$. (12 M)

(OR)

10. Given the values of $u(x, y)$ on the boundary of the square in the following figure, evaluate the function $u(x, y)$ satisfying the Laplace equation $u_{xx} + u_{yy} = 0$ at the pivotal points of this figure. (12 M)



Hall Ticket No :

Question Paper Code :

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

BASIC CIVIL ENGINEERING

(Open Elective)

Time: 3 hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT-I

1. a) Discuss the requirements of good quality bricks. (6M)
b) What are the types of cement and their uses? (6M)

(OR)

2. a) Discuss the requirements of good quality stones. (6M)
b) Enumerate various uses of timber. (6M)

UNIT-II

2. a) Explain the common Building components and their functions. (12M)

(OR)

4. a) What are the ingredients of concrete and their importance in construction? (6M)
b) Explain the preparation of concrete. (6M)

UNIT-III

5. What are the different classifications of surveying and state the principles of surveying (12M)

(OR)

6. What are the various modes of transportation? Discuss them. (12M)

UNIT-IV

7. Explain in brief various water treatment methods. **(12M)**

(OR)

8. What are the different types of irrigation? Explain. **(12M)**

UNIT-V

9. Explain **(6M)**
(a) Various types of soil **(6M)**
(b) Bearing capacity of soil

(OR)

10. State the various functions of foundations for a building. **(12M)**

Note: As the subject is an Open elective taken by non-civil engineering students, the student is expected to gain only elementary knowledge of the subject.

Hall Ticket No :

Question Paper Code :

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

BUILDING PLANNING AND CONSTRUCTION

(Open Elective)

Time: 3 hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT-I

1. a) What are the different types of residential buildings? **(6M)**
- b) Explain in brief various components of a building. **(6M)**

(OR)

2. Explain in detail various factors for selection of site of a residential building. **(12M)**

UNIT-II

3. What are the different types of bonds used in brick masonry? **(12M)**

(OR)

4. a) Explain in brief "Stone Masonry". **(6M)**
- b) Explain in brief "Brick Masonry". **(6M)**

UNIT-III

5. Explain in brief various types of flooring? **(12M)**
6. a) What are the various types of roofs? **(6M)**
- b) What are the basic roofing elements? **(6M)**

UNIT-IV

7. Explain in brief various types of doors and windows. **(12M)**

(OR)

8. a) Write a short note on "location of doors and windows". **(6M)**
- b) Write a short note on "Ventilators". **(6M)**

UNIT-V

9. Explain the causes and effects of dampness on buildings. **(12M)**

(OR)

10. a) What are the various methods used for water proofing? **(6M)**

b) What should be the fire resisting properties for a common building material? **(6M)**

Note: As the subject is an Open elective taken by non-civil engineering students, the student is expected to gain only elementary knowledge of the subject.

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

COMPUTER AIDED DESIGN**(Open Elective)****Time: 3 Hours****Max Marks: 60****Answer ONE Question from each Unit****All Questions Carry Equal Marks****All parts of the question must be answered in one place only**

1. Explain with the help of a neat sketch how an image is generated on a computer terminal (12M)

(OR)

2. a. What are the requirements of a CAD database? (4M)
b. Explain with the help of a block diagram the hardware structure of a CAD workstation. (8M)

3. a. What are the functions of an interactive graphic design workstation? (4M)
b. Describe various commonly used primitives for solid modeling. (8M)

(OR)

4. a. What is geometric modeling? (2M)
b. Briefly explain about 2D and 3D wire-frame modeling (10M)

5. What are the basic steps involved in a finite element analysis and explain them briefly. (12M)

(OR)

6. a. What are the input methods for macro blocks? (4M)
b. Explain the terms, 3-dimensional shape description and automatic mesh generation? (8M)

7. How do you analyze cross sectional area, Centroid and moment of inertia of a mechanical element using CAD? Explain through an example. (12M)

(OR)

8. a. Explain about ANSYS software package in detail. (8M)
b. What are its drawbacks in modeling? (4M)

