AR18

CODE: 18CET311 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations, June-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) 1 cum of wet soil weighs 20 kN. Its dry weight is 18 kN. The value of specific gravity of soil solids is 2.67. Determine water content, porosity, void ratio and the degree of saturation and draw the phase diagram. **6M**
   b) Discuss the significance of well graded, poorly graded and uniformly graded soils with standard curves. **6M**

(OR)

2. a) Draw the phase diagrams of soil when the soil is fully saturated and when the soil is in partially saturated condition. **6M**
   b) Derive the relation between void ratio, degree of saturation, moisture content and specific gravity of soil. **6M**

UNIT-II

3. a) Derive coefficient of permeability equation for variable head test. **6M**
   b) Describe the phenomena of quicksand condition with a neat sketch and derive an equation for critical hydraulic gradient. **6M**

(OR)

4. a) The following details are observed from constant head test: Internal diameter of mould of 10cm, head loss and length of sample are 7cm and 12.5cm, quantity of water collected in 60 sec is 350ml and porosity of soil sample was 44%. Calculate coefficient of permeability, discharge velocity and seepage velocity. **6M**
   b) Derive an equation for seepage discharge through a soil based on flow net. **6M**

UNIT-III

5. a) A concentrated load of 50 kN acts on the surface of a soil. Determine the vertical stress at a depth 10 meters beneath the point load. Also plot the variation in vertical stress due to the load on a horizontal planes at depths of 1 meter and 3 meters upto a horizontal distance of 3 meters on either side. Use Boussinesq's approach. **6M**
   b) A 4m thick of clay soil underline by 3.5m 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 **6M**

(OR)

6. a) Define total stress, effective stress and neutral stress. **6M**

b) A hollow circular foundation use in construction of water tank has internal diameter and external diameter are 6m and 8m respectively. The uniform pressure act on foundation is 22kN/m^2. Determine the vertical stress at the center of foundation of depth 8m. **6M**

UNIT-IV

7. a) Write the procedure for compaction test as per IS light weight compaction in detail. **6M**

b) A clay soil, tested in a consolidometer, showed a decrease in void ratio from 1.2 to 1.1 when pressure was increased from 0.25 to 0.5 kg/cm^2 and having thickness of 1.9cm. Calculate the coefficient of compressibility (a_v), coefficient of volume compressibility (m_v) and coefficient of compression index (Cc). **6M**

(OR)

8. a) A footing for a water tower carries a load of 850t and 3.5m square and depth of foundation is 1.5m. It rests on dense sand of 9m thickness overlaying a clay layer of 3m depth. The clay layer overlies by hard rock. Liquid limit of clay is 54%, void ratio is 1.08. The saturated unit weights of sand and clay are 1.89 g/cc and 1.79 g/cc. Assume load distribution as 2V to 1H. Assume site was flooded. Calculate consolidation settlement of clay layer. **6M**

b) Explain the various factors affecting compaction **6M**

UNIT-V

9. a) Derivation of Mohr-Coulomb's equation $\sigma_1 = \sigma_3 \tan^2 \alpha_f + 2C \tan \alpha_f$ **6M**

b) The soil sample was tested on UCS (Unconfined compressive strength) Test having dimensions of 38mm diameter and 76mm height. The soil sample fail at load of 28N and corresponding deformation of 13mm. Calculate Unconfined compressive strength and Undrained shear strength **6M**

(OR)

10. a) Explain the stress-strain curves for NCC/loose sand and OCC/ dense sand. **6M**

b) A normally consolidated clay sample tested on CU triaxial test having confined pressure and additional axial stress are 200 kN/m^2 and 150 kN/m^2. The pore water pressure of at failure was 75 kN/m^2. Determine shear strength parameters both in terms of total and effective stress by analytically or Mohr's circles method. **6M**

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AR18

CODE: 18EET311 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations, June-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)	Explain the concept of segmented memory. What are its advantages?	6M
	b)	Draw the register organisation of 8086 and explain typical application of each register.	6M
		(OR)	
2.	a)	An 8086 Processor operating on 5MHz clock rate executes a program contains 8 Instructions. Calculate time required to execute the program.	6M
	b)	Explain the interrupt response sequence of 8086.	6M

