AR18

CODE: 18CET311 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Regular & Supplementary Examinations, February-2022

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) Write a relationship between void ratio, degree of saturation, moister content and specific gravity of soil solids. 6M
   b) Explain the Atterberg's limits (Liquid limit and plastic limit) with diagram 6M

(OR)

2. a) i) Draw a grain size distribution curves for different grades of soils and name them. 7M
   ii) What are the corrections required in hydrometer analysis?
   b) Establish the relation $\gamma_d = (1- n) G_s\gamma_w$ 5M

UNIT-II

3. a) What are the factors affecting permeability? and explain. 7M
   b) Write down various characteristics of flow net 5M

(OR)

4. a) The following soil stratum consists of a three layers and thickness of soil layers consists of a ratio in 3, 1, 2 respectively. The permeability of top and bottom layers are 1.5×10^{-3} cm/sec and also middle layer of 3×10^{-3} cm/sec. Calculate average of horizontal permeability for entire soil layer system. 7M
   b) Describe the phenomena of quicksand condition with a neat sketch and derive an equation for critical hydraulic gradient. 5M

UNIT-III

5. a) Describe Newmark's Influence chart. 5M
   b) A 5m thick of clay soil underline by 3m thick sandy soil. The density of sand is $1.6t/m^3$ and saturated unit weight of clay is 1.9 $t/m^3$and location of ground water table is at 4m from ground level. Plot total stress, pore water pressure and effective stress diagrams 7M

(OR)

6. a) Define total stress, effective stress and neutral stress. 6M
   b) Write assumptions of Boussinesq's theory 6M

UNIT-IV

   a) Explain the procedure of light weight compaction test to determine the optimum water content and maximum dry density. 6M
   b) Write the differences between compaction and consolidation 6M

(OR)

8. a) The following data refers to compaction test as per IS light weight compaction. 8M

Water content (%)	9	12	13.8	16.2	18.30	20.1
Weight of wet sample (Kg)	1.75	1.82	1.91	1.96	1.85	1.7

If the specific gravity of soil grains and volume of the mold are 2.70 and 1000 cm^3. Plot compaction curve to obtain maximum dry density and optimum moisture content.

   b) Define of coefficient of compressibility (a_v) and coefficient of compression index (Cc), coefficient of volume compressibility (m_v) with graphs 4M

UNIT-V

9. a) Explain procedure of direct shear test. Write it advantages and disadvantages 5M

   b) An unconfined compression test was conducted on an undisturbed sample of clay. The sample had a diameter of 37.5 mm and 80 mm long. The load at failure measured by proving ring was 28 N and the axial deformation of the sample at failure was 13mm. Determine the unconfined compressive strength and the undrained shear strength of the clay. 7M

(OR)

10. a) Explain tri-axial test procedure of UU test for saturated clays and Explain mohr's circle for saturated clays. 5M
   b) The results shear strength parameters in terms total and effective stress from CU tests: Cu = C' = 0 and $\varphi_u = 15^0$, $\varphi' = 30^0$. The cell pressure of soil sample tested at 150kN/m^2. Determine deviator stress, pore water pressure, major and minor principle stresses are at failure by analytically or Mohr's circles method. (Normal Graph needed). 7M

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AR18

CODE: 18EET311 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Regular & Supplementary Examinations, February-2022

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)	Draw and discuss the internal block diagram of 8086.	8M
	b)	What do you mean by pipelined architecture? How is it implemented in 8086?	4M
		(OR)	
2.	a)	What is interrupt vector table of 8086? Explain its structure.	8M
	b)	Explain the physical memory organisation in an 8086 system.	4M

UNIT-II

3.	a)	What is the difference between jump and loop instructions.	6M
	b)	Write an assembly language program(ALP) for arranging the numbers in ascending order.	6M
		(OR)	
4.	a)	Explain the function of the following instructions i) ADD ii) MOVSB iii) JNZ	6M

	b)	What will be the contents of Accumulator and carry flag after executing the following program
		MOV BL,8CH
		MOV AL,7FH
		CMP AL,BL
		ADD AL,BL
			6M

UNIT-III

5.		What is USART 8251? Explain its operation with neat block diagram.	12M
		(OR)	
6.	a)	Explain the initialisation sequence of 8259A.	6M
	b)	Discuss the properties of DMA request inputs of 8257.	6M

UNIT-IV

7.		Draw the architecture of 80386 and explain each block.	12M
		(OR)	
8.		With a neat sketch explain the Architecture of ARM Processor	12M

UNIT-V

9.	a)	Discuss the advantages of microcontroller based systems over microprocessor based systems.	6M
	b)	Develop an 8051 Assembly Language Program to perform addition subtraction, multiplication and division on two 16 bit numbers 8756H and 2543H	6M
		(OR)	
10.		With a neat sketch explain the architecture of 8051 Microcontroller	12M

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AR18

CODE: 18MET309 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Regular & Supplementary Examinations, February-2022

DESIGN OF MACHINE MEMBERS – I

(Mechanical Engineering)

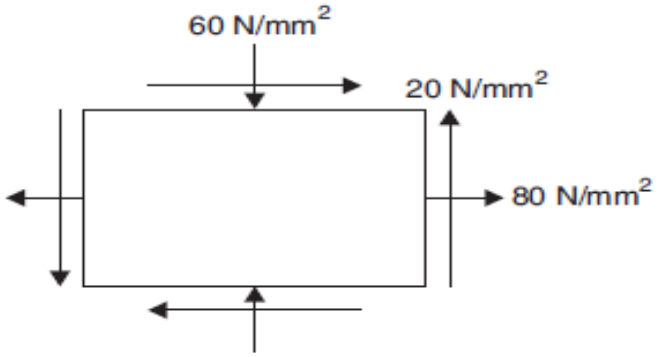
Time: 3 Hours **Max Marks: 60**

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 any three theories of failure in detail 6M

   b) The state of stress in a material stressed to two-dimensional state of stress is as shown in Fig. Determine principal stresses and maximum shear stress and the planes on which they act. 6M



(OR)