9. a. What is artificial intelligence? (4M)
b. Explain the various elements of artificial intelligence (8M)

(OR)

10. a. What are the applications of artificial intelligence in computer aided design? (6M)
b. Briefly discuss the use of sensors and AI in computer aided design. (6M)

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

**Computer operating system
(Open Elective)**

Time: 3 hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT-1

1. Discuss about
- a) Evolution of an operating system. (4M)
 - b) Operating System Structure (2M)
 - c) Services of the operating system (4M)
 - d) Time-shared operating system. (2M)

(OR)

2. a) Compare and contrast thread and process. (2M)
- b) Explain various steps involved in change of a process state with process state neat transition diagram. (3M)
- c) Discuss Multithreading Models with neat diagrams. (4M)
- d) what are the five major activities of an operating system in regard to process management? (3M)

UNIT-2

- 3.a) Distinguish Explain briefly How communication takes place in a shared- memory environment (4M)
- b) Distinguish between counting and binary semaphores. Show when does the semaphore definition requires busy waiting. Suggest a solution to overcome this problem (4M)
- c) State and explain Dining philosopher problem . (4M)

(OR)

4. a). What is a Critical Section? Discuss the solution of the Critical Section problem (3M)
- b). Draw the flowchart and explain the banker's algorithm in detail. (5M)
- c). Explain in detail about deadlock detection techniques. (4M)

UNIT-3

5. a) Consider the reference string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 for a memory with three frames. Trace FIFO, optimal, and LRU page replacement algorithms. (6M)
- b) What is a Virtual Memory? Discuss the benefits of virtual memory technique. (6M)

(OR)

- 6.a) Explain about the memory allocation model for a process? (6M)
- b) What is Thrashing? What is the cause of Thrashing? How does the system detect Thrashing? What can the system do to eliminate this problem? (6M)

UNIT-4

- 7.a) Write short notes on: i) FCFS and ii) SSTF Disk Scheduling schemes. (6M)
- b) How to provide protection to a file system? Explain. (3M)
- c) Briefly explain about single-level, two-level and Tree-Structured directories. (3M)

(OR)

8. a) Explain and compare the SCAN and C-SCAN disk scheduling algorithms. (6M)
- b) Write a short notes on the following: (6M)
- (i) access methods (ii) file system organization (iii) files types

UNIT-5

- 9.a) explain why interrupt and dispatch latency times must be bounded in a hard real-time system (6M)
- b) discuss ways in which the priority inversion problem could be addressed in a real-time system. also discuss whether the solutions could be implemented with the context of a proportional share scheduler (6M)

(OR)

- 10.a) describe the three main architectural layers of windows xp (4M)
- b) how would you classify linux threads as user-level threads or kernel-level threads? support your answer (4M)
- c) Explain about process management in MS-DOS (4M)

Hall Ticket No :

Question Paper Code :

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

ENVIRONMENTAL SCIENCES

(Open Elective)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

Unit - I

1. a) What are renewable and non-renewable resources? Give examples? 4M
b) How would environmental awareness help to protect our environment? 8M

Or

2. a) What are the major causes of deforestation? 4M
b) Mention the environmental impacts of modern agriculture? 8M

Unit - II

3. a) Discuss the models of energy flow in an ecosystem? 4M
b) What is Homeostasis? What are the feedback mechanisms? 8M

. Or

4. a) Comment upon Indian Biodiversity with special reference as a mega diversity nation? 4M
b) What is meant by in situ and ex situ conservation of Biodiversity? Give Examples? 8M

Unit - III

5. a) Mention some major implications of enhanced global warming? 4M
b) Enumerate the various methods for control of air pollution? 8M

Or

6. a) What are the major impacts of acid rains and how can we control it? 4M
b) Classify solid waste? What are the sources of urban and industrial solid wastes? 8M

Unit – IV

7. a) Define EIA? Mention some advantages? 4M
b) What do you mean by sustainable development? What are the major measures to attain sustainability? 8M

