

Time: 3 Hours

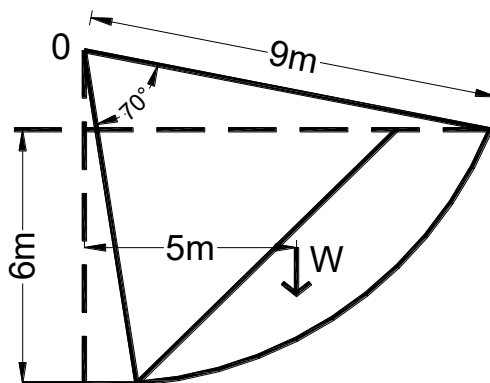
Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		UNIT-I	Marks	CO	Blooms Level
1.	a)	Explain Standard Penetration Test used in soil exploration. Explain the corrections to be applied to SPT blow count 'N'.	5M	1	2
	b)	Explain the terms 'area ratio', 'inside clearance' and 'outside clearance' as applied to a sampler. Why are they provided?	5M	1	2
(OR)					
2.	a)	Describe with neat sketch how will you carry out the wash boring method of soil exploration.	5M	1	2
	b)	Explain the uses and limitations in plate load test	5M	1	2
		UNIT-II			
3.	a)	Explain different types of slope failures with neat sketches also mention and their prevent methods.	5M	2	2
	b)	A cutting is to be made in clay for which the cohesion is 35 kN/m^2 and $\phi = 0^\circ$. The density of the soil is 18 kN/m^3 . Find the maximum depth for a cutting of side slope 1.5 to 1 if the factor of safety is to be 1.5. Take the stability number for a 1.5 to 1 slope and $\phi = 0^\circ$ as 0.17.	5M	2	4
(OR)					
4.	a)	Explain the method of slices for stability analysis of slopes.	5M	2	2
	b)	Fig. shows details of an embankment made of cohesive soil with $\phi = 0$ and $c = 30 \text{ kN/m}^2$. The unit weight of soil is 18.9 kN/m^3 . Determine the factor of safety against sliding along the trial slip circle shown. The weight of the sliding mass is 360 kN acting at an eccentricity of 5.0 m from the centre of rotation. Assume that no tension crack develops. The central angle is 70° .	5M	2	4



UNIT-III

5. a) Explain with neat sketch 'Culmann's graphical method' for active case with purely frictional soil. 5M 3 2
- b) A retaining wall 4 m high supports a back fill (cohesion = 20 kN/m², angle of internal friction = 30° and bulk unit weight = 20 kN/m³) with horizontal top, flush with the top of the wall. The back fill carries a surcharge of 20 kN/m². If the wall is pushed towards the backfill, compute the total passive pressure on the wall and its point of application. 5M 3 4

(OR)

6. a) Distinguish between 'active' and 'passive' earth pressure. 5M 3 2
- b) A wall, 5.4 m high, retains sand. In the loose state the sand has void ratio of 0.63 and $\phi = 27^\circ$, while in the dense state, the corresponding values of void ratio and ϕ are 0.36 and 45° respectively. Compare the ratio of active and passive earth pressure in the two cases, assuming $G = 2.64$. 5M 3 4

UNIT-IV

7. a) Explain assumptions in Terzaghi's theory of bearing capacity. 5M 4 2
- b) Compute the safe bearing capacity of a square footing of size 2.0 m located at a depth of 1.5 m in a cohesionless soil layer with an average saturated unit weight of 20 kN/m³ and the angle of internal friction of 35°. The corresponding bearing capacity factors are given as follows: $N_c = 57.8$, $N_q = 41.4$ and $N_r = 42.4$. Assume F.S as 2.5 and water table is quite deep. What will be the percentage reduction in the value if the water table rises to the surface due to unprecedented rainfall? 5M 4 4

(OR)

8. a) Explain IS code method to determine bearing capacity of shallow foundation. 5M 4 2
- b) A test plate 30 cm x 30 cm resting on sand deposit settles by 10 mm under a certain loading intensity. A footing 150 cm x 200 cm resting on the same sand deposit and loaded to the same load intensity, determine its settlement. 5M 4 4

UNIT-V

9. a) Write Hiley's formula to determine allowable load on pile and explain the terms in it. 5M 5 2
- b) Write the factors that influence the load-carrying capacity of pile groups in sandy soils. How does pile spacing and arrangement affect the group capacity and settlement? 5M 5 2

(OR)