2. a) A shaft is transmitting 100 kW at 160 r.p.m. Find a suitable diameter for the shaft, if the maximum torque transmitted exceeds the mean by 25%. Take maximum allowable shear stress as 70 MPa. 6M

   b) The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt required according to 1. Maximum principal stress theory; 2. Maximum shear stress theory 6M

UNIT-II

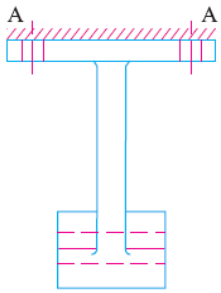
3. a) Draw stress-time plots for (i) fluctuating stress, (ii) repeated stresses and (iii) reversed stresses 4M

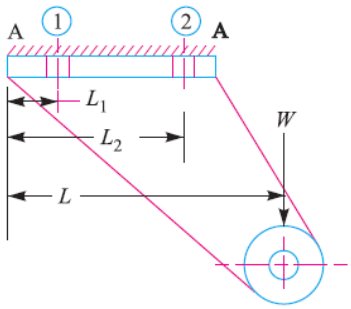
   b) A machine component is subjected to a fluctuating stress that varies from 100 N/ mm^2 and 40 N/ mm^2. The corrected endurance strength for machine component is 270 N/ mm^2. The ultimate and yield strength of the material are 600 N/ mm^2 and 450 N/ mm^2 respectively. Determine the factor of safety using Soderberg line and Goodman line. 8M

(OR)

4. a) Define the following terms used in bolted joint :
   (a) Major diameter, (b) Minor diameter, (c) Pitch, and (d) Lead. 4M

   b) A bracket, as shown in Fig. supports a load of 30 kN. Determine the size of bolts, if the maximum allowable tensile stress in the bolt material is 60 MPa. The distances are :
   L_1 = 80 mm, L_2 = 250 mm, and L = 500 mm. 8M





UNIT-III

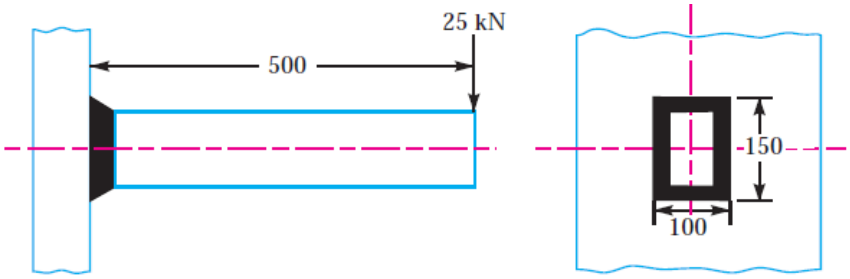
5. a) Explain the possible failures of a riveted joint with neat sketches 6M

   b) A double riveted lap joint is made in 6 mm thick plates with 20mm diameter rivets. Find the efficiency of the joint for a pitch of 50mm if σ_t = 120MPa, τ = 90MPa and σ_c =150MPa. 6M

(OR)

6. a) A plate 100mm wide and 10mm thick is welded to another steel plate by means of double parallel fillet welds. The plates are subjected to a static tensile force of 50kN. Determine the required length of the welds if the permissible shear stress in the weld is 94N/mm^2 6M

   b) A rectangular cross-section bar is welded to a support by means of fillet welds as shown in Fig. Determine the size of the welds, if the permissible shear stress in the weld is limited to 75 MPa. 6M



UNIT-IV

7. A solid circular shaft is subjected to a bending moment of 3000 N-m and a torque of 10 000 N-m. The shaft is made of 45 C 8 steel having ultimate tensile stress of 700 MPa and a ultimate shear stress of 500 MPa. Assuming a factor of safety as 6, determine the diameter of the shaft. 12M

(OR)

8. Design and make a neat dimensioned sketch of a muff coupling which is used to connect two steel shafts transmitting 40 kW at 350 r.p.m. The material for the shafts and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40 MPa and 80 MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15 MPa. 12M

UNIT-V

9. Design a sleeve and cotter joint to resist a tensile load of 60 kN. All parts of the joint are made of the same material with the following allowable stresses: σ_t = 60 MPa ; τ = 70 MPa ; and σ_c = 125 MPa. 12M

(OR)

10. a) Explain the terms used in compression springs 6M

    b) A close coiled helical compression spring of 12 active coils has a spring stiffness of k. It is cut into two springs having 5 and 7 turns. Determine the spring stiffness of resulting springs. 6M

AR18

CODE: 18ECT312 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Regular & supplementary Examinations, February-2022

CONTROL SYSTEMS

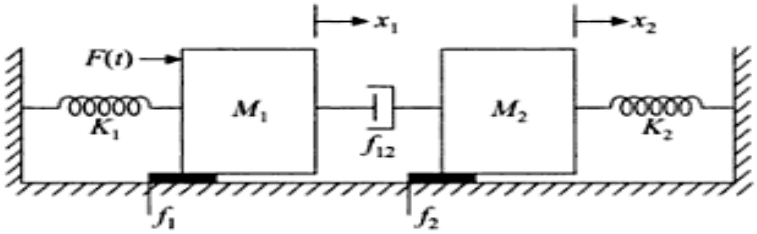
(Electronics and Communication Engineering)

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

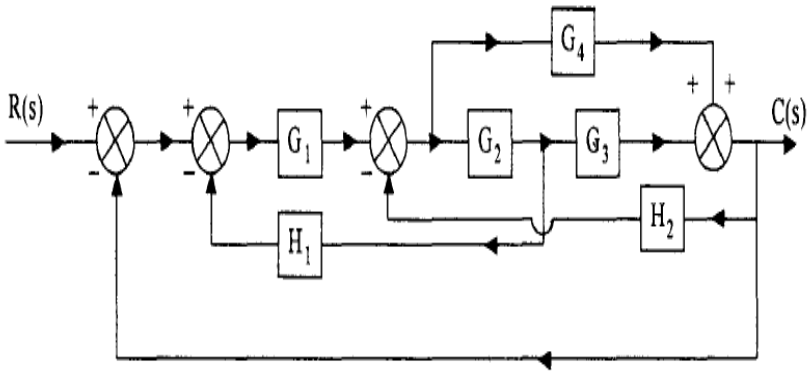
UNIT-I

1. a) Obtain the transfer function of series RLC circuit. 4M
   b) Find the transfer function $\frac{X_2(S)}{F(S)}$ for following mechanical system. 8M