UNIT-II

3.	a)	Write a program to find out the number of even and odd numbers from a given series of 16-bit hexadecimal numbers.	6M
	b)	Write assembly language code for performing factorial of a given number.	6M
		(OR)	
4.	a)	What are the assembler directives and pseudo-ops?	6M
	b)	Write an assembly language program to find sum of squares of first ten numbers	6M

UNIT-III

5.		Draw and discuss internal architecture of 8259A.	12M
		(OR)	
6.	a)	With a neat sketch Explain the modes of operation of 8255A	6M
	b)	Draw and discuss internal architecture of 8255A	6M

UNIT-IV

7.	a)	Draw and discuss internal architecture of 80386 in detail.	6M
	b)	Draw and discuss the flag registers of 80486.	6M
		(OR)	
8.		Draw and discuss : (i) Block diagram of ARM (ii) Detail Architecture of ARM	12M

UNIT-V

9.	a)	Write a program to interface stepper motor with 8051 micr controller.	6M
	b)	With a neat sketch Explain the Architecture of 8051 Microcontroller.	6M
		(OR)	
10.	a)	How does 8051 differentiate between the external and internal program memory?	6M
	b)	Write the addressing modes of 8051 with suitable examples.	6M

AR18

CODE: 18MET309 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations, June-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) A rectangle bar is subjected to direct stresses (σ_1) in one plane only. Find the normal stresses on a oblique plane. 6M

   b) Rectangle bar of cross sectional area 10000mm^2 is subjected to an axial load of 20kN. Determine the normal and shear stress on a section which is inclined at an angle of 30^o with normal cross section of the bar 6M

(OR)

2. a) 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. 12M

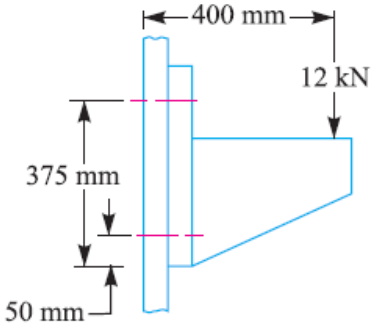
UNIT-II

3. a) Explain the procedure of determining endurance limit with neat diagram 6M

   b) Determine the thickness of a 120 mm wide uniform plate for safe continuous operation if the plate is to be subjected to a tensile load that has a maximum value of 250 kN and a minimum value of 100 kN. The properties of the plate material are as follows: Endurance limit stress = 225 MPa, and Yield point stress = 300 MPa. The factor of safety based on yield point may be taken as 1.5. 6M

(OR)

4. a) For supporting the travelling crane in a workshop, the brackets are fixed on steel columns as shown in Fig. The maximum load that comes on the bracket is 12 kN acting vertically at a distance of 400 mm from the face of the column. The vertical face of the bracket is secured to a column by four bolts, in two rows (two in each row) at a distance of 50 mm from the lower edge of the bracket. Determine the size of the bolts if the permissible value of the tensile stress for the bolt material is 84 MPa. Also find the cross-section of the arm of the bracket which is rectangular. 12M

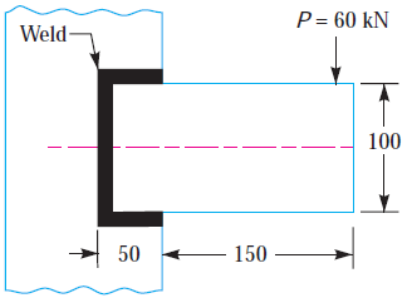


UNIT-III

5. a) Enumerate the different types of riveted joints 4M
   b) Find the efficiency of the following riveted joints : 8M
   Single riveted lap joint of 6 mm plates with 20 mm diameter rivets having a pitch of 50 mm.
   Assume Permissible tensile stress in plate = 120 MPa, Permissible shearing stress in rivets = 90 MPa and Permissible crushing stress in rivets = 180 MPa

(OR)

6. A rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load P, as shown in Fig. Determine the weld size if shear stress in the same is not to exceed 140 MPa. 12M



