AR18

CODE: 18CET316 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech II Semester Regular/Supplementary Examinations, July, 2022

GEOTECHNICAL ENGINEERING-II

(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) Describe standard penetration tests. 6M
   b) What are design features of a good sampler. 6M

(OR)

2. a) How will you stabilize a bore hole at a site characterized by a clay layer underlain by a fine sand layer in which artesian conditions are known to exist. 6M
   b) Discuss the stages in sub-surface explorations? 6M

UNIT-II

3. a) With neat sketches explain about different types of slope failures. 6M
   b) An embankment is to be made of a soil which has the following shear strength parameters under the existing conditions $c' = 35$ kN/m^2 and $\Phi' = 15^o$. It is assumed that different margins of safety are available for cohesion and friction are $C_m = 25$ kN/m^2 and $\Phi_m = 10^o$, If the average value of normal effective stress on the failure surface is 120 kN/m^2. What is the factor of safety with respect to (a) cohesion and (b) friction (c) shear strength? 6M

(OR)

4. a) Derive formula for factor of safety of slope stability using friction circle method? 8M
   b) Determine the factor of safety with respect to cohesion for a submerged embankment 20 m high and having a slope of $i = 35^o$, $c = 40$ kN/m^2, $\Phi = 35^o$ and $\gamma_{sat} = 20$ kN/m^3. Take $S_n = 0.097$ 4M

UNIT-III

5. a) Discuss in details on the method of estimating the active earth pressure on a retaining wall by using the Columb's method. 6M
   b) A retaining wall 8m height with a smooth vertical back retains the following materials. (a) Top 2m: clay, $\gamma_s = 1.75$g/cc, $\Phi = 0$, and $c = 10$kN/m^2, (b) Bottom 6m, saturated sand, $\gamma_s = 1.95$g/cc and $\Phi = 30^0$, if the water level is on top of the sand layer, draw the diagram of lateral pressure on the wall assuming that no tension crack develops on the top layer. 6M

(OR)

6. a) Explain the factors affecting the lateral earth pressure 4M

b) A retaining wall of 4.5 m high with a smooth vertical back. The backfill has a horizontal surface in level with top of the wall and carries a uniformly distributed surcharge load of 20t/m^2. The density, angle of internal friction and -cohesive value of soil is 1.9 t/m^3,30° and zero respectively. Estimate the magnitude and point of application of the total active pressure per meter length of the wall. 8M

UNIT-IV

7. a) A continuous footing of width 2.5m rests 1.5m below and ground surface in clay. The unconfined compressive strength of the clay is 150 KN/m^2. Calculate the ultimate bearing capacity of the footing, when there is no effect of water table and when water reaches ground surface. Take γ =18 KN/m^3, γ_{sat} = 20 KN/m^3. 4M

b) Soil investigation at a site gave the following information. Top soil up to a depth of 10.6 m is fine sand, and below this lies soft clay layer of 7.60 m thick. The water table is at 4.60 m below the ground surface. The submerged unit weight of sand is 10KN/m^3 and unit weight above water table is 17.6 KN/m^3. The water content of the normally consolidated clay w_n= 40% its liquid limit, w_l= 45%, and specific gravity of the solid particle is 2.78. The proposed construction will transmit a net stress of 120 KN/m^2 Find the average settlement of clay layer. 8M

(OR)

8. a) What are the assumptions in Terzaghi's theory for shallow foundations and also types of shear failures? 6M

b) A 3 m X 4 m rectangular footing is eccentrically loaded. The resultant is 0.2 m outside of centroid width wise, and 0.3 m outside of centroid length wise. If c = 10kPa, ϕ = 25°, γ=16kN/m^3, find the safe load carried by footing. What would have been the increase in load carried, if the load was concentric? Take Nc=25.1,Nq =12.7, Nγ = 9.7. 6M

UNIT-V

9. a) Define static formulae for ultimate bearing capacity of pile? 4M

b) A group of 16 piles with 4 piles in a row were driven into soft clay extending from ground level to a great depth. The diameter and length of piles are 30cm and 10m respectively. The unconfined compressive strength of clay is 100kPa. If the piles were spaced at 90cm c/c, compute the allowable load on the pile group on the basis of shear failure criterion for a factor of safety of 2.5, Assume adhesion factor 0.6. 8M

(OR)