(OR)

2. a) Describe "System" and "Control System" with applications. 4M
   b) Using block diagram reduction technique, find closed loop transfer function of the following system: 8M



UNIT-II

3. a) Obtain the response of a 1st order system when unit step input is applied. 4M
   b) A unity feedback system is represented by $G(s) = \frac{K}{S(s+10)}$. Determine gain 'k' so that the system will have damping ratio of 0.5. For this values of 'k' determine rise time, peak time, peak overshoot and settling time for a unit step input. 8M

(OR)

4. a) Discuss the effect of damping ration on response of a closed loop system. 4M

b) Derive the expression for transfer function of armature controlled DC servo motor. 8M

UNIT-III

5. a) Analyze the stability for $S^4+3S^3+S^2+2S+2=0$ using R-H criterion. 4M

b) A unity feedback system has an open-loop transfer function GH(S) = $\frac{K}{S(S+2)(S+4)}$. Sketch the Root locus plot and find K so that system becomes stable. 8M

(OR)

6. a) The characteristic equation of a unity feedback system is $S^4+6S^3+3S^2+18S+2=0$; Find the location of poles on s-plane and stability by RH-Criteria. 4M

b) A unity feedback control system has open loop transfer function GH(s)=$\frac{K(S+3)}{S^2(S+6)}$. Sketch the root locus. 8M

UNIT-IV

7. a) Discuss about a Lead compensator and realize it with a suitable electrical system. 4M

b) Sketch the Bode plot showing the magnitude in decibels and phase angle in degrees as a function of log frequency for the transfer function given below. G(s) = $\frac{10}{S(S+5)(S+10)}$ 8M

(OR)

8. a) Explain gain margin, phase margin and gain cross over frequency.

b) Draw Nyquist plot and analyse stability for a unity feedback control system with open loop transfer function GH(s)= $\frac{4S+1}{S^2(S+1)(2S+1)}$.

UNIT-V

9. a) Obtain state model equations for series RC electrical circuit. 4M

b) The state space model equations are given as follows: 8M

$$\dot{X}=\begin{bmatrix}1 & -2\\ 0 & -4\end{bmatrix}X+\begin{bmatrix}1\\ -3\end{bmatrix}U \text{ and } Y=[-2 \quad -5]X$$

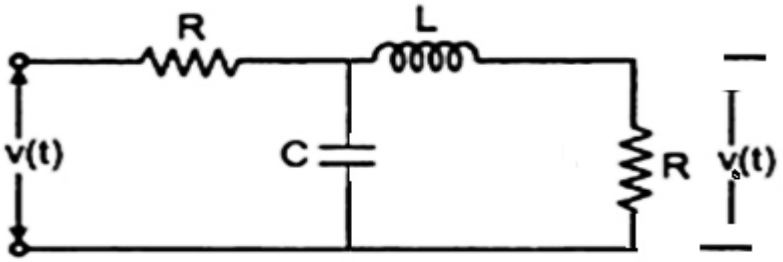
a. Test Controllability

b. Test Observability

(OR)

10. a) Specify any four advantages of state space approach. 4M

b) Obtain the state model of the given electrical network. 8M



AR18

CODE: 18CST310 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Regular & Supplementary Examinations, February-2022

FORMAL LANGUAGES & AUTOMATA THEORY

(Common to CSE & IT)

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

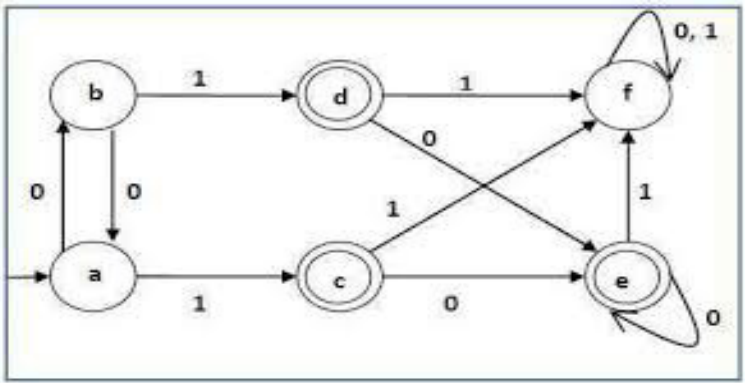
UNIT-I

1. a) What is a finite automata? Explain different types of finite automata with an example — 6 M

   b) Construct DFA for the language which does not have a substring '101'. — 6 M

(OR)

2. a) Minimize the given finite automata — 6 M



   b) Design a Moore machine to determine residue mod 3 for each binary string treated as integer. — 6 M

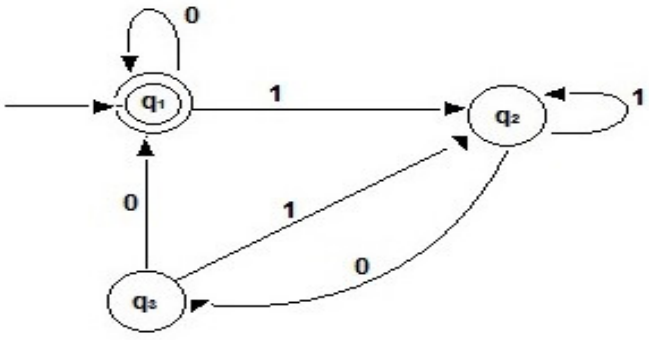
UNIT-II

3. a) Construct a finite automata for the given regular expression (0+1)*(010) — 6 M

   b) Prove that the following languages are not regular — 6 M
   i) L= $\{0^i1^j$ / gcd (i, j)=1 $\}$ ii) L= $\{a^ib^{2i}/i>0\}$

(OR)

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



   b) State and prove pumping lemma for regular languages. — 6 M

AR18

CODE: 18CST310 **SET-1**

UNIT-III

5. a) Given a Grammar G=({E},{+,*,id},P,E) where P=E->E+E/E*E/id. Give all possible LMD's, RMD's and also parse tree for the string id+id*id. 6 M

   b) Define a useless symbol. Remove useless symbols from the given grammar. 6 M

   S→aAa
   A→Sb/bCC/DaA
   C→abb/DD
   E→aC
   D→aDA

(OR)

6. a) Convert the following grammar G having productions 6 M
   E → E + T / T, T → T * F / F, F → (E) / id, into equivalent CNF grammar

   b) What is an ambiguous grammar? Check the grammar G having productions 6 M
   S → aB / bA, A → a / aS / bAA, B → b / bS / aBB is ambiguous or not?