UNIT-IV

7. A mild steel shaft transmits 20 kW at 200 r.p.m. It carries a central load of 900 N and is simply supported between the bearings 2.5 metres apart. Determine the size of the shaft, if the allowable shear stress is 42 MPa and the maximum tensile or compressive stress is not to exceed. 56 MPa. 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 and draw a cotter joint to support a load varying from 30 kN in compression to 30 kN in tension. The material used is carbon steel for which the following allowable stresses may be used. The load is applied statically. Tensile stress = compressive stress = 50 MPa ; shear stress = 35 MPa and crushing stress = 90 MPa. 12M

(OR)

10. Find the maximum shear stress and deflection induced in a helical spring of the following specifications, if it has to absorb 1000 N-m of energy. Mean diameter of spring = 100 mm; Diameter of steel wire, used for making the spring = 20 mm; Number of coils = 30 ; Modulus of rigidity of steel = 85 kN/mm^2. 12M

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AR18

CODE: 18ECT312 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

CONTROL SYSTEMS

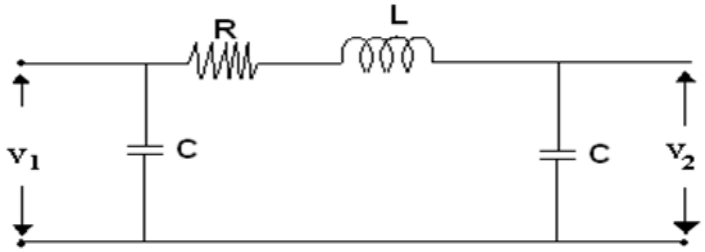
(Electronics and Communication Engineering)

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

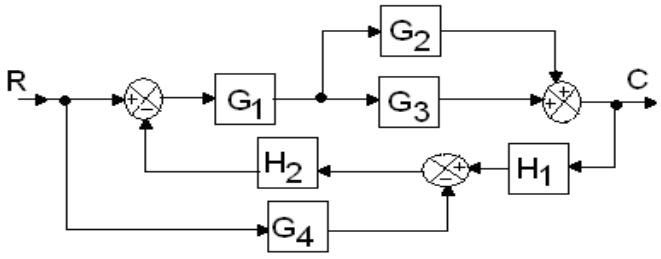
UNIT-I

1. a) Mention the advantages and disadvantages of closed loop systems. 4M
   b) Obtain $V_2(S)/V_1(S)$ for a given electrical control system. 8M



(OR)

2. a) Explain block diagram reduction technique rules. 4M
   b) Evaluate the closed loop transfer function of a system whose block diagram is given below by using signal flow graph. 8M



UNIT-II

3. a) Derive the transfer function of field flux controlled DC servo motor. 8M
   b) A unity feedback control system has an open loop transfer function $G(s) = \frac{2}{s(s+3)}$ Find T_r, T_s and steady state error for unit step input. 4M

(OR)

4. a) A unity feedback system has an open loop transfer function of $G(s) = \frac{10}{(s+1)(s+2)}$. Determine the steady state error for unit step input. 4M
   b) Write short notes on Time domain specifications. 8M

UNIT-III

5. a) A unity feedback control system has open loop transfer function is $GH(s) = \frac{K}{(S^2+S+1)(S+3)(S+6)}$. i) Determine breakaway point ii) Angle of departure 6M

   b) Construct Routh array and determine the stability of the system whose characteristic equation is $S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$. Also determine the number of roots lying on right – half of s – plane, left – half of s – plane and on imaginary axis. 6M

(OR)

6. a) Find out closed loop system stability for a following characteristics equation: 4M

   $S^4+S^3+2S^2+2S+3=0$

   b) Draw Root Locus for unity feedback control system has open loop transfer function 8M

   $G(s)H(s) = \frac{K}{S(S+2)(S+4)}$

UNIT-IV

7. A unity feedback control system has open loop transfer function 12M

   $G(s)H(s) = \frac{1}{S\ \ (S+10)(0.4S+1)}$

   Draw Bode plot b) Determine Gain margin and Phase Margin.

   c) Analyse its stability

(OR)

8. Draw Nyquist plot for open loop transfer function for a unity feedback control system: $G(s)H(s) = \frac{213}{S(S+6)}$ and also Analyse its stability. 12M

