

**GEOTECHNICAL ENGINEERING-I  
(Civil Engineering)****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

**UNIT-I**

1. a) Discuss about major soil deposits in India. 6M  
b) The Atterberg limits of clay are: Liquid Limit=60%, Plastic Limit=45% and SL=25%. The specific gravity of soil solids is 2.70 and the natural moisture content is 50%.  
i) What is its state of consistency in nature?  
ii) Calculate the volume to be expected in the sample when moisture content is reduced by evaporation to 20%. Its volume at liquid limit is  $10\text{cm}^3$ .

**(OR)**

2. a) Explain about different soil structures. 6M  
b) A compacted sample of soil with a bulk unit weight of  $19.62\text{kN/m}^3$  has a water content of 15%. Calculate its dry density, degree of saturation and air content? Assume  $G = 2.65$ . 6M

**UNIT-II**

3. a) Derive an equation for average permeability for flow perpendicular to the bedding planes. 6M  
b) For a homogenous earth dam of 52 m height and 2 m free board, the flow net has 22 potential drops and 5 flow channels. Calculate the discharge per metre length of the dam, given  $k = 22 \times 10^{-6} \text{ m/sec}$ , and exit hydraulic gradient. 6M

**(OR)**

4. a) Calculate the ratio of average permeability in horizontal direction to that in the vertical direction for a soil deposit consisting of three Horizontal layers, if the thickness and permeability of second layer are twice of those of the first and those of the third layer twice those of second? 6M  
b) Explain the methods of obtaining flow nets. 6M

**UNIT-III**

5. a) Describe the Newmark's chart and its application. 6M  
b) A water tank has supported by a circular foundation of diameter 10.5 m is resting on a soil stratum. The total weight of the tank including the foundation is 17,700 kN. Estimate the stress due to the above load at 0.5 m and 2.5 m depth at the center of the water tank. 6M

**(OR)**

6. a) Discuss in detail about the Boussinesq's analysis to find vertical stress and horizontal shear stress for point load. 6M
- b) A concentrated load 10kN acts on the surface of a soil mass. Using Boussinesq analysis find the vertical stress at points (a) 3m below the surface on the axis of loading and (b) at radial distance of 2m from axis of loading but at same depth of 3m. 6M

#### **UNIT-IV**

7. a) Discuss the effect of compaction on various engineering properties of soils. 6M
- b) A partially saturated sample from a borrow pit has a natural moisture content of 15% and bulk unit weight of 1.9 g/cc.  $G = 2.7$ . Determine the degree of saturation and void ratio. What will be the unit weight of the soil if it gets saturated? 6M

**(OR)**

8. a) A laboratory compaction test on soil having  $G = 2.67$  gave a maximum dry unit weight of  $17.8 \text{ kN/m}^3$  and a water content of 15%. Determine the degree of saturation, air content and percentage air voids at the maximum dry unit weight. What would be theoretical maximum dry unit weight corresponding to zero air voids at the optimum water content? 6M
- b) Describe the proctor compaction test in detail. 6M

#### **UNIT-V**

9. Explain the step by step procedure for determination of cohesion of a given clayey soil by conducting unconfined compression test. 12M

**(OR)**

10. a) An unconfined compression test was conducted on an undisturbed clay sample. The sample had a diameter of 37.5mm and length 80mm. Load at failure measured by proving ring was 28 N and the axial deformation at failure point was 13mm. Determine the unconfined compressive strength and the undrained shear strength of the clay. Plot all the results on a Mohr's circle. 6M
- b) Derive a relationship between the principal stresses at failure using Mohr-Coulomb failure criterion. 6M

# AR18

**CODE: 18EET311**

**SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**III B.Tech I Semester Supplementary Examinations, November-2021**

**MICROPROCESSORS AND MICROCONTROLLERS**

**(Electrical and Electronics Engineering)**

**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

## **UNIT-I**

1. a) Explain Physical Address formation in 8086 with examples. 6 M
- b) Explain the register organization of 8086. 6M

**(OR)**

2. a) Explain the architecture of 8086 with a neat diagram. 6M
- b) Explain the interrupt structure of 8086 in detail. 6M

## **UNIT-II**

3. a) Develop an Assembly language program to add two multibyte numbers 6M
- b) Explain the classification of 8086 instruction set with examples 6M

**(OR)**

4. a) Explain with examples any two string instructions. 6M
- b) Explain the differences between a macro and a procedure. 6M

## **UNIT-III**

5. a) Explain the modes of operation of 8255 6M
- b) Draw and discuss Architecture of 8259A Interrupt Controller. 6M

**(OR)**

6. a) Explain the architecture of 8255 with a neat block diagram. 6M
- b) Draw and discuss Architecture of 8257 DMA Controller 6M