10. a) Explaining about negative skin friction of pile foundation. 4M

b) A group of 16 piles of 10 m length and 0.5 m diameter is installed in a 10 m thick stiff clay layer underlain by rock. The pile-soil adhesion factor is 0.4. Average shear strength of soil on the sides is 100 kPa.Undrained shear strength of soil at the base is also 100 kPa. Calculate the base resistance of a single pile and the group side resistance assuming 100 % efficiency of group. 8M

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AR18

CODE: 18EET316 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech II Semester Regular/Supplementary Examinations, July, 2022

INDUSTRIAL AUTOMATION

(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 basic components of automation.	6M
	b)	Illustrate the control elements in industrial automation.	6M
		(OR)	
2.	a)	Describe the history and development of industrial automation.	6M
	b)	Explain the sensing elements in industrial automation.	6M

UNIT-II

3.		Explain various program control instructions in detail.	12M
		(OR)	
4.	a)	List out some applications of PLC	6M
	b)	Describe various types of PLCs	6M

UNIT-III

5.		Develop Ladder logic diagram for each of the following Boolean expressions using AND, OR, and NOT gates: (a) Y= ABC + D (b) Y= AB + CD (c) Y= (A+ B) ($\bar{C}$+D)	12M
		(OR)	
6.	a)	Write a brief note on construction of PLC ladder diagrams.	6M
	b)	Describe the application of ladder diagrams in process control.	6M

UNIT-IV

7.	a)	Explain up-counter and down-counter briefly.	6M
	b)	Explain any Boolean logic function with example.	6M
		(OR)	
8.		Explain PLC timer and counter functions in detail.	12M

UNIT-V

9.	a)	Define SCADA. Give the history of SCADA system and its hierarchy.	8M
	b)	Explain the benefits of SCADA system.	4M
		(OR)	
10.	a)	Give the architecture of SCADA and its components.	6M
	b)	Explain remote terminal unit in detail.	6M

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AR18

CODE: 18MET315 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech II Semester Regular/Supplementary Examinations, July, 2022

DYNAMIC SYSTEMS & MECHANICAL VIBRATIONS

(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 cam is to give the following motion to a knife-edged follower: 12M
   1. Outstroke during 60° of cam rotation; **2.** Dwell for the next 30° of cam rotation;
   3. Return stroke during next 60° of cam rotation, and **4.** Dwell for the remaining 210° of cam rotation.
   The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The
   follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft.

(OR)

2. A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below : 12M
   1. To raise the valve through 50 mm during 120° rotation of the cam ;
   2. To keep the valve fully raised through next 30°;
   3. To lower the valve during next 60°; and
   4. To keep the valve closed during rest of the revolution i.e., 150°;
   The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion. When the cam shaft rotates at 100 r.p.m, draw the displacement, the velocity and the acceleration diagrams for one complete revolution of the cam.

UNIT-II

3. Four masses A, B, C and D carried by a rotating shaft are at radii 100, 140, 210 and 160 mm respectively. The planes in which the masses revolve are spaced 600mm apart and the masses of B, C and D are 16 kg, 10 kg and 8 kg respectively. Find the required mass A and the relative angular positions of the four masses so that shaft is in complete balance. 12M

(OR)

4. A single cylinder reciprocating engine has speed of 240 rpm and stroke 300mm, mass of reciprocating parts 50kg, mass of revolving parts at 150mm radius is 37kg. If two third of the reciprocating parts and all the revolving parts are to be balanced, find 12M
   i. the balance mass required at a radius of 400mm, and
   ii. the residual unbalanced force when the crank has rotated 60^0 from top dead centre

UNIT-III

5. A mass of 10 kg is suspended from one end of a helical spring, the other end being fixed. The stiffness of the spring is 10N/mm. The viscous damping causes the amplitude to reduce to one-tenth of the initial value in four complete oscillations. If a periodic force of 150Cos50t N is applied at the mass in the vertical direction, find the amplitude of the forced vibrations. What is its value at resonance. 12M

(OR)

6. The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined together to give a spring stiffness of 5.4N/mm. If the vibrating system has a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1m/s, find 1. Critical damping coefficient 2. Damping factor 3. Logarithmic decrement and 4. Ratio of two consecutive amplitudes. 12M