UNIT-V

9. a) Differentiate between Compensator and PID controller. 4M

   b) Compute State Transition Matrix (STM) of a state space model 8M

   $\dot{X} = \begin{bmatrix} -1 & -2 \\ 0 & -4 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \end{bmatrix} U$ and $Y = [7 \quad -3]X$

(OR)

10. a) Find out complete output response for unit step input of a system given by 6M

    $\dot{X} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} X + \begin{bmatrix} 0 \\ 5 \end{bmatrix} U$, $Y = [0 \quad 1]X$; at initial condition $X(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$.

    b) Analyse controllability and observability for the system given in Q.No:10 (a). 6M

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ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

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

CONTROL SYSTEMS

(Electronics and Communication Engineering)

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

Answer ONE Question from each Unit
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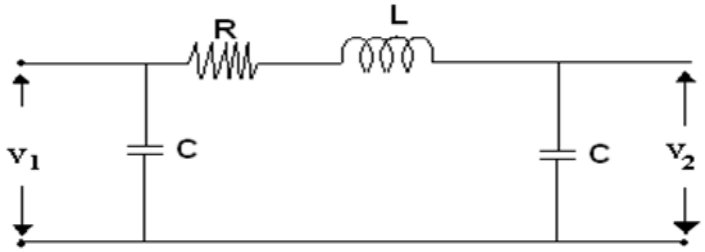
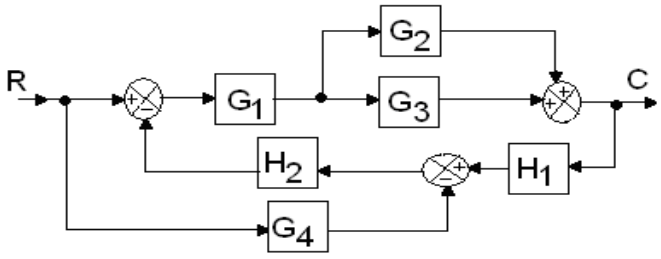
   b) Obtain $V_2(S)/V_1(S)$ for a given electrical control system. 8M



(OR)

2. a) Explain block diagram reduction technique rules. 4M
   b) Evaluate the closed loop transfer function of a system whose block diagram is given below by using signal flow graph. 8M



UNIT-II

3. a) Derive the transfer function of field flux controlled DC servo motor. 8M
   b) A unity feedback control system has an open loop transfer function $G(s) = \frac{2}{s(s+3)}$ Find T_r, T_s and steady state error for unit step input. 4M

(OR)

4. a) A unity feedback system has an open loop transfer function of $G(s) = \frac{10}{(s+1)(s+2)}$. Determine the steady state error for unit step input. 4M
   b) Write short notes on Time domain specifications. 8M

UNIT-III

5. a) A unity feedback control system has open loop transfer function is $GH(s) = \frac{K}{(S^2+S+1)(S+3)(S+6)}$. i) Determine breakaway point ii) Angle of departure 6M

   b) Construct Routh array and determine the stability of the system whose characteristic equation is $S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$. Also determine the number of roots lying on right – half of s – plane, left – half of s – plane and on imaginary axis. 6M

(OR)

6. a) Find out closed loop system stability for a following characteristics equation: 4M

   $S^4+S^3+2S^2+2S+3=0$

   b) Draw Root Locus for unity feedback control system has open loop transfer function 8M

   $G(s)H(s) = \frac{K}{S(S+2)(S+4)}$

UNIT-IV

7. A unity feedback control system has open loop transfer function 12M

   $G(s)H(s) = \frac{1}{S\ \ (S+10)(0.4S+1)}$

   Draw Bode plot b) Determine Gain margin and Phase Margin.

   c) Analyse its stability

(OR)

8. Draw Nyquist plot for open loop transfer function for a unity feedback control system: $G(s)H(s) = \frac{213}{S(S+6)}$ and also Analyse its stability. 12M

UNIT-V

9. a) Differentiate between Compensator and PID controller. 4M

   b) Compute State Transition Matrix (STM) of a state space model 8M

   $\dot{X} = \begin{bmatrix} -1 & -2 \\ 0 & -4 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \end{bmatrix} U$ and $Y = [7 \quad -3]X$