## **UNIT-IV**

7. a) Describe the register organisation of 80386 processor 6M
- b) What are the differences between 80486 and Pentium processors 6M

**(OR)**

8. a) Explain with a neat diagram the architecture of ARM processor 12 M
- b)

## **UNIT-V**

9. a) Explain pin diagram of 8051 microcontroller 6M
- b) Explain register organisation of 8051 microcontroller 6M

**(OR)**

10. a) Explain immediate, direct and indirect addressing modes of 8051 with examples 6M
- b) Write an ALP to find square of a given 8-bit number using 8051 6M

# AR18

**CODE: 18MET309**

**SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**III B.Tech I Semester Supplementary Examinations, November-2021**

**DESIGN OF MACHINE MEMBERS – I**

**(Mechanical Engineering)**

**Time: 3 Hours**

**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

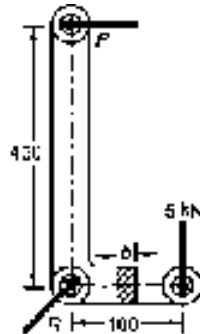
All parts of the Question must be answered at one place

## UNIT-I

1. a) Explain maximum shear stress theory, maximum principle strain theory and maximum distortion energy theory of failure. 12M

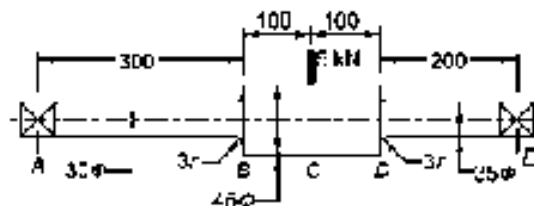
**(OR)**

- 2 A right angled bell crank lever is to be designed to raise a load of 5 kN at the short arm end. The lengths of short and long arms are 100 and 450mm respectively. The lever and the pins are made of steel 30C8 ( $S_{yt} = 400 \text{ N/mm}^2$ ) and the factor of safety is 5. The permissible bearing pressure on the pin is  $10 \text{ N/mm}^2$ . The lever has a rectangular cross section and ratio of width to thickness is 3:1. The length to diameter ratio of fulcrum pin is 1:25:1. Calculate i) The diameter and the length of fulcrum pin ii) The shear stress in the pin iii) The dimensions of the boss of the lever at the fulcrum. Assume that the arm of bending moment on the lever extends up to the axis of the fulcrum. 12M



## UNIT-II

3. A rotating shaft subjected to a non rotating force of 5 kN and simply supported between two bearings A and E as shown in figure. The shaft is machined from plain carbon steel 30C8 ( $S_{ut} = 500 \text{ N/mm}^2$ ) and the expected reliability is 90%. The equivalent notch radius at the fillet section can be taken as 3 mm. Determine life of shaft. 12M

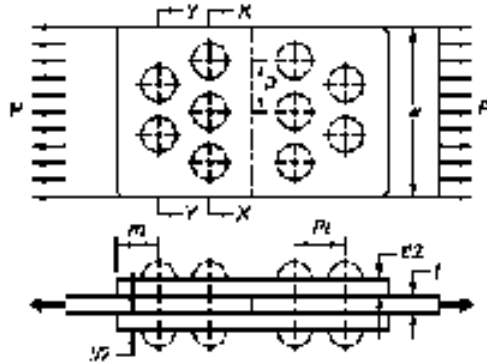


**(OR)**

4. a) Discuss methods of reducing stress concentration. 6M  
 b) A Machine component is subjected to two dimensional stresses. The tensile stress in the X direction varies from 10 to 80  $\text{N/mm}^2$ . The frequency of variation of these stresses are equal. The corrected endurance limit of the component is 270  $\text{N/mm}^2$ . The ultimate tensile strength of the material of the component is 660  $\text{N/mm}^2$ . Determine the factor of safety. 6M

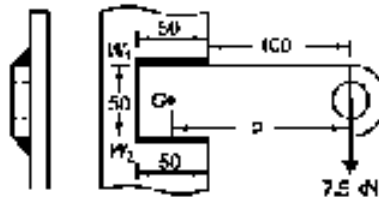
### UNIT-III

5. Two flat plates subjected to a tensile force P are connected together by means of double strap butt joint as shown in figure. The force P is 250kN and the width of the plate w is 200mm. The rivets and plates are made of the same steel and the permissible stresses in tension and compression and shear are 70, 100 and 60  $\text{N/mm}^2$  respectively. Calculate i) the diameter of the rivets ii) the thickness of the plates iii) the dimensions of the seam and efficiency of joint. 12M



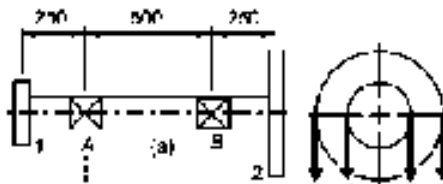
(OR)