UNIT-IV

7. A shaft 1.5 m long, simply supported in flexible bearings at the ends carries two wheels each of 50 kg mass. One wheel is situated at the centre of the shaft and the other at a distance of 375 mm from the centre towards left. The shaft is hollow of external diameter 75 mm and internal diameter 40 mm. The density of the shaft material is 7700 kg/m^3 and its modulus of elasticity is 200 GN/m^2. Find the whirling speed of the shaft, taking into account the mass of the shaft. 12M

(OR)

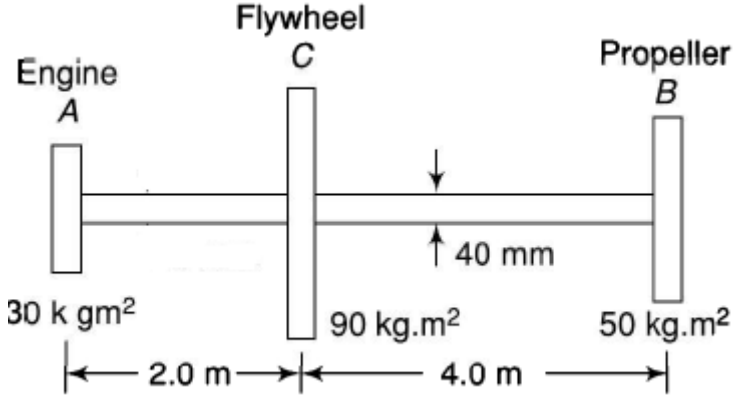
8. A shaft 50 mm diameter and 3 metres long is simply supported at the ends and carries three loads of 1000 N, 1500 N and 750 N at 1 m, 2 m and 2.5 m from the left support. The Young's modulus for shaft material is 200 GN/m^2. Find the frequency of transverse vibration. 12M

UNIT-V

9. Derive an expression for Natural Frequency of Free Torsional Vibrations 12M

(OR)

10. For the torsional system shown, find the single-node and two node frequency of torsional vibrations and their positions. 12M



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AR18

CODE: 18ECT316 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech II Semester Regular/Supplementary Examinations, July, 2022

DIGITAL SIGNALPROCESSING

(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) A pair of sinusoidal signals with a common angular frequency is represented by $x_1(n) = 3\sin(3\pi n)$ and $x_2(n) = \sqrt{3}\sin(3\pi n)$. Specify the period N of both $x_1(n)$ and $x_2(n)$ must satisfy them to be periodic. 6M

   b) Check the stability of the following systems: (i). $y(n) = e^{x(n)}$ (ii). $y(n) = \cos x(n)$ 6M

(OR)

2. a) Explain the following with respect to systems: Causality, Linearity and Stability 6M

   b) Prove the linear and time shifting properties of Z- transformer. 6M

UNIT-II

3. a) State and prove the multiplication property of Discrete time Fourier series. 6M

   b) Find the four point DFT of the sequence $x(n) = \begin{cases} 1, & 0 \le n \le 3 \\ 0 & elsewhere \end{cases}$ 6M

(OR)

4. a) State and prove any two properties of DFT. 4M

   b) Find the 8 point DFT of the sequence $x(n) = \{1,2,3,4,4,3,2,1\}$ using radix-2 DIT FFT algorithm. 8M

UNIT-III

5. a) Explain the the direct form-I and direct form realization of IIR filters in detail. 6M

   b) Obtain the direct form-I and direct form-II realization of the filter 6M

$$y(n) - \frac{1}{8}y(n-1) + \frac{1}{7}y(n-2) + \frac{1}{6}y(n-3) = x(n) - \frac{1}{2}x(n-1) + \frac{1}{3}x(n-2) - \frac{1}{4}x(n-3)$$

(OR)

6. a) Write the advantages and disadvantages of IIR filter over FIR filters. 6M

   b) Obtain the cascade realization of the given FIR filter 6M

$H(z) = 1 + 6z^{-1} + 19z^{-2} + 35z^{-3} + 42z^{-4} + 29z^{-5} + 12z^{-6}$

UNIT-IV

7. a) Explain the application of Wiener smoothing to noise cancelling. 6M

   b) Explain Wiener smoothing filters in detail.. 6M

(OR)

8. a) Discuss the factors determine the choice of adaptation. 6M

   b) Explain Normal equations for linear prediction filtering. 6M

UNIT-V

9. a) Draw the architecture of TMS 320C5X processor and explain the function each block in detail. 8M

   b) Explain the MAC concept in detail. 4M

(OR)