10. a) Describe various classification of pile foundations. 5M 5 2
- b) A square pile group of 9 piles passes through a recently filled up material of 4.5m depth. The diameter of the pile is 30 cm and pile spacing is 90 cm centre to centre. If the unconfined compression strength of the cohesive material is 60 kN/m² and unit weight is 15 kN/m³, compute the negative skin friction of the pile group. 5M 5 4

UNIT-VI

11. a) What is a "Caisson"? How are Caissons classified based on the method of construction? 5M 6 2
- b) Explain the different shapes of Cross-sections of wells used in practice, giving the merits and demerits of each. 5M 6 2

(OR)

12. a) Explain the components of well foundations with neat sketch. 5M 6 2
- b) What is tilts and shifts, explain the precautions to be taken to avoid tilts and shifts 5M 6 2

III B. Tech II Semester Supplementary Examinations, July, 2025
MICROPROCESSORS AND MICROCONTROLLERS
(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

		<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	Draw and explain the architecture of the 8086 microprocessor. What is the function of each block?		10M	1	Understand
	(OR)				
2.	Discuss the read and write cycle of the 8086 microprocessor with the help of a timing diagram.		10M	1	Understand
	(OR)				
3.	What are string instructions in the 8086 microprocessor? Explain their role in handling sequences of data efficiently.		10M	2	Understand
	(OR)				
4. a	Explain the different data transfer instructions in 8086 assembly language. Provide examples for each category.		5M	2	Understand
b	Develop an ALP in 8086 to determine the sum of the even numbers in a given N-Numbers		5M	2	Apply
	(OR)				
5. a	Explain the functional block diagram of USART (8251).		5M	3	Understand
b	Compare and contrast the three modes of operation of 8255.		5M	3	Analyze
	(OR)				
6. a	Explain the working of the 8257 DMA controller with a block diagram.		5M	3	Understand
b	Discuss how the 8259A interrupt controller prioritizes and handles multiple interrupts.		5M	3	Analyze
	(OR)				
7. a	Compare and contrast real mode, protected mode, and virtual 8086 mode in 80386.		5M	4	Analyze
b	Demonstrate the steps involved in setting up virtual memory using 80386 paging.		5M	4	Understand
	(OR)				
8.	Explain the signal descriptions of 80386 and their role in microprocessor communication.		10 M	4	Understand
	(OR)				
9.	How does the ARM processor handle interrupts and exceptions? Describe the process step by step.		10M	5	Analyze
	(OR)				
10. a	Compare RISC and CISC		5M	5	Analyze
b	List and describe the different registers available in the ARM architecture.		5M	5	Understand
	(OR)				
11. a	Discuss the different addressing modes used in 8051 assembly language		5M	6	Understand
b	Explain the difference between a microcontroller and a microprocessor.		5M	6	Analyze
	(OR)				
12. a	Explain the pin description of 8051 with a neat block diagram.		5M	6	Understand
b	Discuss about memory organization of 8051 microcontroller?		5M	6	Understand

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

	<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	a) Explain the working principle of an air blast circuit breaker with neat diagrams.	5M	CO1	Understand
	b) Discuss the significance of resistance switching and its effect on circuit breakers.	5M	CO1	Understand
	(OR)			
2.	a) Describe the construction, principle of operation, and applications of SF6 circuit breakers.	5M	CO1	Remember
	b) In a short circuit test on a circuit breaker, the following readings were obtained 50 μ sec, 100 kV on single frequency transient: (i) time to reach the peak re-striking voltage, (ii) the peak re-striking voltage, Determine the average RRRV and frequency of oscillations	5M	CO1	Apply
	<u>UNIT-II</u>			
3.	a) Explain the working principle of a directional overcurrent relay.	5M	CO2	Understand
	b) Describe the working of an induction disc relay with a neat sketch	5M	CO2	Understand
	(OR)			
4.	a) Compare the advantages and disadvantages of static relays and electromagnetic relays.	5M	CO2	Evaluate
	b) Explain the construction and working of a static instantaneous overcurrent relay.	5M	CO2	Understand
	<u>UNIT-III</u>			
5.	a) Explain the restricted earth fault protection scheme for an alternator.	5M	CO3	Understand
	b) A 13.2 kV, 175 MVA alternator is grounded through a resistance of 15 Ω . The CT ratio is 1200/5, and the relay setting is 0.6 A. Determine the percentage of generator winding protected.	5M	CO3	Apply

(OR)

- | | | | | | |
|----|----|---|----|-----|------------|
| 6. | a) | Explain the protection schemes used to safeguard a generator against stator faults and rotor faults | 5M | CO3 | Understand |
| | b) | Explain the differential protection of a transformer and how the CT ratio is calculated. | 5M | CO3 | Understand |