6. A Welded connection as shown in figure is subjected to an eccentric force of 7.5 kN. Determine the size of welds if the permissible shear stress for the weld is 100  $\text{N/mm}^2$ . Assume static conditions. 12M



### UNIT-IV

7. The lay out of a shaft carrying two pulleys 1 and 2 and supported on two bearings A and B is shown in figure. The shaft transmits 7.5 kW power at 360 rpm from pulley 1 to the pulley 2 are 250 mm and 500 mm respectively. The masses of pulleys 1 and 2 are 10 kg and 30 kg respectively. The belt tensions are vertically downwards and the ratio of belt tensions on the tight side to slack side for each pulley is 2.5:1. The shaft is made of plain carbon steel ( $S_{yt}=380\text{N/mm}^2$ ) and the factor of safety is 3. Determine diameter of shaft. 12M



(OR)

8. a) What are advantages and disadvantages of muff coupling 4M  
b) Design a Muff coupling which is used to connect two steel shafts transmitting 40 KW at 350 rpm. The material for the shaft and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40MPa and 80MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15MPa 8M

### **UNIT-V**

9. Design a knuckle joint to connect two circular rods subjected to an axial tensile force of 50kN. The rods are co axial and a small amount of angular movement between their axes is permissible. Design the joint and specify the dimensions of components. Select suitable material for the parts. 12M

**(OR)**

10. A helical compression spring made of circular wire is subjected to an axial force which varies from 2.5kN to 3.5 kN . Over this range of force the deflection of the spring should be approximately 5 mm. The spring index can be taken as 5. The spring has square and grounded ends. The spring is made of patented and cold drawn steel wire with ultimate tensile strength of 1050 N/mm<sup>2</sup> The permissible shear stress for the spring wire should be taken as 50% of the ultimate tensile strength. Design the spring. 12M

# AR18

**CODE: 18ECT312**

**SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**III B.Tech I Semester Supplementary Examinations, November-2021**

## **CONTROL SYSTEMS**

**(Electronics and Communication Engineering)**

**Time: 3 Hours**

**Max Marks: 60**

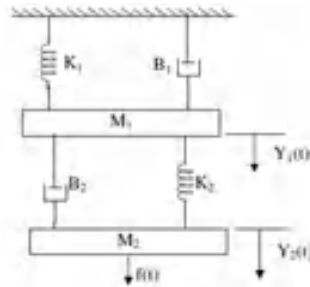
Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

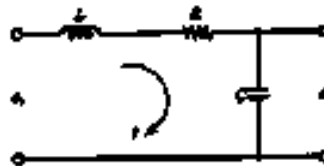
### **UNIT-I**

1. a) Compare open loop and closed loop control systems 4M
- b) Find  $Y_2(s)/F(s)$  of system shown below 8M

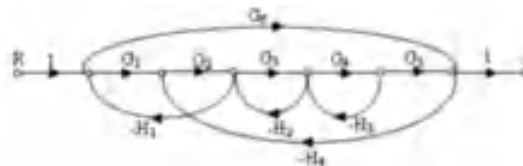


**(OR)**

2. a) Find the Transfer Function of the system shown below 4M



- b) Obtain overall transfer function of given SFG by using Mason's gain formula. 8M



### **UNIT-II**

3. Obtain the transfer function of the armature controlled DC servo motor? 12M

**(OR)**

4. a) Define maximum peak overshoot and derive expression for maximum peak overshoot of second order system. 8M
- b) Determine the position, velocity & acceleration error constants for a unity feedback system having transfer function  $G(s) = \frac{10}{S(S+2)(S+5)}$  4M

### UNIT-III

5. a) Explain the Routh's criterion to determine the stability of a dynamical system and give its limitations. 8M  
b) Construct Routh array and determine the stability of the system represented by the characteristics equation  $S^4+8S^3+18S^2+16S+5=0$ . 4M

(OR)

6. Draw root locus for unity feedback system with open loop TF 12M

$$G(S)=\frac{k}{S(S+2)(S+4)}$$

### UNIT-IV

7. Draw the bode plot for the open loop transfer function 12M  
 $G(S) = 1000 / \{S(1+0.5S) (1+0.1S)\}$  Determine the Phase Margin & Gain Margin.

(OR)

8. Draw the Nyquist plot for the transfer function  $G(S) = \frac{K(S+4)}{(S+100)(S+1)}$  and 12M  
determine the value of k for the system to be stable.