(OR)

10. a) Find out complete output response for unit step input of a system given by 6M

    $\dot{X} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} X + \begin{bmatrix} 0 \\ 5 \end{bmatrix} U$, $Y = [0 \quad 1]X$; at initial condition $X(0) = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$.

    b) Analyse controllability and observability for the system given in Q.No:10 (a). 6M

AR16

CODE: 16CE3011 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations, June-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)	The natural moisture content of an excavated soil is 32%. Its liquid limit is 60% and plastic limit is 27%. Determine the plasticity index of the soil and comment about the nature of the soil.	4M
	b)	i) Explain IS soil classification. ii) What are the different hydrometer corrections? Explain.	10M
		(OR)	
2.	a)	A dry soil has a void ratio of 0.65 and its grain specific gravity is = 2.80. (i) What is its unit weight? (ii) Water is added to the sample so that its degree of saturation is 60% without any change in void ratio. Determine the water content and unit weight. (iii) The sample is next placed below water. Determine the true unit weight (not considering buoyancy) if the degree of saturation is 95% and 100% respectively.	7M
	b)	Write a relationship between water content, void ration, degree of saturation and specific gravity of soil solids.	7M

UNIT-II

3.	a)	i) Derive expression for calculating average permeability of layered soil systems. ii) What are the uses of flow nets?	8M
	b)	A concrete dam is constructed across a river over a permeable stratum of soil of limited thickness. The water heads are upstream side 16m and 2m on the downstream side. The flow net constructed under the dam gives Nf= 4 and Nd=l2. Calculate the seepage loss through the subsoil if the average value of the hydraulic conductivity is 6 x 10-3 cm/sec horizontally and 3 x 10-4 cm/ sec vertically. Calculate the exit gradient if the average length of the last field is 0.9 m. Assuming e = 0.56, and Gs = 2.65, determine the critical gradient. Comment on the stability of the river bed on the downstream side.	6M
		(OR)	
4.	a)	A soil profile consists of a surface layer of sand 3m thick (γ=16kN/m3), an intermediate clay layer 2m thick (γsat=19.25kN/m3), and a bottom layer of gravel 4m thick (γsat=19kN/m3). The water table is at the top of the clay layer. Determine the effective stress at various interfaces. There is a surcharge of 50kN/m2 on the ground surface.	7M
	b)	Derive the expression to determine the average coefficient of permeability in the horizontal direction for a stratified soil deposit.	7M

UNIT-III

5. a) A three-legged tower forms an equilateral triangle of side 4m in plan. If the total weight of the tower is 450kN and is equally carried by all the legs, compute the vertical stress increase caused in the soil by the tower at a depth of 4m directly below one of the legs and also at the same depth below the centroid of the triangle. 6M

   b) i) A long strip footing of width 2m transmits a pressure of 200kPa to the underlying soil. Using 2 : 1 dispersion method, compute the approximate value of the vertical stress at a depth of 5m below the footing. 8M
   ii) A line load of 100kN/m run extends to a long distance. Determine the intensity of vertical stress at a point 2m below the surface at a distance of 2m perpendicular to the line load. Use Boussinesq's theory

(OR)

6. a) A ring footing of external diameter 8 m and internal diameter 4 m rests at a depth 2 m below the ground surface. It carries a load intensity 300 kN/m2 . Find the vertical stress at depths of 2, 4 and 8 m along the axis of the footing below the footing base. Neglect the effect of the excavation on the stress. 8M

   b) Write a note on 2:1 stress distribution method. 6M

UNIT-IV

7. a) i) What are the assumptions in Terzaghi's 1-D Consolidation theory? 8M
   ii) Explain consolidation concept.

   b) A clay layer 5.0m thick has double drainage. It was consolidated under a load of 127.50kN/m2 . The load is increased to 197.50kN/m2 . The coefficient of volume compressibility is 5.79 x 10–4 m2 /kN and value of k = 1.60 x 10-8 m/min. If the test sample is 2cm thick and attains 100% consolidation in 24 hours, what is the time taken for 100% consolidation in the actual layer? 6M

(OR)

8. a) An oedometer test is performed on a 4 cm thick clay sample. After 5 minutes, 50% consolidation is reached. After how long a time would the same degree of consolidation is achieved in the field where the clay layer is 8 m thick? Assume the sample and the clay layer has the same drainage boundary conditions (double drainage). 6M

   b) i) Explain coefficient of volume compressibility, coefficient of consolidation. 8M
   ii) How do you determine the consolidated settlement of a foundation?