UNIT-IV

7. a) Construct PDA for the language having equal number of a's and b's. 6 M

   b) Define PDA. Design a PDA for the language L={$a^n b^{2n}$ / n>=1} 6 M

(OR)

8. a) Design a PDA for the grammar having productions 6 M
   S->0A, A->0ABC/1B/0, B->1, C->2

   b) Show that acceptance by final state and acceptance by empty stack in PDA are equivalent. 6 M

UNIT-V

9. Design Turing Machine for L={$a^n b^n c^n$/n>=1}. 12 M

(OR)

10. a) Prove that PCP is undecidable. 6 M

    b) What is a linear bounded automata? Explain with an example. 6 M

AR16

CODE: 16CE3011 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations, February, 2022

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) Write a relationship between void ratio, degree of saturation, unit weight of soil, unit weight of water and specific gravity of soil solids. 7M
   b) A soil has bulk density of 20.1 kN/m3 and water content of 15%. Calculate the water content if the soil partially dries to a density of 19.4 kN/m3 and the void ratio remains unchanged. 7M

(OR)

2. a) i) Draw a grain size distribution curves for different grades of soils and name them. 8M
   ii) What are the corrections required in hydrometer analysis?
   b) The laboratory tests on a sample of soil gave the following results: wn - 24%, w, = 62%, wp = 28%, percentage of particles less than 2 microns is23%. Determine: (i) The liquidity index, (ii) activity (iii) consistency and nature of soil. 6M

UNIT-II

3. a) Write the procedure for falling head permeability test is to be performed on a soil. 7M
   b) With the help of a sketch of a flow net, derive the formula to determine the quantity of seepage through an earth dam. 7M

(OR)

4. a) Determine the average horizontal and vertical permeability coefficients of a soil deposit made up of three horizontal strata, each 1m thick, if the coefficients of permeability are 1x10–1 mm/s, 3x10–2mm/s and 8x10–3mm/s respectively for the three layers. 7M
   b) Derive the formula to compute the height of capillary rise in soils. 7M

UNIT-III

5. a) Two concentrated loads of 500 kN and 900 kN are situated 5 m apart on the ground surface. Find out the vertical stresses at 3.0 m below each load. 6M
   b) Explain New mark's influence chart preparation and usage. 8M

(OR)

6. a) A Newmark's chart was prepared with the influence coefficient of 0.005 with the desired scale the stress concentrated area is drawn on tracing paper. Then the tracing paper is placed on top of the influence chart with the desired position. Then number of sectors covered by the stress area is 31. Compute the stress at the given position for the desired stress area. Applied on the area is 200 kN/m2 . 7M

b) Two point loads P and Q act on the ground surface 8m apart. The magnitude of P is 100kN and that of Q is 80kN. Point A is at a depth of 6m directly below P and point B is at a depth of 5m directly below Q. Point C is between P and Q and it is at a distance of 4m from P. Point C lies at a depth of 3m below the ground surface. Calculate the increase in vertical stresses at A, B and C due to the point loads. 7M

UNIT-IV

7. a) i) Explain concept of consolidation using Spring Analogy. 8M
ii) Explain the procedure for determining pre consolidated pressure

b) An oedometer test is performed on a 2 cm thick clay sample. After 5 minutes, 50% consolidation is reached. After how long time would the same degree of consolidation is achieved in the field where the clay layer is 3.70 m thick? Assume the sample and the clay layers have the same drainage boundary conditions (double drainage). 6M

(OR)

8. a) Differentiate between compaction and consolidation. 8M

b) There is a layer of soft clay 4 m thick under a newly constructed building. The overburden pressure over the center of the clay layer is 300 kN/m2 . Compute the settlement, if there is an increase in pressure due to construction of 100 kN/m2 . Take Cc = 0.50, G = 2.70. The water content of the deposit was found to be 50 % 6M

UNIT-V

9. a) In a direct shear test on a specimen of clean dry sand, a normal stress of 180kPa was applied and failure occurred at a shear stress of 100kPa. Determine analytically the angle of shearing resistance, the principal stresses during failure, and directions of the principal planes with respect to the direction of the plane of shearing. 7M

b) Explain the stress-strain behaviour of clays. 7M

(OR)

10. a) Explain Mohr Coulomb's shear failure theory. 7M

b) In an unconfined compression test, a sample of sandy clay 8cm long and 4cm in diameter fails under a load of 120N at 10% strain. Compute the shearing resistance taking into account the effect of change in cross-section of the sample. 7M

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AR16

CODE: 16EC3015 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations, February-2022

FUNDAMENTALSOFSIGNALSANDSYSTEMS

(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) Explain the following basic signals 8M
   (i) unit step (ii) Unit Ramp (iii)Signum function
   b) Check the causality and linearity for the given system 6M
   $y(t) = \int_{-\infty}^{t} x(\tau)\, d\tau$

(OR)

2. a) Explain the properties of impulse signal 7M
   b) Identify the period the following signals 7M
   $(i) x_1(t) = \sin(0.4\, t) + \cos(0.6\, t)$
   (ii) $x_2(t) = \cos(0.5\pi n)$

UNIT-II

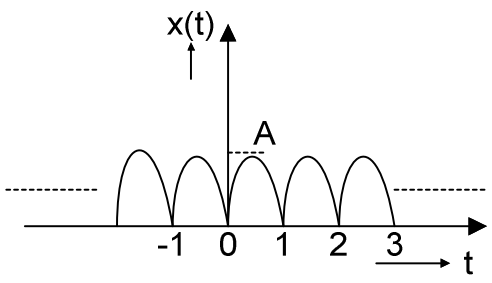
3. a) Illustrate the properties of convolution 5M
   b) Find the convolution of the following signals by graphical method. x(t) = e^{-3t} u(t) & h(t) = u(t+3). 9M