### UNIT-V

9. Find state transition matrix, transfer function of the system having the state 12M  
equation  $\dot{X} = AX + BU$  &  $Y=CX+DU$  where,

$$A = \begin{bmatrix} 1 & 0 \\ -2 & -3 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, C = [1 \quad 1], D = 0$$

(OR)

10. a) Explain the concepts of Controllability and Observability. 8M  
b) Give the applications of linear control system. 4M



**Time: 3 Hours****Max Marks: 60**

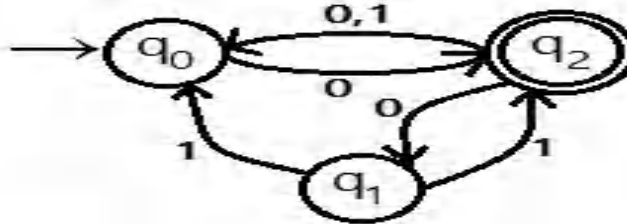
Answer ONE Question from each Unit

All Questions Carry Equal Marks

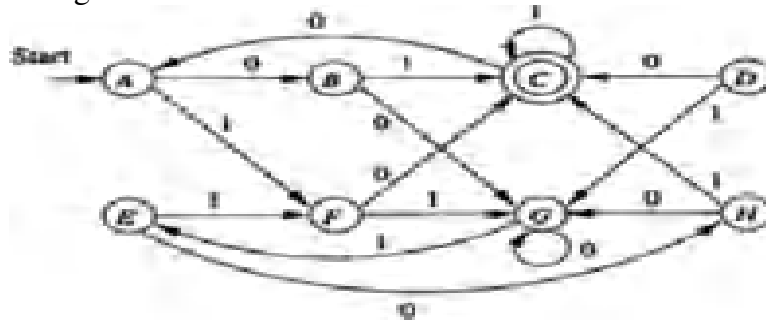
All parts of the Question must be answered at one place

**UNIT-I**

1. a) State and prove equivalence of NFA and DFA. 6 M  
 b) Convert the following NFA into its equivalent DFA. 6 M

**(OR)**

2. a) Minimize the given finite automata 6 M



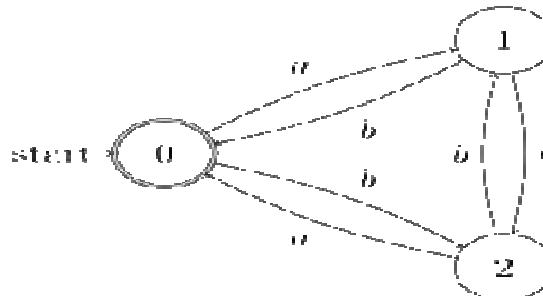
- b) Construct DFA for the language  $L = \{w / w \text{ ends with '110'}\}$ . 6 M

**UNIT-II**

3. a) State and prove pumping lemma for regular languages. 6 M  
 b) Show that the language  $L = \{a^p / p \text{ is a prime}\}$  is not regular. 6 M

**(OR)**

4. a) Find the regular expression generated by the given finite automata 6 M



- b) Construct a finite automata for the given regular expression  $(ab+ba)(a+b)^*$  6 M

### UNIT-III

5. a) Given a Grammar  $G = (\{S, A, B\}, \{a, b\}, P, E)$  6 M  
where  $P = S \rightarrow aB / bA, A \rightarrow a / aS / bAA, B \rightarrow b / bS / aBB$ .  
Find the language generated by the grammar.
- b) Define CNF grammar and convert the following CFG into its equivalent CNF 6 M  
 $S \rightarrow ABC \quad A \rightarrow BC/a \quad B \rightarrow bAC/\epsilon \quad C \rightarrow cAB/\epsilon$
- (OR)**
6. a) Convert the following context free grammar G having productions 6 M  
 $S \rightarrow AA / 0, A \rightarrow SS / 1$  into its equivalent GNF grammar
- b) Explain about Enumeration properties of CFL 6 M

### UNIT-IV

7. a) Construct PDA for the language  $L = \{wcw^r / w \in (0,1)^*\}$ . 6 M
- b) Define PDA. Differentiate DPDA and NPDA. 6 M
- (OR)**
8. a) Design a PDA for the grammar having productions 6 M  
 $S \rightarrow aB / bA, A \rightarrow a / aS / bAA, B \rightarrow b / bS / aBB$
- b) Find a grammar generating  $L(M)$ ,  $M =$  6 M  
 $(\{q_0, q_1, q_2\}, \{0, 1\}, \{Z_0, A\}, \delta, q_0, Z_0, \{q_2\})$  where  $\delta$  is given by  
 $\delta(q_0, a, Z_0) = \{(q_1, AZ_0)\}$   
 $\delta(q_0, a, A) = \{(q_1, AA)\}$   
 $\delta(q_1, a, A) = \{(q_0, AA)\}$   
 $\delta(q_1, \epsilon, A) = \{(q_1, AA)\}$   
 $\delta(q_2, b, A) = \{(q_2, \epsilon)\}$