10. a) What are the differences between digital signal processors and microprocessors? 4M

    b) Define pipelining. Explain the advantages of pipelining. 8M

AR18

CODE: 18CST314 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech II Semester Regular/Supplementary Examinations, July, 2022

DATA MINING

(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 data mining? Discuss about motivating challenges.	6M
	b)	Describe any four data mining tasks.	6M
		(OR)	
2.	a)	Explain various measures of similarity and dissimilarity.	6M
	b)	What are different types of data? Explain structured data with suitable example.	6M

UNIT-II

3.	a)	Explain in detail about the implementation of a data warehousing.	6M
	b)	Explain multidimensional data model with a neat diagram.	6M
		(OR)	
4.	a)	Discuss summarization-based characterization	6M
	b)	Explain Analytical characterization.	6M

UNIT-III

5.	a)	Explain about Association rule Mining.	6M
	b)	Discuss about FP-growth algorithm with example.	6M
		(OR)	
6.	a)	Write short notes on Maximal Frequent Item Set.	6M
	b)	Discuss about Apriori algorithm.	6M

UNIT-IV

7.	a)	Discuss about Decision tree induction algorithm with an example.	6M
	b)	Explain the Naive Bayesian Classification algorithm.	6M
		(OR)	
8.	a)	Discuss the Issues Regarding Classification and Prediction,	6M
	b)	Explain about Rule-Based Classification.	6M

UNIT-V

9.	a)	What do you meant by Clustering? Explain different types of Clusters.	6M
	b)	Explain in detail about Hierarchical Clustering.	6M
		(OR)	
10.	a)	Explain in detail K-means algorithm.	6M
	b)	Explain DBSCAN Algorithm.	6M

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AR16

CODE: 16EC3016 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech II Semester Supplementary Examinations, July-2022

ANALOG AND DIGITAL ELECTRONIC CIRCUITS

(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) Obtain the response of RC Low pass circuit excited by a pulse waveform. 7M

   b) A symmetrical square wave is applied to high pass circuit having R= 20KΩ, C=0.05μF. If the frequency of the input signal is 1KHz and the signal swings between ±5V, draw to scale the output waveform and indicate the voltages. 7M

(OR)

2. a) Explain the working of shunt clippers (Positive & Negative clippers) with help of transfer characteristics. 7M

   b) A square wave has to be generated by passing a sine wave through a clipper. The square wave has to have an upper level of -4V and a lower level of -7V. The period of the square wave is to be 5ms. Draw the necessary clipper circuit and transfer characteristics. 7M

UNIT-II

3. a) With neat diagrams, explain how the transistor behaves as a switch. 7M

   b) Write a short notes on transistor switching times. 7M

(OR)

4. a) Explain the construction and working of fixed bias bistable multivibrator circuit. 7M

   b) Explain the operation of Astable multivibrator circuit with neat sketch. 7M

UNIT-III

5. a) Write the characteristics of the ideal op-amp and draw the pin diagram for 741 op-amp. 7M

   b) Explain how the op-amp is used as integrator with necessary equations and draw the input and output waveforms by considering the square wave as input. 7M

(OR)

6. a) Explain in detail all the DC characteristics of ideal op-amp with relevant expressions. 7M

   b) Draw the diagram of a First order high pass filter and obtain the expression for transfer function, write the expression for cut-off frequency 7M

UNIT-IV

7. a) Draw the functional diagram of a 555 timer IC ad explain the function of each internal block to obtain astable multivibrator operation. 7M

   b) Explain the operation of the PLL with the help of the block diagram 7M

(OR)

8. a) Explain the working of the weighted resistor digital to analog converter and state the features. 7M

   b) Draw the block diagram of a successive approximation 3 – bit ADC and explain the circuit operation in detail. 7M

UNIT-V

9. a) Design two input ECL OR/NOR Gate and discuss its operation. 7M

   b) Design two input NAND Gate using CMOS technology and explain its operation with the help of truth table. 7M

(OR)

10. a) Design two input TTL NAND Gate and discuss its operation. 7M

    b) Write the Characteristics, Advantages, Disadvantages of ECL logic. 7M

AR16

CODE: 16CE3018 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech II Semester Supplementary Examinations, July-2022