Or

8. a) What is meant by Population explosion? Discuss the Indian scenario? 4M
b) What is Rainwater harvesting? Mention the purposes served by it? 8M

Unit - V

- 9 a) Describe briefly about Silent valley project? 4M
b) Discuss the salient features of Wildlife(Protection) Act, 1972? 8M

Or

- 10 a) Write a short note on Stockholm Conference? 4M
b) How do you define pollution as per Water (Prevention and Control of Pollution) Act, 1974? Mention some salient features of the Act? 8M

Hall Ticket No :

Question Paper Code :

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

FILE SYSTEMS & DATABASES

(Open Elective)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. a) Explain about magnetic disc structure (6M)
b) What is redundancy.Explain about RAIDS (6M)

(OR)

2. a) Explain memory hierarchy (6M)
b) Explain file Access methods (6M)

UNIT - II

3. a) What is data model ?Describe various data models. (6M)
b) Mention various groups of database users. Explain about their roles in detail. (6M)

(OR)

4. a) Explain the architecture of DBMS? (6M)
b) Explain the concept of Data independence and data Independence? (6M)

UNIT-III

5. a) Explain in detail about inheritance, specialization and generalization using ER diagrams. (12M)

(OR)

6. a) What is a view? How to specify a view? Write about view implementation techniques. (6M)
b) What is a relation? Describe the characteristics of a relation. (6M)

UNIT-IV

7. a) Distinguish between independent and correlated nested queries. Provide appropriate examples to support your explanation. (6M)

b) List and explain aggregate functions used in SQL with examples. (6M)

(OR)

8.a) With the aid of relevant examples illustrate different DDL statements supported by SQL (8M)

b) What is a database trigger? Give an example of trigger definition. (4M)

UNIT-V

9 .a) Why normalization is needed? Explain the process of normalization. (8M)

b) Explain the role of functional dependencies in normalization with suitable examples (4M)

(OR)

10.a) What is 2-phase locking protocol? How does it guarantee serializability? (8M)

b) What is transaction? Mention the desirable properties of a transaction. (4M)

Hall Ticket No :

Question Paper Code :

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017
FUNDAMENTALS OF COMPUTER NETWORKS
(Open Elective)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT-I

1. a) Write a short note on guided transmission media (4M)
b) Explain in detail about OSI layer (8M)

(OR)

2. a) What are the responsibilities of physical layer (4M)
b) List functions of data link layer and write about different categories of flow control methods (8M)

UNIT-II

3. a) Write a short note on ALOHA (4M)
b) Discuss in detail about hubs, switches, routers and gateways (8M)

(OR)

4. a) Write about CSMA /CD (4M)
b) Discuss in about switching in data link layer (8M)

UNIT-III

5. a) what is store and forward packet switching (4M)

b) Discuss about Distance vector routing (8M)

(OR)

6. a) Discuss about routing and flooding (4M)

b) Write about any one congestion control algorithm in detail(8M)

UNIT-IV

7.a) Differentiate between TCP and UDP 4M

b) Write about IPv4 header format (8M)

(OR)

8.a) Discuss about Tunneling (4M)

b) Write about Packet Fragmentation (8M)

UNIT-V

9.a) Write a short note on DNS (4M)

b) Explain in detail about HTTP request response messages (8M)

(OR)

10.a) Discuss Role of FTP (4M)

b) Describe in detail about functions of application layer (8M)

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

Industrial Safety and Hazard Management

(Open Elective)

Time: 3 hours

Max Marks: 60

Answer ONE Question from each Unit**All Questions Carry Equal Marks****All parts of the question must be answered in one place only**

UNIT - I

- 1) a) Discuss different types of accident and loss statistics. (6M)
b) Explain in detail how the toxicants are eliminated from biological organisms. (6M)
(OR)
- 2) a) Discuss any three major chemical industry accidents and also discuss safety lapses in them (12M)