### UNIT-V

9. a) Design Turing Machine for  $L = \{a^n b^n / n \geq 1\}$ . 6 M
- b) What is counter machine? Explain with an example. 6 M
- (OR)**
10. a) Discuss in detail Universal Turing Machine 6 M
- b) Write short note on post correspondence problem. 6 M

# AR16

**CODE: 16CE3011**

**SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**III B.Tech I Semester Supplementary Examinations, November-2021**

**GEOTECHNICAL ENGINEERING-I**

**(Civil Engineering)**

**Time: 3 Hours**

**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

## UNIT-I

1. a) Define and explain water content, wide ration, porosity and degree of saturation. 8M  
b) The sieve analysis of soil gave the following results % passing 75 $\mu$ =10%, 6M  
% retained on 4.75mm sieve=30%, Coefficient of curvature=2 and Uniformity coefficient=7.  
The fine fraction gave the following results  
Plastic limit = 4%, Liquid limit = 18%  
Classify according to ISC system.  
(OR)
2. a) There are two borrow areas A and B which have soils with void ratios of 0.80 and 10M  
0.70, respectively. The in place water content is 20%, and 15%, respectively. The  
fill at the end of construction will have a total volume of 10,000 m<sup>3</sup>, bulk density of  
2Mg/m<sup>3</sup> and a placement water content of 22%. Determine the volume of the soil  
required to be excavated for both areas. G = 2.65.  
If the cost of excavation of soil and transportation is Rs. 200/- per 100 m<sup>3</sup> for area  
A and Rs. 220/- per 100m<sup>3</sup> for area B, which of the borrow area is more  
economical?  
b) What do you understand by consistency of soil? 4M

## UNIT-II

3. a) In a constant head permeameter test, the following observations were taken. 8M  
Distance between piezometer tappings 100mm, difference of water levels in  
piezometers 60mm, diameter of the sample 100mm, quantity of water collected  
350ml, duration of the test 270 seconds. Determine the coefficient of permeability  
of the soil.  
b) Explain the uses of flow net 6M  
(OR)
4. a) Derive the expression for critical hydraulic gradient. 7M  
b) Explain the procedure involved in determining the coefficient of permeability in 7M  
variable head method

## UNIT-III

5. a) Derive the principle of construction of Newmark's chart and its uses. 10M  
b) Define total stress, neutral stress and effective stress. 4M  
(OR)
6. a) A soil profile consists of a surface layer of clay 4m thick ( $\gamma = 19.5 \text{ kN/m}^3$ ) and a sand layer 10M  
2m thick ( $\gamma = 18.5 \text{ kN/m}^3$ ) over lying an impermeable rock. The water table is at the ground  
surface. If the water level in a standpipe driven into the sand layer rises 2m above the  
ground surface. Draw the plot showing the variation of total stress, pore Water pressure  
and the effective stress and determine the increase in effective stress at the top of rock  
when the artesian head in the sand is reduced by 1m.  
b) There is a line load of 120kN/m acting on the ground surface along y-axis. Determine the 4M  
vertical stress at a point P which has x and z coordinates as 2m and 3.5m respectively.

#### **UNIT-IV**

7. a) What is the effect of compaction on engineering properties of soil? 7M  
b) Describe briefly the procedure to compute the pre-consolidation pressure. 7M

**(OR)**

8. a) The volume of mould used was 950ml. Make necessary calculations and plot the compaction curve and obtain the MDD and OMC. Also calculate the void ratio, the degree of saturation and the theoretical MDD ( $G=2.70$ ) 7M

The maximum dry density of a sample by the light compaction test is 1.78g/ml at an optimum water content of 15%. Find the air voids and the degree of saturation.  $G=2.67$

- b) Explain the consolidation process with spring analogy mechanism. 7M

#### **UNIT-V**

9. a) Write revised Mohr-coulomb equation. How does it differ from the original equation 8M  
b) Describe the Direct shear test. What are the advantages of direct shear test 6M

**(OR)**

10. a) The following results were obtained from a consolidation-undrained test on normally consolidated clay. Plot the strength envelop in terms of total stress and effective stress and determine the strength parameters. 7M

Sample No.	Cell pressure ( $\text{kN/m}^2$ )	Deviator stress ( $\text{kN/m}^2$ )	Pore-water pressure ( $\text{kN/m}^2$ )
1	250	152	120
2	500	300	250
3	750	455	350

- b) What is unconfined compression test? Sketch the apparatus used. What is its advantage over a Tri-axial test? 7M

# AR16

**CODE: 16EC3015**

**SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**III B.Tech I Semester Supplementary Examinations, November-2021**