UNIT-V

9. a) Write a note on the laboratory triaxial shear test. 7M

   b) Direct shear tests on specimens of fine sand gave the following data: 7M

Normal stress(kN/m^2)	96	135
Shear stress at failure(kN/m^2)	14.7	17.8

Find the shear strength of soil at a depth of 7 m from G.L., if the void ratio = 0.56 G = 2.56 and GWL is at a depth of 3 m from ground surface

(OR)

10. a) Write a note on the laboratory box shear test. 7M

    b) Two identical specimens of soil were tested in a tri-axial apparatus. The first specimen failed at a deviator stress of 800 kN/m2 when the cell pressure was 200 kN/m2 while the second specimen failed at a deviator stress of 1400 kN/m2 when the sell pressure was 300 kN/m2 . Determine 'c' and 'ϕ' for the soil. 7M

AR16

CODE: 16ME3013 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech I Semester Supplementary Examinations, June-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. a) What are the factors to be considered for the selection of materials for the design of machine elements? 4M

   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: 10M
      i. Maximum principal stress theory
      ii. Maximum shear stress theory
      iii. Maximum principal Strain theory
      iv. Maximum strain energy theory
      v. Maximum distortion energy theory.

   Take permissible tensile stress at elastic limit = 100 MPa and poisson's ratio = 0.3

(OR)

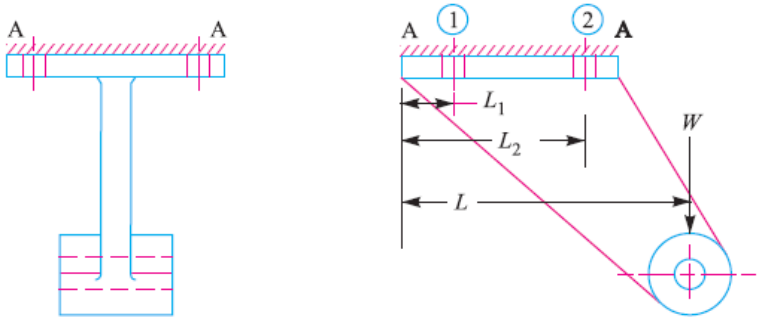
2. a) Define 'Endurance limit' 2M

   b) A circular bar of 500 mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50 kN. Determine the diameter of bar by taking a factor of safety of 1.5, size effect of 0.85, surface finish factor of 0.9. The material properties of bar are given by: ultimate strength of650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa. 12M

UNIT-II

3. a) What are the assumptions made in the design of welded joints? 2M

   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: L1 = 80 mm, L2 = 250 mm, and L = 500 mm. 12M



(OR)

4. a) Discuss the design of bolts with pre-stresses. 4M

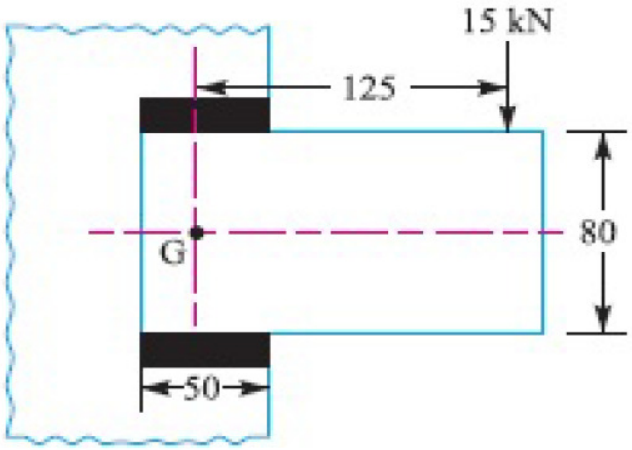
   b) The maximum pull in the tie rods of a turnbuckle used in the roof truss is 4.5 kN. The tie rods are made of steel 40C8 (S_{yt} = 380 N/mm^2) and the factor of safety is 5. Determine the nominal diameter of the threads on the tie rod on the basis of Maximum principal stress theory. Assume d_c = 0.8 d. 10M