UNIT - II

- 3) Explain briefly about the industrial hygiene identification, evaluation and control. (12M)
(OR)
- 4) Discuss on OSHA process safety management and risk management plan. (12M)

UNIT - III

- 5) a) Explain in detail fires and explosions. (8M)
b) What is auto ignition, auto oxidation? Explain in brief. (4M)
(OR)
- 6) a) Explain minimum oxygen concentration. (6M)
b) Explain in brief about sprinkler system. (6M)

UNIT - IV

- 7) Explain the importance of relief device installation in the process vessel or process pipeline and explain in detail the relief types and characteristics. (12M)
(OR)
- 8) Discuss any two different types of relief sizing methods. (12M)

UNIT - V

- 9) Explain the procedure for using hazards identification and risk assessment. (12M)
(OR)
- 10) a) What are hazard check lists? Explain with example. (6M)
b) Write a brief note on hazard surveys. (6M)

Hall Ticket No:

Question Paper Code:

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov– 2017

INTRODUCTION TO EMBEDDED SYSTEMS

(Open Elective)

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered at one place only

UNIT-I

1. a) Differentiate RISC and CISC Processor Architectures (6M)
b) Illustrate conversion between various number systems with examples (6M)

(OR)

2. a) Illustrate various buses and their purpose in a Computer System (6M)
b) Discuss the mechanism of Instruction execution with necessary diagrams (6M)

UNIT-II

3. a) Define Embedded Systems and illustrate their characteristics (6M)
b) Write a note on Application domains of an Embedded Systems (6M)

(OR)

4. a) Differentiate Microprocessor and Micro-controller (6M)
b) Discuss current trends and models for an Embedded System (6M)

UNIT-III

5. a) Illustrate the architectural features of an Embedded Processor. (6M)
b) Illustrate the significance of pull-up and pull-down transistors. (6M)

(OR)

6. a) Illustrate various features of 8051 micro-controller. (6M)
b) Explain the necessity and techniques for Low-Power design. (6M)

UNIT-IV

7. a) Discuss the process of ADC with necessary diagrams. (6M)
b) Illustrate any FOUR sensors that can be a part of an Embedded System. (6M)

(OR)

8. a) Illustrate various features of 8051 micro-controller (6M)
b) Illustrate any FOUR Actuators that can be a part of an Embedded System. (6M)

UNIT-V

9. With diagrams explain how embedded systems are related to an aerospace vehicle. (6M)

(OR)

10. With block diagrams explain how embedded systems can be used in production environment. (6M)

Hall Ticket No :

Question Paper Code :

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

NANOTECHNOLOGY AND ENGINEERING APPLICATIONS

(Open Elective)

Time: 3 hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT I

1. a) Write briefly about the microstructural features of nanomaterials. (4M)
b) Discuss about the defects in nanocrystalline materials. (5M)
c) Write a short note on Vander Waals interactions. (3M)
(OR)
2. a) Describe any one physical vapour deposition technique with a suitable diagram. (7M)
b) Write briefly about the synthesis of nanomaterials by mechanical alloying process. (5M)

UNIT – II

3. a) Explain the synthesis of carbon nanotubes by electric arc discharge method. (8M)
b) What is the basis of quantum confinement in quantum dots. (4M)
(OR)
4. a) Describe the structural and optical properties of nanowires. (8M)
b) Mention the applications of polymeric nanocomposites. (4M)

UNIT – III

5. a) Describe in detail, the role of nanoscale dimension on the electronic properties of materials. (6M)
b) What are the mechanical properties of nanomaterials. (6M)
(OR)
6. a) Describe the tunneling conduction mechanism in nanoparticles. (4M)
b) Explain optical properties of nanomaterials. (5M)
c) Find the refractive index of a material if transmission is 90%. (3M)

UNIT – IV

7. a) Explain the working and principle of scanning tunneling microscope. (6M)
b) Describe the different operating modes in an atomic force microscopy. (6M)
(OR)
8. a) Describe the principle and working of scanning electron microscope. (8M)
b) Distinguish between SEM and TEM. (4M)