**FUNDAMENTALS OF SIGNALS AND SYSTEMS  
(Electrical and Electronics Engineering)**

**Time: 3 Hours**

**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

## UNIT-I

1. a) Find the following signals are periodic or not 7M  
(i)  $\sin(2\pi n/3) + \cos(2\pi n/5)$  (ii)  $3\sin 200\pi t + 4\cos 100\pi t$   
b) Check the given signal is energy or power signal  $x(t) = e^{-at}u(t)$  7M  
(OR)
2. a) Draw the wave forms of the following signals 7M  
(i)  $x(t) = u(t) - 2u(t-1) + u(t-2)$  (ii)  $y(t) = r(t) - r(t-1) - u(t-1)$   
b) Find the classifications the system defined as  $y(n) = x(n)x(n-2)$  7M

## UNIT-II

3. a) Write the properties of convolution sum? 7M  
b) Find the convolution of the signals  $x(t) = e^{-at}u(t)$  and  $y(t) = e^{-bt}u(t)$  using Fourier transform? 7M  
(OR)
4. a) A signal  $x(t) = \cos(200\pi t)$  is sampled at a rate of (i) 150hz 7M  
(ii) 225hz (iii) 300hz for each of these three cases, can you recover the signal  $x(t)$  from the sampled signal? explain with neat figures?  
b) Calculate the convolution of the following sequences 7M  
 $X[n] = \{1, 2, 3, 2\}$  and  $h[n] = \{1, 2, 2\}$  and draw their plots?

### **UNIT-III**

5. a) Find the Fourier transform of a periodic signal? 7M  
b) Draw the frequency spectrum of the following signal 7M  
 $X(t)=\{A : 0 \leq t < \pi \text{ and } -A : \pi \leq t < 2\pi\}$   
(OR)  
6. State and prove any four properties of Fourier transform 14M

### **UNIT-IV**

7. a) What is ROC ? Write its significance for a system? 7M  
b) Find the Laplace transform of the signals  $x(t) = u(-t)$  and  $x(t) = e^{-t}u(t) + e^{-4t}u(t)$  find its ROC 7M  
(OR)  
8. a) Find the Laplace transform for ramp function and parabolic function? 7M  
b) State and prove the time scaling and time shifting properties of Laplace transform 7M

### **UNIT-V**

9. a) Find the Z transform and ROC of  $x(n)=(1/2)^n u(n-2)$  sketch the pole-zero location of ROC 7M  
b) State and prove the convolution property of Z transform 7M  
(OR)  
10. State and prove any four properties of Z transform 14M

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

1. a) Explain the design considerations for the selection of Engineering Materials and their properties? 4M
- b) A rotating shaft carries a 18 KN pulley at the center of a 0.75 m simply Supported span. The average torque is 230 N m. Assume the torque range to be 10 % of the average torque. The material has yield point of 770 MPa and the endurance limit of 450MPa. Determine the required diameter of the shaft based on 10M
- i) Maximum stress theory and
- ii) Distortion energy theory.
- Stress concentration factor may be taken as 1.5 and a factor of safety 2.

**(OR)**

2. A hot rolled steel shaft is subjected to a torsional moment that varies from +350 Nm to -115 Nm and an applied bending moment at a critical section varies from 445 Nm to 225 Nm. The shaft is of uniform cross section. Determine the required shaft diameter. The material has an ultimate strength of 550 MPa and yield strength of 410 MPa. Take the endurance limit as half the ultimate strength, factor of safety of 2, size factor of 0.85 and a surface finish factor of 0.62. (Using Goodman's Line). 14M

**UNIT-II**

3. Design a triple riveted longitudinal double strap butt joint with unequal straps for a boiler. The inside diameter of the drum is 1.3 meters. The joint is to be designed for a steam pressure of 2.4 N/mm<sup>2</sup>. The working stresses to be used are  $\sigma_t=77\text{N/mm}^2$ ,  $\tau=62\text{ N/mm}^2$ ;  $s_c=120\text{ N/mm}^2$ . Assume the efficiency of the joint as 81 %. 14M

**(OR)**

4. a) Differentiate between compound screw and differential screw 4M
- b) The lead screw of a lathe has Acme threads of 40 mm outside diameter and 6 mm pitch. The screw must exert an axial pressure of 3500 N in order to drive the tool carriage. The thrust is carried on a collar 210 mm outside diameter and 55 mm inside diameter and lead screw rotates at 40 r.p.m. Determine (a) the power required to drive the screw and (b) the efficiency of the lead screw. Assume a coefficient of friction of 0.15 for the screw and 0.12 for the collar 10M

### UNIT-III

5. The end of a receiver, cylindrical in shape is closed by a lap joint using rivets. The maximum pressure in the receiver is 2MPa. The axial length of the receiver is limited to 3 m while its storing capacity is 2 m<sup>3</sup>. Design the suitable lap joint giving a neat sketch. The permissible stresses in shear and crushing of rivets may be taken as 40MPa and 50MPa. The permissible tensile stress for the plate material is 80MPa 14M