GEOTECHNICAL ENGINEERING-II

(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) Describe various methods of soil exploration. 7M
   b) Discuss standard penetration test. What are the various corrections? What is the importance of the test geotechnical engineering? 7M

(OR)

2. a) Describe the split-spoon sampler. What is its use? 7M
   b) What are the factors that affect the sample disturbance? How are the effect minimized? 7M

UNIT-II

3. a) Discuss different types of failure surfaces that can be considered in slope stability analyses. 7M
   b) Determine the factor of safety with respect to cohesion for a submerged embankment 25m high and having a slope of 40^0,(ϕ = 10°,c = 40 kN/m^2; γ_{sat} = 20 kN/m^3). 7M

(OR)

4. a) A long natural slope in an over consolidated clay (C'=19.5kN/m^2, ϕ=25^0, γ sat=19.5kN/m^3) is inclined at 10^0 to the horizontal. The water table is at the surface and the seepage is parallel to the slope. If a plane slip had developed at a depth of 5m below the surface. Determine the factor of safety. Take γ_w=10kN/m^3. 7M
   b) Derive the equation for FS of infinite slope in a purely cohesive soil. 7M

UNIT-III

5. a) A wall of 8 m height retains sand having a density of 1.936 Mg/m^3 and angle of internal friction of 34°. If the surface of the backfill slopes upwards at 15° to the horizontal, find the active thrust per unit length of the wall. Use Rankine's conditions. 7M
   b) A retaining wall of 8 m high retains cohesionless soil (backfill) with an angle of internal friction 30^0. The backfill surface is level with the top of the wall. The unit weight of the top 3 m of the fill is 19kN/m^3 and that of the rest is 20kN/m^3. Water table is at the surface level of the backfill. Find the magnitude and point of application of the active thrust. 7M

(OR)

6. a) A 6 m high retaining wall is to support a soil with weight $\gamma = 17.4$ kN/m^3, ϕ=26degrees and c'=14.36kN/m^2. Determine the rankines active force per unit length of wall before the tensile crack occurs find the critical depth. 7M

   b) Determine the distribution of active earth pressure and total active force acting on a 6 m high smooth wall with sand as backfill. The sand properties are $\phi = 32°$, $\gamma = 18$ kN/m^3; $\gamma_{sat} = 21$ kN/m^3. Water level behind the wall is at 3 m below the Sand surface. 7M

UNIT-IV

7. a) Discuss the various factors influencing the bearing capacity of a footing on (i) a cohesionless soil and (ii) a purely cohesive soil 7M

   b) A 1.5 m wide strip footing is resting -on a sandy soil stratum having unit weight of soil $\gamma = 18$ kN/m3 , γsat = 21 kN/m ^{3}, $\Phi = 35°$, and c =0 and its base at a depth of 1.5 m from ground level. Determine the safe bearing capacity of the footing if the ground water table is located (a) at a depth of 1m below the ground surface and (b) at a depth of 1.0 m below the base of the footing. Assume a factor of safety of 2 and bearing capacity factors N q = 33.3 and Nγ = 48.03. 7M

(OR)

8. a) A rectangular footing (3 m x 2 m) exerts a pressure of 150 kN/m^2 on a cohesive soil (E value of 5 x 10^4 kN/m^2 and μ=040). Determine the immediate settlement at the Centre, Assuming the footing is a) flexible, b) rigid. 6M

   b) A strip footing 2 m wide carries a load intensity of 400kN/m^2 at a depth of 1.2 m in sand. The saturated unit weight of sand is 19.5kN/m^3 and unit weight above water table is16.8kN/m^3. The shear strength parameters are $C^1 = 0$ and $\Phi^1 = 35^o$. Determine the factor of safety with respect to shear failure for the following cases of location of water table. (a) at a depth of 0.5 m below the ground surface, (b) At a depth of 0.5m below the base of the footing and bearing capacity factors N q = 33.3 and Nγ = 48.03. 8M

UNIT-V

9. a) List different types of deep foundations based on shape and size 6M

   b) A 500 mm diameter and 22 m long RCC pile is to be installed at a site, which is characterized by two clay layers. The top layer is 12 m thick, has a γ_t = 20kN/m^3 and a Cu = 70kN/m^2. The bottom layer is 20 m thick, has a γ_t = 22kN/m^3 and a Cu = 90 kN/m^2. The ground water table is at the ground surface. Determine the ultimate axial load capacity of the pile. Assume α = 0.9 for both the clay layers (c = Cu = Su = Undrained shear strength). 8M