UNIT-III

5. a) What is efficiency of riveted joint? 2M
   b) A double-riveted double cover butt joint in plates 20 mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are : σt = 120 MPa; τ = 100 MPa; σc = 150 MPa. Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear. 12M

(OR)

6. a) What is the cause of residual stresses in welded joints? How are they relieved? 4M
   b) A bracket carrying a load of 15 kN is to be welded as shown in Figure. Find the size of the weld required if the allowable shear stress is not to exceed 80 MPa. 10M



UNIT-IV

7. A solid circular shaft is subjected to a bending moment of 3000 N-m and a torque of 10000 N-m. The shaft is made of 45C8 steel having ultimate tensile stress of 700 MPa and an ultimate shear stress of 500 MPa. Assuming a factor of safety as 6. Determine the diameter of the shaft? 14M

(OR)

8. Design a clamp coupling to transmit 30 kW at 100 r.p.m. The allowable shear stress for the shaft and key are 40 MPa and the number of bolts connecting the two halves is six. The permissible tensile stress for the bolts is 70 MPa. The coefficient of friction between the muff and the shaft surface may be taken as 0.3. 14M

UNIT-V

9. Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. 14M

(OR)

10. A locomotive semi-elliptical laminated spring has an overall length of 1 m and sustains a load of 70 kN at its centre. The spring has 3 full-length leaves and 15 graduated leaves with a central band of 100 mm width. All the leaves are to be stressed to 400 MPa when fully loaded. The ratio of the total spring depth to that of width is 2. E = 210000 MPa. Determine: (i). The thickness and width of the leaves. (ii). The initial gap that should be provided between the full length and graduated leaves before the band load is applied. (iii). The load exerted on the band after the spring is assembled. 14M

AR13

CODE: 13EC3018 **SET-1**

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

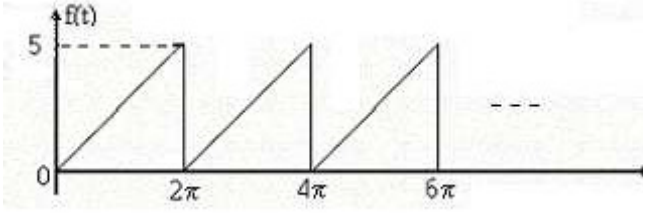
(OR)

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

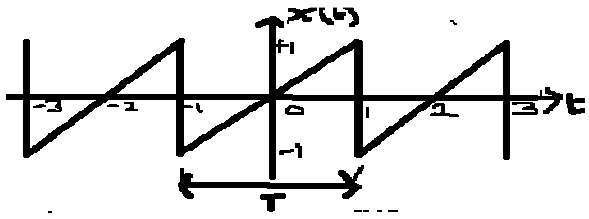
4. a) Discuss the concept of trigonometric Fourier series and derive the expressions for coefficients. 6M
   b) Find the trigonometric Fourier series of the waveform shown in below figure: 6M



(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. a) Obtain the Fourier transform of the following functions. i) Rectangular function ii) DC signal iii) Unit step function. 6M

b) State and prove differentiation and integration properties of Fourier transform. 6M

UNIT-IV

8. a) Find the Laplace transform of the following signals i) Impulse function ii) unit step function iii) A sin w_0t u(t). 6M

b) Find the Laplace transform of the signal $x(t) = e^{-at} u(t) + e^{-bt} u(-t)$ 6M

(OR)

9. a) State and prove the scaling and time shifting properties of Laplace transform. 6M

b) Determine the Laplace transform of $x(t) = e^{-at} \cos wt\, u(t)$. 6M

UNIT-V

10. a) Distinguish between Fourier transform, Laplace transform and Z- transforms. 6M

b) State and prove time shifting and time convolution properties of Z- transform. 6M

(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_0n] u(n) 6M