(OR)

6. a) What are the advantages and disadvantages of welded joints 4M  
b) A 65 mm diameter solid shaft is to be welded to a flat plate by a fillet weld around the circumference of the shaft. Determine the size of the weld if the torque on the shaft is 3kNm and the allowable shear stress in the weld is 70MPa 10M

### UNIT-IV

7. a) A shaft is required to transfer 43kW of power at 600rpm. The outside diameter must not exceed 50mm and the maximum shear stress is not to exceed 70N/mm<sup>2</sup>. Find out the dimensions of hollow and solid shaft, which would meet these requirements. Also compare their weights 10M  
b) Briefly explain the procedure to design a shaft based on any two theories of failures 4M

(OR)

8. a) Write the design procedure for a flexible coupling 4M  
b) Design a Muff coupling which is used to connect two steel shafts transmitting 40 KW at 350 rpm. The material for the shaft and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40MPa and 80MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15MPa 10M

### UNIT-V

9. Design a knuckle joint to connect two circular rods subjected to an axial tensile force of 50kN. The rods are co axial and a small amount of angular movement between their axes is permissible. Design the joint and specify the dimensions of components. Select suitable material for the parts. 14M

(OR)

10. a) Describe the construction of semi-elliptical leaf spring 4M  
b) A helical compression spring made of oil tempered carbon steel is subjected to a load which varies from 400N to 1000N. The spring index is 6 and the design factor of safety is 1.25. If the yield stress in shear is 770MPa and endurance stress in shear is 350MPa. Find i) Size of spring wire, ii) Diameters of the spring, iii) Number of turns of the spring, iv) free length of spring. The compression of the spring at the maximum load is 30mm. The modulus of rigidity for the spring material may be taken as 80kN/mm<sup>2</sup> 10M



# AR16

**CODE: 16EC3017**

**SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)**

**III B.Tech I Semester Supplementary Examinations, November-2021**

**DIGITAL IC APPLICATIONS**

**(Electronics and Communication Engineering)**

**Time: 3 Hours**

**Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

## **UNIT-I**

1. a) Design a 2-input NAND and NOR logic gates using CMOS logic 7M  
b) What is the difference between transmission time and propagation delay? Explain these two parameters with reference to CMOS logic 7M

**(OR)**

2. a) Explain sinking current and sourcing current of TTL gate. Which of the parameters decide the fan-out and how? 7M  
b) Draw the circuit diagram of two-input 10K ECL OR gate and explain its operation. 7M

## **UNIT-II**

3. a) Explain about CMOS static behaviour. 7M  
b) Design a 32 input to 5 output priority encoder using four 74LS148 & gates. 7M

**(OR)**

4. a) Explain different data types available in VHDL with relevant examples. 7M  
b) Design a 32 to 1 multiplexer using four 74X151 multiplexers and 74X139 decoder 7M

## **UNIT-III**

5. a) Write a VHDL program for n-bit ripple carry adder. 7M  
b) Explain in detail about combinational multiplier 7M

**(OR)**

6. a) Draw the block diagram of barrel shifter and explain its operation. 7M  
b) Write a VHDL code for 4-bit Look ahead carry generator. 7M

## **UNIT-IV**

7. a) Design a serial in and parallel out shift register and explain its operation. 7M  
b) Design a self-correcting 4 bit 8 state Johnson counter. 7M

**(OR)**

8. a) Design a modulo – 10 counter using two 74 x 163 binary counters. 7M  
b) Write a VHDL code to implement a MOD-4 counter. 7M

## **UNIT-V**

9. a) Explain about EPROM using floating gate MOS transistor. 7M  
b) Design sequence detector to detect a sequence 1101 using suitable PLA. Give state diagram and state table. 7M

**(OR)**

10. a) Briefly list out the comparison of PAL, PLA and PROM. 7M  
b) Draw the programmable logic array circuit for simplified expression. 7M  
 $F(A,B,C,D) = \sum (0,1,2,4,6,10,11,12,14)$  and explain its operation.

**UNIX INTERNALS****(Common to CSE & IT)****Time: 3 Hours****Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

1. Identify UNIX commands used to perform the file related operations? Explain each command in detail and also compare them? [14M]

**(OR)**

2. Discuss about the file permissions in unix operating system? Identify the appropriate unix command which will give read , write and execute permission to the owner, user and growth? [14M]

**UNIT-II**

3. Define a shell script. What are the two ways of running a shell script? Write a shell script that takes command and arguments and accept pattern and a file and search for the pattern in the file? [14M]

**(OR)**

4. a Write a shell script that accepts two integers as its arguments and computes the value of first number raised to the power of the second number. [7M]  
b Define the term pipe? Why pipes are required? How we use pipes in combining multiple commands? Give an example [7M]