(OR)

10. a) Explain different classifications of piles with neat sketches.. 8M

    b) A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of the piles were 30 cm and 9 m respectively. If the unconfined compression strength of the clay is 90kN/m^2, and the pile spacing is 90 cm centre to centre. What is the capacity of the group? Assume a factor of safety of 2.5 and adhesion factor of 0.75. 6M

AR16

CODE: 16ME3019 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech II Semester Supplementary Examinations, July-2022

MECHANICAL VIBRATIONS

(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 cam operating a roller follower with radius of 10mm has the following data 14M

- Follower moves outwards through 40mm during 90° of cam rotation.
- Follower dwells for the next 45°.
- Follower returns of its original position during next 90°.
- Follower dwells for the rest of the rotation.

The displacement of the follower is to take place with SHM during the outward and uniform velocity motion during the return strokes. The least radius of the cam is 50mm. Draw the profile of the cam when the axis of the follower is offset 20mm towards right from the cam axis. If the cam rotates at 300 r.p.m., determine maximum velocity and acceleration of the follower during the outward stroke and the return stroke.

(OR)

2. a) Discuss about classification of followers. 4M

b) Cam with 25 mm as minimum diameter is rotating clockwise at a uniform speed of 1000 rpm and has to give the motion to the roller follower 10mm diameter as defined below: 10M

- Follower to complete outward stroke of 30mm during 120^0 of cam rotation with equal uniform velocity
- Follower to dwell for 60^0 of cam rotation.
- Follower to return to its initial position during 120^0 of cam rotation with SHM.
- Follower to dwell for the remaining 90^0 of cam rotation.

Layout the cam profile when the roller follower axis passes through the axis of the cam.

UNIT-II

3 A shaft carries four rotating masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks of the masses measured anti clockwise are A to B 45^0, B to C 70^0 and C to D 120^0. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions. 14M

(OR)

4. a) Define static and dynamic balancing. 2M

b) A single cylinder engine runs at 250 rpm and has stroke of 180mm. the reciprocating part has a mass of 120kg and revolving parts are equivalent to mass of 70kg at a radius of 90mm. A mass is placed opposite to the crank at a radius of 150mm to balance the whole of the revolving mass and 2/3 of the reciprocating mass. Determine the magnitude of the balancing mass and the resultant residual unbalance force when crank has turned 30^0 from the inner dead centre; neglect the obliquity of the connecting rod. 12M

UNIT-III

5. a) A harmonic motion is given by, x = 10 Sin ($\omega t - 60^0$) mm. Determine **i.** Frequency **ii.** Time Period **iii.** Maximum Velocity **iv.** Maximum acceleration — 8M

   b) An unknown mass m is hung on a spring of unknown stiffness k. When a mass m1 = 0.5 kg is added to m, the system natural frequency is lowered from 50Hz to 49Hz. Determine the values of m and k. — 6M

(OR)

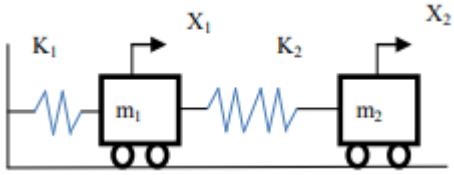
6. a) A simple pendulum is found to vibrate at a frequency of 0.5 Hz in a vacuum and 0.45 Hz in a viscous fluid medium. Find the damping constant, assuming the mass of the bob of the pendulum is 1 Kg. — 7M

   b) The deflection of the spring when the system is at rest is 1.25cm. The mass weighs 9Kg. The amplitude of a free vibration decreases from 0.4 in to 0.1 in 20 cycles. What is the damping constant? — 7M

UNIT-IV

7. a) Define the terms free and forced vibrations. — 4M

   b) For the un-damped two DOF systems shown in figure with the generalized coordinates X1, X2, determine (i) The principal coordinates, and (ii) The ensuing vibrations of the system for the initial conditions. — 10M