(OR)

4. a) Demonstrate ideal sampling process with neat diagram. 9M
   b) Find the Nyquist rate of the following. 5M
   (i)x(t)=5Cos(1000πt)Cos(4000πt) (ii) y(t)=Sinc(200t)

UNIT-III

5. a) Identify the exponential Fourier series for the given signal and plot its magnitude spectrum 9M



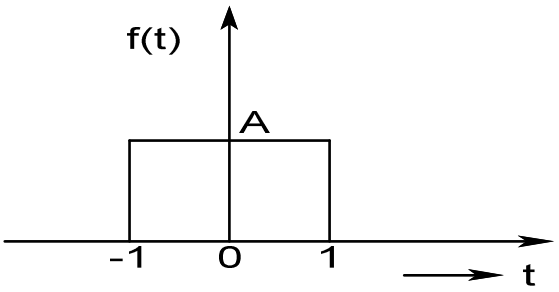
   b) Explain symmetry conditions in Fourier series 5M

(OR)

6. a) Find the Fourier transform of the given signals. 8M

i. $f_1(t) = e^{-2t}u(t)$

ii.



b) Demonstrate the following properties of Fourier Transform 6M
i. Time reversal ii. Time shifting

UNIT-IV

7. a) Find out the Laplace transform for the following signals and specify the ROC 8M
(i) $-e^{-at}u(-t)$
(ii) $\sin w_0\, tu(t)$

b) Demonstrate the properties of ROC for Laplace Transform 6M

(OR)

8. a) Obtain the inverse transform of $F(s)=\frac{1}{s(s+1)(s+2)}$ using partial fraction method. 7M

b) State and prove the initial and final value theorems of Laplace transform. 7M

UNIT-V

9. a) Find the Z-Transform and its RoC for the following signals 8M
(i)$x(n) = a^n u(n)$ (ii) $y(n) = -b^n u(-n-1)$

b) Explain the concept of ROC and stability in Z-Transform 6M

(OR)

10. a) Find the Inverse Z-Transform of the following 8M

$$X(z) = \frac{z(z^2 - 4z + 5)}{(z-1)(z-2)(z-3)}$$

b) Explain any two properties of Z-Transform 6M

AR16

CODE: 16CS3011 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B. Tech I Semester Supplementary Examinations, February, 2022

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.	a)	Discuss about ordinary files, directories and special files and how we can identified each.	9 M
	b)	What do you mean by file system mounting? Write the command for mounting operation.	5 M
		(OR)	
2.	a)	How does UNIX file system works? Explain with example.	5 M
	b)	Explain the following commands – cp, wc, pwd, head, tail, date and its uses.	9 M

UNIT-II

3.	a)	Define UNIX shell. Mention few shell names you know along with examples.	7 M
	b)	How we take users input in a shell script? Explain with example. Write the command to execute a shell script in UNIX command interface.	7M
		(OR)	
4.	a)	Write a shell script to find the factorial of a number (taken from users input).	6 M
	b)	What do you mean by output redirection? How it can be implemented (pipelined) in UNIX?	8M

UNIT-III

5.		What is a system call? Explain the utilities of following system calls: **write, lseek**, **fopen**, **fflush**, and **fork**.	14M
		(OR)	
6		What is the purpose of system calls? Mention any five system calls in details with syntax.	14M

UNIT-IV

7.	a)	What is PCB? Explain with neat sketch.	7M
	b)	How to destroy a process in UNIX? Write the command to destroy a process with Pid: **6463**. Define Zombie process.	7M
		(OR)	
8.	a)	When a process resides in ready queue? When a process resides in waiting queue? Discuss vfork ().	7M
	b)	What is interrupt? Can we call it as a signal? If YES, from where it is generated? For whom it is generated? What is "pause" in UNIX?	7M

UNIT-V

9.	a)	Discuss IPC. Why it is so relevant in multiprocessing environment?	7M
	b)	How to create a child process ? How we can visualise parent and child process.	7M
		(OR)	
10.	a)	How to Create a child process.	7M
	b)	Compare named and unnamed pipes. How a pipe is useful for IPC?	7M

AR16

CODE: 16ME3013 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations, February, 2022

DESIGN OF MACHINE MEMBERS – I

(Mechanical 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. The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. Find the diameter of bolt required according to 1. Maximum principal stress theory; 2. Maximum shear stress theory; 3. Maximum principal strain theory; 4. Maximum strain energy theory; and 5. Maximum distortion energy theory. Take permissible tensile stress at elastic limit = 100 MPa and poisson's ratio = 0.3. **14M**

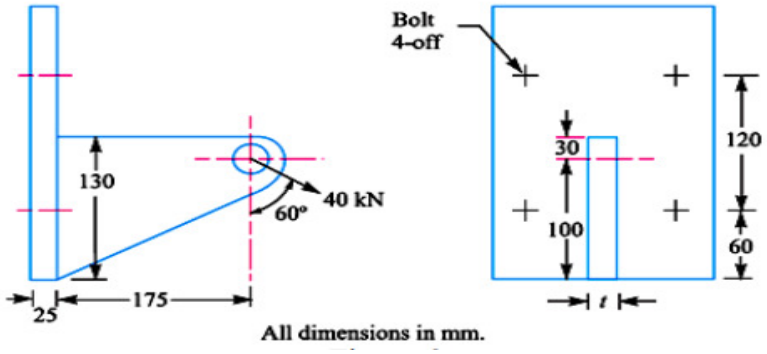
(OR)

2. a) What is meant by stress concentration? How do you take it into consideration in case of a component subjected to dynamic loading? **4M**

   b) A bar of circular cross-section is subjected to alternating tensile forces varying from a minimum of 200 kN to a maximum of 500 kN. It is to be manufactured of a material with an ultimate tensile strength of 900 MPa and an endurance limit of 700MPa. Determine the diameter of bar using safety factors of 3.5 related to ultimate tensile strength and 4 related to endurance limit and a stress concentration factor of 1.65 for fatigue load. Use Goodman straight line as basis for design. **10M**