**UNIT-III**

5. What is a system call? Explain the syntax and each argument of the following functions along with syntax : [14M]

a) stat    b) fstat    c) lstat    d) chmod    e) chown

**(OR)**

6. List at least five Services Provided by System Calls ? Explain about [14M]  
i) unlink,    ii) link,    iii) symlink,    iv) rmdir

**UNIT-IV**

7. Explain about process control system call write syntax about the following system calls [14M]  
i. kill    ii.raise    iii.alarm

**(OR)**

8. How to create a process? what are the command need to create a process? Which process do you think may have maximum number of children? What is its PID?can you divide its children into two categories? [14M]

**UNIT-V**

9. a Explain in detail about shared memory? How shared memory will be used in IPC? [7M]  
b Analyse the following command ls | pr | lpr [7M]

**(OR)**

10. a Explain about named pipes and nameless pipes [7M]  
b Explain about semaphores? [7M]

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI  
(AUTONOMOUS)****III B.Tech I Semester Supplementary Examinations, November-2021****SIGNALS AND SYSTEMS****(Electrical and Electronics Engineering)****Time: 3 Hours****Max Marks: 70****PART-A****ANSWER ALL QUESTIONS****[1M x 10 = 10 M]**

1. a) Define continuous time unit step and unit impulse signals.
- b) What is the condition for stability of an LTI system?
- c) Write the expressions for trigonometric Fourier series coefficients  $a_0$ ,  $a_n$  and  $b_n$ .
- d) State the condition for convergence of Fourier Series.
- e) Find the Fourier Transform of impulse function.
- f) Define Fourier Transform.
- g) State Initial value Theorem of Laplace Transform.
- h) What is the condition to be satisfied for the existence of Laplace Transform?
- i) Mention any two properties of ROC of Z-transform.
- j) Define two sided Z-transform.

**PART-B****Answer one question from each unit****[5x12=60M]****UNIT-I**

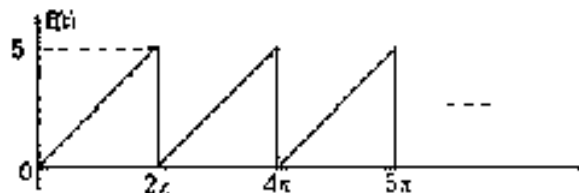
2. a) Find whether the following signals are periodic or not. 6M
  - (i)  $x(t) = 2\cos(10t+1) - \sin(4t-1)$
  - (ii)  $x(t) = 3\cos 4t + 2\sin 2\pi t$
- b) Distinguish between the following: 6M
  - (i) Continuous time signal and discrete time signal
  - (ii) Periodic and non periodic signals
  - (iii) Causal and non-causal Signals

**(OR)**

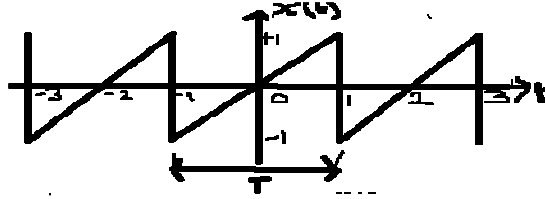
3. a) Check whether the following systems are linear or not. 6M
  - (i)  $y(n) = Ax(n) + B$
  - (ii)  $y(n) = nx(n)$
- b) What is an LTI system? Explain its properties. Derive an expression for the transfer function of an LTI system. 6M

**UNIT-II**

4. a) Discuss the concept of trigonometric Fourier series and derive the expressions for coefficients. 6M
- b) Find the trigonometric Fourier series of the waveform shown in below figure: 6M

**(OR)**

5. a) Define Fourier series and derive the relationship between trigonometric Fourier series and exponential Fourier series. 6M
- b) Find the trigonometric Fourier series for the periodic signal  $x(t)$  shown below. 6M



### UNIT-III

6. a) Explain how Fourier transform is developed from Fourier series. 6M
- b) Determine the Fourier transform of a two sided exponential pulse  $x(t) = e^{-|t|}$ . 6M
- (OR)
7. State and prove any four properties of fourier transform. 12M

### UNIT-IV

8. a) Find the Laplace transform of the following signals i) Impulse function ii) unit step function iii)  $A \sin w_0 t u(t)$ . 6M
- b) Find the Laplace transform of the signal  $x(t) = e^{-at} u(t) + e^{-bt} u(-t)$  6M
- (OR)
9. State and prove any four properties of laplace transform 12M

### UNIT-V

10. State and prove any four properties of Z transform 12M
- (OR)
11. a) State and prove initial value and final value theorems of Z- transform. 6M
- b) Find the Z-transform of the given signal  $x(n)$  and find its ROC:  $X(n) = [\sin(w_0 n)] u(n)$  6M