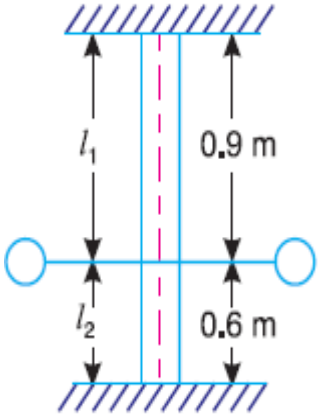
(OR)

8. a) Define the term radius of gyration. — 4M

   b) A Machine runs at 3000 rpm. Its forcing frequency is very near to its natural frequency. If the nearest frequency of the machine is to be at least 10% from the forced frequency, design a suitable vibration absorber for the system. Assume the mass of the machine as 20 kg. — 10M

UNIT-V

9. A flywheel is mounted on a vertical shaft as shown in Figure. The both ends of the shaft are fixed and its diameter is 50 mm. The flywheel has a mass of 500 kg and its radius of gyration is 0.5m. Find the natural frequency of torsional vibrations, if the modulus of rigidity for the shaft material is 80 GN/m^2. — 14M



(OR)

10. A steel shaft ABCD 1.5m long has flywheel at its ends A and D. The mass of the flywheel A is 600 kg and has a radius of gyration of 0.6 m. The mass of the flywheel D is 800 kg and has a radius of gyration of 0.9 m. The connecting shaft has a diameter of 50 mm for the portion AB which is 0.4 m long; and has a diameter of 60 mm for the portion BC which is 0.5 m long; and has a diameter of d mm for the portion CD which is 0.6 m long. Determine the diameter d of the portion CD so that the node of the torsional vibration of the system will be at the centre of the length BC; and also determine the natural frequency of the torsional vibrations. The modulus of rigidity of the shaft material is 80 GN/m^2. — 14M

AR16

CODE: 16EC3021 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

III B.Tech II Semester Supplementary Examinations, July-2022

DIGITAL SIGNAL PROCESSING

(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)	The system having impulse responses given below, determine whether they are stable and causal. (i) $h(n) = \delta(n) + \cos(\pi n)$, (ii). $h(n) = e^{2n}u(n-1)$	7M
	b)	Determine the z-transform and ROC of the following signals: i) $x(n) = \left(\frac{1}{2}\right)^{n+1} u(n)$, and (ii). $x(n) = \left(\frac{1}{3}\right)^{n} u(-n-1)$	7M

(OR)

2	a)	Show that the output of an LTI system is given by the convolution of input sequence and impulse response.	7M
	b)	Illustrate the properties of ROC of Z transform.	7M

UNIT-II

3	a)	Compute 8-point DFT of the sequence given by {0,0,0,0	7M
	b)	In an LTI system, the input x(n)={1,2,1} and impulse response h(n)={1,3}. Determine the response of LTI system by the radix-2 DIT FFT.	7M

(OR)

4	a)	State and prove the following properties of DFT (i) Periodicity (ii) Circular convolution.	6M
	b)	Find the IDFT of the sequence X(k) using DIF FFT radix-2 algorithm where X(k)={12,1-j2.414,0,1-j0.414,0,1+j0.414,0,1+j2.414}.	8M

UNIT-III

5 Obtain the direct form I, direct form II, cascade and parallel realization of the system described by the equation 14M

$$y(n) - \frac{5}{6}y(n-1) + \frac{1}{6}y(n-2) = x(n) + 2x(n-1).$$

(OR)

6 a) Design an analog Butterworth filter that has a -2dB passband attenuation at a frequency of 20 rad/sec and atleast -20 dB stopband attenuation at 35 rad/sec 10M

b) Compare Butterworth and Chebyshev filters. 4M

UNIT-IV

7 a) Explain the design of FIR filter using frequency sampling technique. 10M

b) Compare the IIR and FIR filters. 4M

(OR)

8 Design an ideal pass band digital filter with desired frequency response 14M

$$H_d(e^{j\omega}) = \begin{cases} 1 & 0.25\pi \le \omega \le 0.75\pi \\ 0 & otherwise \end{cases}$$

for N=11, Find H(Z) using Hanning window.

UNIT-V

9. a) Illustrate the computational building blocks of DSP. 7M

b) Explain about the programmability and speed issues of DSP processor. 7M

(OR)

10 a) Discuss about various interrupts of DSP processing system. 7M

b) Explain about the speed issues in DSP processor and also discuss the remedies for these effects. 7M