UNIT – V

9. a) Discuss the role of NEMS technology in advanced engineering applications. (4M)
b) Explain the mechanisms and fabrication of nanosensors. (8M)
(OR)
10. a) Write a note on the application of nanotechnology for energy production, storage and enhancing energy efficiency. (8M)
b) Discuss the role of nanotechnology in information technology. (4M)

Hall Ticket No :

Question Paper Code :

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

**RENEWABLE ENERGY TECHNOLOGIES
(Open Elective)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT - I

1. a) What are the prospects of non- conventional energy sources in India? (6 M)
b) What are the main components of a flat plate solar collectors, explain the function of each? (6 M)

(OR)

2. a) Explain the applications of solar Energy. (6 M)
b) What is Photovoltaic (solar electricity) cell? What are the components of a Photovoltaic (PV) system? (6 M)

UNIT – II

3. a) Derive the expression for Power developed due to wind. (6 M)
b) How are Wind Energy Conversion Systems (WECS) are classified? Discuss in brief. (6 M)

(OR)

4. a) Describe with a neat sketch the working of a wind energy system with main components (6 M)
b) Prove that in case of horizontal axis wind turbine maximum power can be obtained when $P_{\max} = \frac{8}{27} \rho A V^3$ (6 M)

UNIT – III

5. a) What are the main types of Ocean Thermal Energy Conversion (OTEC) power plants? Describe their working in brief. (6 M)
b) Describe the closed cycle Ocean Thermal Energy Conversion (OTEC), with it's advantages over open cycle Ocean Thermal Energy Conversion (OTEC) (6 M)

(OR)

6. a) Classify the Geothermal sources. Explain (6 M)
b) What are the main application of Geothermal sources. (6 M)

UNIT – IV

7. a) How are biogas plants classified. Explain them briefly. **(6 M)**
b) How biomass conversion takes place? What is the difference between biomass and biogas. **(6 M)**

(OR)

8. a) What is meant by wet fermentation and dry fermentation? **(6 M)**
b) Write the main application of biogas. **(6 M)**

UNIT – V

9. a) Derive the equations for the voltage and power output of an MHD generator. **(6 M)**
b) How MHD systems are classified? Describe them in brief. **(6 M)**

(OR)

10. a) What is fuel cell? Derive an expression for emf of a fuel cell. **(6 M)**
b) Explain Wind- Diesel Hybrid system. **(6 M)**

Hall Ticket No :

Question Paper Code :

**ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)**

III/IV B. Tech I- Semester Regular Examinations Nov - 2017

**ROBOTICS
(Open Elective)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

Unit-1

1. a) What is Industrial Robot. Explain in brief about motion defining categories with neat sketches. (5M)
- b) Explain about Robot Sensing Mechanism. (4M)
- c) What are the three major approaches to communicate with a robot. (3M)

(OR)

2. a) Discuss about background and historical development of robotics. (9M)
- b) What is Degree of Freedom. Define Pitch, Yaw, and Roll. (3M)

Unit-2

3. a) Explain homogeneous transformations and their applications in robot kinematics. (8M)
- b) Write short notes on spherical coordinates for positioning subassembly. (4M)

(OR)

4. Explain the joint velocities of a robot manipulator. (12M)

Unit-3

5. a) Discuss briefly about Quaternion Representation. (7M)
- b) Write Algorithm on Bounded Deviation Joint Path. (5M)

(OR)

6. What is Cartesian Path Control Scheme and Explain (12M)

Unit-4

7. Discuss Resolved Motion Force Control with a neat diagram. (12M)

(OR)

8. Explain Resolved Motion Acceleration Control. (12M)

Unit-5

9. a) Write short notes on Optical Proximity Sensors. (6M)

b) Explain Concatenation and Inverse Transformations (6M)

(OR)

10. a) Discuss about Thresholding. (4M)

b) Explain Sensing in Robot Programming. (4M)

c) Write short notes on Task Specification. (4M)