UNIT-II

3. Determine the size of the bolts and the thickness of the arm for the bracket as shown in Figure, if it carries a load of 40 kN at an angle of 60^0 to the vertical. The material of the bracket and the bolts is same for which the safe stresses can be assumed as 70, 50 and 105 MPa in tension, shear and compression respectively. **14M**



(OR)

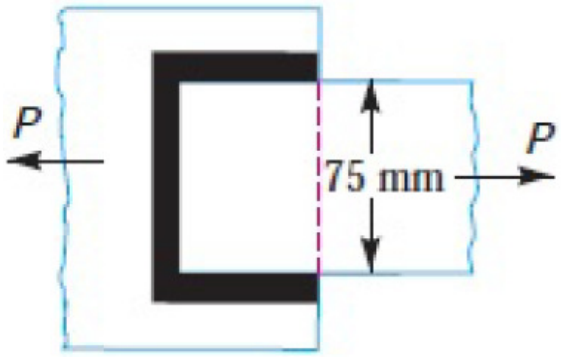
4. A vertical screw with single start square threads of 50 mm mean diameter and 12.5 mm pitch is raised against a load of 10 kN by means of a hand wheel, the boss of which is threaded to act as a nut. The axial load is taken up by a thrust collar which supports the wheel boss and has a mean diameter of 60 mm. The coefficient of friction is 0.15 for the screw and 0.18 for the collar. If the tangential force applied by each hand to the wheel is 100 N, find suitable diameter of the hand wheel. **14M**

UNIT-III

5. Find the efficiency of the following riveted joints : 14M
(i). Single riveted lap joint of 6 mm plates with 20 mm diameter rivets having a pitch of 50 mm.
(ii). Double riveted lap joint of 6 mm plates with 20 mm diameter rivets having a pitch of 65 mm. Assume Permissible tensile stress in plate = 120 MPa; Permissible shearing stress in rivets = 90 MPa; Permissible crushing stress in rivets = 180 MPa

(OR)

6. A plate 75 mm wide and 12.5 mm thick is joined with another plate by a single transverse weld and a double parallel fillet weld as shown in Figure. The maximum tensile and shear stresses are 70 MPa and 56 MPa respectively. Find the length of each parallel fillet weld, if the joint is subjected to both static and fatigue loading. 14M



UNIT-IV

7. A cylindrical shaft made of steel of yield strength 700 MPa is subjected to static loads consisting of bending moment 10 kN-m and a torsional moment 30 kN-m. Determine the diameter of the shaft using two different theories of failure, and assuming a factor of safety of 2. Take E = 210 GPa and Poisson's ratio = 0.25. 14M

(OR)

8. Design and make a neat dimensioned sketch of a muff coupling which is used to connect two steel shafts transmitting 40 kW at 350 r.p.m. The material for the shafts and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40 MPa and 80MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15MPa. 14M

UNIT-V

9. Design a sleeve and cotter joint to resist a tensile load of 60 kN. All parts of the joint are made of the same material with the following allowable stresses :σt= 60 MPa ; τ = 70 MPa ; and σc= 125 MPa. 14M

(OR)

10. a) Classify springs according to their shapes 2M
b) Design a helical compression spring for a maximum load of 1000 N for a deflection of 25 mm using the value of the spring index as 5. The maximum permissible shear stress for spring wire is 420 MPa and the modulus of rigidity is 84000 MPa. Use Wahl's Correction Factor 12M

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AR13

CODE: 13CE3013 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
III B.Tech I Semester Supplementary Examinations, February,2022
GEOTECHNICAL ENGINEERING-I
(Civil Engineering)

Time: 3 Hours **Max Marks: 70**
NOTE: Normal graph sheet is supplied.

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) State Darcy's law.
   b) Classify the soil with liquid limit = 45% and plastic limit = 31%.
   c) Define critical hydraulic gradient.
   d) Define relative compaction.
   e) What is over consolidated clay?
   f) What is adsorbed water is soil mass?
   g) Write Westergaard's equation for vertical stress.
   h) Define critical void ratio.
   i) What is a pressure bulb?
   j) Write the equation for find out the shear strength of soil using vane shear test.

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2. a. Derive the relation $\gamma_d = \frac{(1-n_a)G\gamma_w}{1+wG}$ Where γ_d = dry unit weight; n_a = percentage of air voids, G = specific gravity of solids, γ_w = unit weight of water, w = water content. **6M**
   b. The natural water content of sand sample is 24%, the bulk unit weight being 18 kN/m^3. Assuming specific gravity of solids as 2.70 and the sample to be partially saturated, calculate the degree of saturation and void ratio of the sample. **6M**

(OR)

3. a. Define the following terms.
   i) Shrinkage Limit ii) Liquidity Index iii)Activity of Soil. **6M**
   b. The sieve analysis and consistency tests conducted on a soil gave following results: Soil passing through 4.75mm sieve ,= 82%, Passing through 75µm sieve = 9%, D_{10} = 0.11mm, D_{30} = 0.45mm, D_{60} = 1.12mm, liquid limit = 22%, plastic limit = 12%. Classify the soil as per IS Classification System. **6M**

UNIT-II

4. a. Briefly explain the factors influencing on permeability coefficient. **6M**
   b. Constant head permeability test is conducted for fine sand in a soil specimen having area = 90 cm^2, Length of the Specimen = 320 mm. At a Constant head of 460mm, flow of water through specimen is 40 ml per min. The same soil specimen with same dimensions tested in a falling-head permeameter. If area of the standpipe is 5 cm^2 and head at the beginning of the test is 1000mm, calculate the final head after 300 seconds from the start of the test. **6M**

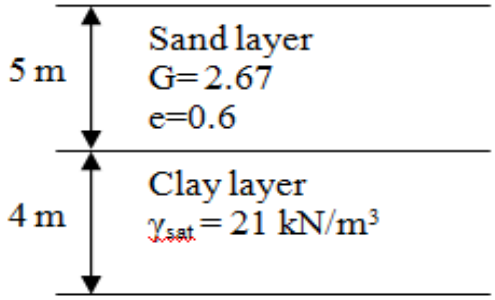
(OR)

AR13

CODE: 13CE3013 **SET-1**

5. a. Explain with neat sketch how you can determine capillary rise. Explain its significance in soils. **5M**

b. For the subsoil conditions shown in figure, plot total, neutral and effective stress distribution up to the bottom of the clay layer, when
(i) W.T is 2 m below ground surface (take S=50% above W.T);
(ii) W.T is at the ground surface and
(iii) W.T is 2 m above the ground surface. **7M**



UNIT-III

6. a. Explain how you can determine vertical stress increase due to loading using Newmark's influence chart with neat sketch. **6M**

b. Determine the vertical stress increase at a depth of 1.5 m beneath the centre of square footing of width 3 m and with intensity of loading is 200 kN/m^2 **6M**

(OR)

7. a. Explain the assumptions in Westergaard's theory. **6M**

b. The base of a tower consists of equilateral triangular frame (of side 6m) on the corners of which three legs of the tower is supported. The total weight of the tower is 600 kN, which is equally carried by all the three legs. Compute the increase in vertical stress in the soil caused at a point 5m below one of the legs. Use Boussinesq's analysis. **6M**

UNIT-IV

8. a. Differentiate between compaction and consolidation. **6M**

b. Explain the affect of compaction on soil properties. **6M**

(OR)

9. a. Define the following terms.
(i) Coefficient of compressibility (ii) Coefficient of volume change **6M**
(iii) Compression index.

b. Briefly explain how to determine coefficient of consolidation by Taylor's square root time method with neat sketch. **6M**

UNIT-V

10. a. Explain Mohr-Coulomb theory for shear strength of soils with a neat sketch. **6M**

b. Explain in brief about direct shear tests for finding shear strength of soil with a neat sketch. **6M**

(OR)

11. a. Discuss about advantages and disadvantages of triaxial test. **6M**

b. The results of a series of CU tests on undisturbed samples of over consolidated clay were as below: **6M**

Cell pressure (kN/m^2)	100	200	400	600
Deviator stress at failure(kN/m^2)	300	410	610	850
Pore water pressure at failure(kN/m^2)	- 45	-15	50	110

Determine the shear strength parameters in terms of effective stresses. Use normal graph sheet.

AR13

CODE: 13ME3015 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
III B.Tech I Semester Supplementary Examinations, February-2022
DESIGN OF MACHINE MEMBERS - II
(Mechanical Engineering)

Time: 3 Hours **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) What is the difference between hydrostatic lubrication and hydrodynamic lubrication?
   b) Name different types of ball bearings
   c) What is the function of a connecting rod of an internal combustion engine?
   d) What are the various types of crankshafts?
   e) What is the purpose of piston pin?
   f) Distinguish wet and dry liner.
   g) What are methods to eliminate interference?
   h) Write any two causes for tooth failure?
   i) What is the difference between ACME thread and trapezoidal thread?
   j) What are the end conditions for the screw While designing a screw in a screw jack against buckling failure

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

2. Design a journal bearing for a centrifugal pump from the following data: Load on the journal = 20 000 N; Speed of the journal = 900 r.p.m.; Type of oil is SAE 10, for which the absolute viscosity at 55°C = 0.017 kg / m-s; Ambient temperature of oil = 15.5°C; Maximum bearing pressure for the pump = 1.5 N / mm2. Calculate also mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C. Heat dissipation coefficient = 1232 W/m2/°C. 12M

(OR)

3. A single row deep groove ball bearing has a dynamic load capacity of 40500N and operates on the following work cycle. 12M
   a) Radial load of 5000N at 500 rpm for 25% of the time
   b) Radial load of 10000N at 700 rpm for 50% of the time and
   c) Radial load of 7000N at 400 rpm for remaining 25% of the time Calculate the expected life of the bearing in hours.

UNIT-II

4. Determine the dimensions of an I-section connecting rod for a petrol engine from the following data: Diameter of the piston = 110 mm; Mass of the reciprocating parts = 2 kg; stroke length = 150 mm; Length of connecting rod from centre to centre = 325 mm; speeds variation = 1500 to 2500 rpm and Maximum explosion pressure = 2.5 MPa. Assume suitable data, if required. 12M

(OR)

5. Design a side crankshaft for a 500 mm × 600 mm gas engine. The weight of the flywheel is 80kN and the explosion pressure is 2.5 N/mm^2. The gas pressure at maximum torque is 0.9 N/mm^2 when the crank angle is 30^0. The connecting rod is 4.5 times the crank radius. Any other data required for the design may be assumed. 12M

UNIT-III

6. Design a cast iron piston for a single acting 4 stroke engine for the following data: Cylinder bore is 100 mm, Stroke length is 125 mm, maximum gas pressure is 5 MPa, mean effective pressure is 0.75 MPa, mechanical efficiency is 80 %, speed of fly wheel is 2000 rpm, thermal conductivity of cast iron is 46.6 W / m K — 12M

(OR)

7. A flat belt, 8 mm thick and 100 mm wide transmits power between two pulleys, running at 1600 m/min. The mass of the belt is 0.9 kg/m length. The angle of lap in the smaller pulley is 165° and the coefficient of friction between the belt and pulleys is 0.3. If the maximum permissible stress in the belt is 2 MN/m2, find (i) Maximum power transmitted, and (ii) Initial tension in the belt. — 12M

UNIT-IV

8. It is required to design a pair of spur gears with 20^0 full-depth involute teeth consisting of a 200-teeth pinion meshing with a 50 teeth gear. The pinion shaft is connected to a 22.5 kW. 1450 rpm electric motor. The starting torque of the motor can be taken as 150% of the rated torque. The material for the pinion is plain carbon steel Fe 410 (Sut = 410 N/mm^2). While the gear is made of grey cast iron FG 200 (Sut = 200 N/mm^2). The factor of safety is 1.5. Design the gears based on the Lewis equation and using velocity factor to account for the dynamic load. — 12M

(OR)

9. a) Define Helix angle, Normal Pitch, Axial Pitch of helical gear — 3M
   b) Derive expression for virtual number of teeth in a helical gear. — 9M

UNIT-V

10. a) What is self locking of power screw? What is the condition for self locking? State the application of self lacking? — 4M
    b) A double threaded power screw, with ISO metric trapezoidal threads, is used to raise a load of 300 KN. The nominal diameter is 100 mm and pitch is 12mm. The coefficient of friction at screw threads is 0.15. Neglecting collar friction, calculate i) torque required to raise the load. ii) Torque required lower the load iii) efficiency of the screw. — 8M

(OR)

11. A screw jack carries a load of 22 kN. Assuming the coefficient of friction between screw and nut as 0.15, design the screw and nut. Neglect collar friction and column action. The permissible compressive and shear stresses in the screw should not exceed 42 MPa and 28 MPa respectively. The shear stress in the nut should not exceed 21 MPa. The bearing pressure on the nut is 14 N/mm2. Also determine the effort required at the handle of 200 mm length in order to raise and lower the load. What will be the efficiency of screw? — 12M

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AR13

CODE: 13EC3018 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
III B.Tech I Semester Supplementary Examinations, February,2022

SIGNALS AND SYSTEMS
(Electrical and Electronics Engineering)

Time: 3 Hours **Max Marks: 70**

PART-A

ANSWER ALL QUESTIONS **[1 x 10 = 10 M]**

1. a) Distinguish continuous time and discrete time signals and give examples.
   b) Define periodic and non periodic signals. Give an example in each case.
   c) Define a linear system. When do you say that the system is LTI system?
   d) List the properties of convolution integral.
   e) Define inverse Fourier transform.
   f) What are the limitations of Fourier transform?
   g) What is the condition for convergence of the Laplace transform?
   h) Define poles and zeros of a transfer function.
   i) State final value theorem of Z-transform.
   j) Define ROC of a Z-transform.

PART-B

Answer one question from each unit **[5x12=60M]**

UNIT-I

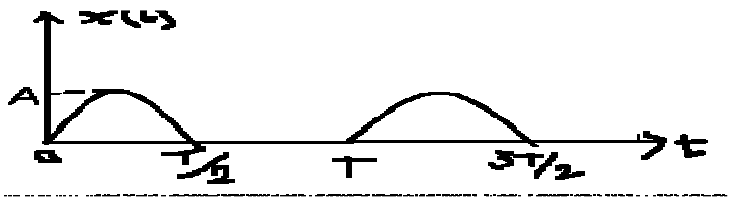
2. a) Find the even and odd components of the signal 6M
   $x(t) = \cos t + \sin t + \cos t \sin t$
   b) Determine the power of the following signals 6M
   (i) $5\cos(50t+(\pi/3))$ (ii) $10\cos(5t)\cos(10t)$

(OR)

3. a) Find whether the following signals are periodic or not. If periodic, find the fundamental period. 6M
   (i) $\cos(n/4)$ ii) $20\cos(10\pi t+(\pi/3))$
   b) Explain all classification of systems with examples for each category. 6M

UNIT-II

4. a) Obtain the trigonometric Fourier series for the half wave rectified sine wave as given below. 6M



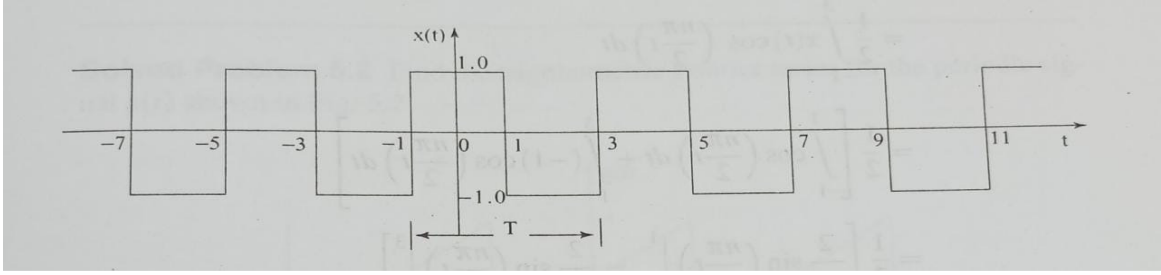
   b) State and prove time reversal and time shifting properties of Fourier series. 6M

(OR)

AR13

CODE: 13EC3018 **SET-2**

5. a) With regard to Fourier series representation , justify the following statements 6M
   a) Odd functions have only sine terms
   b) Even functions have no sine terms.
   b) Find the trigonometric Fourier series for the periodic signal x(t) shown in below figure. 6M



UNIT-III

6. a) State and prove the following properties of Fourier transform. 6M
   i) linearity ii) time scaling
   iii) frequency shifting
   b) Determine the Fourier Transform for double exponential pulse whose function is given by $y(t) = e^{-2|t|}$ Also draw its magnitude and phase spectra. 6M

(OR)

7. a) Explain the condition required for existence of Fourier transform. 6M
   b) Find the Fourier transform for the following signals 6M
   a) $f(t)=e^{-a|t|}$ b) f(t) = u(t)

UNIT-IV

8. a) State and Prove Initial value and Final value theorems with respect to Laplace transform 6M
   b) Find the Laplace Transform X(S) and sketch the pole-zero plot with the ROC for the following signal $x(t) = e^{2t}u(t)+e^{-3t}u(-t))$. 6M

(OR)

9. a) State and prove the convolution and differentiation properties of Laplace transform. 6M
   b) Find the inverse laplace transform of 6M
   $F(s)=(s+4)/(s+3)(s+2)$; $-3<Re(s)<-2$

UNIT-V

10. a) State and prove the following properties of Z transform 6M
    i) Linearity ii) Time shifting iii) Differentiation
    b) Find the z-transform and ROC of 6M
    i) $a^n u(n)$ ii) $-(0.8)^n u(-n-1)$

(OR)

11. a) Explain the properties of ROC for Z Transforms. 6M
    b) Find the inverse z-transform of $x(z) = (z^2+z) / (z-1)(z-3)$, ROC: $z > 3$. Using Partial fraction method 6M