UNIT-IV

- | | | | | | |
|----|----|--|----|-----|------------|
| 7. | a) | Describe the translay relay protection scheme and its advantages. | 5M | CO4 | Understand |
| | b) | Explain the principle of three-zone distance relay protection with impedance relays. | 5M | CO4 | Understand |

(OR)

- | | | | | | |
|----|----|--|----|-----|----------|
| 8. | a) | Define feeder protection and list its main objectives. | 5M | CO4 | Remember |
| | b) | Classify different types of differential protection schemes used for feeder and bus bars with neat diagrams. | 5M | CO4 | Analyze |

UNIT-V

- | | | | | | |
|----|----|--|----|-----|------------|
| 9. | a) | Explain the internal causes of overvoltage in power systems. | 5M | CO5 | Understand |
| | b) | Describe the construction, working principle, and applications of a valve type arrester. | 5M | CO5 | Understand |

(OR)

- | | | | | | |
|-----|----|--|----|-----|------------|
| 10. | a) | Discuss the construction and operation of a zinc-oxide lightning arrester with a neat diagram. | 5M | CO5 | Understand |
| | b) | Explain the concept of insulation coordination and its importance in power system protection. | 5M | CO5 | Understand |

UNIT-VI

- | | | | | | |
|-----|----|--|----|-----|------------|
| 11. | a) | List and explain different grounding techniques with examples. | 5M | CO6 | Understand |
| | b) | Explain the concept and advantages of reactance grounding. | 5M | CO6 | Understand |

(OR)

- | | | | | | |
|-----|----|--|----|-----|------------|
| 12. | a) | A 230 kV, 3-phase, 50 Hz, 200 km transmission line has a capacitance to earth of 0.02 μ F/km per phase. Calculate the inductance and kVA rating of the Peterson coil used for earthing the above system. | 5M | CO6 | Apply |
| | b) | Describe the principle and application of resonant grounding in power systems. | 5M | CO6 | Understand |

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

		<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	a)	Explain the scope of Managerial Economics and its relevance in business decisions.	5	1	Understand
	b)	Discuss the key determinants of demand with suitable examples.	5	1	Understand
		(OR)			
2.	a)	Illustrate the concept of demand elasticity and its applications.	5	1	Understand
	b)	Analyse the different approaches to demand forecasting.	5	1	Analysis
		<u>UNIT-II</u>			
3.	a)	Describe the laws of production with suitable examples.	5	2	Analysis
	b)	Explain how firms benefit from economies of scale.	5	2	Understand
		(OR)			
4.	a)	Differentiate between explicit and implicit costs with examples.	5	2	Understand
	b)	Illustrate the significance of Break-Even Analysis in managerial decision-making.	5	2	Understand
		<u>UNIT-III</u>			
5.	a)	Discuss the nature and characteristics of perfect competition.	5	3	Evaluate
	b)	Explain how prices are determined in monopolistic competition.	5	3	Understand
		(OR)			
6.	a)	Analyse the role of pricing strategies in different market structures.	5	3	Analysis
	b)	Explain price-output determination under monopoly.	5	3	Understand
		<u>UNIT-IV</u>			
7.	a)	Define management and describe its key functions.	5	4	Understand
	b)	Evaluate the contributions of Taylor's Scientific Management.	5	4	Evaluate
		(OR)			
8.	a)	Discuss McGregor's Theory X and Theory Y and their implications in management.	5	4	Understand
	b)	Explain the importance of leadership styles in business organizations.	5	4	Understand
		<u>UNIT-V</u>			
9.	a)	Discuss various marketing functions and their role in business growth.	5	5	Understand
	b)	Analyse how digital marketing has transformed business strategies.	5	5	Analysis
		(OR)			
10.	a)	Explain the different stages of the Product Life Cycle and their impact on marketing strategies.	5	5	Understand
	b)	Describe different types of marketing channels with examples.	5	5	Understand
		<u>UNIT-VI</u>			
11.	a)	Explain the process of recruitment and selection in an organization.	5	6	Understand
	b)	Discuss the importance of performance appraisal in HRM.	5	6	Understand
		(OR)			
12.	a)	Analyse the significance of grievance handling in maintaining employee satisfaction.	5	6	Analysis
	b)	Explain the concept and objectives of job evaluation.	5	6	Understand

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

Answer ONE Question from each Unit

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All parts of the Question must be answered at one place

UNIT-I

- | | | Marks | CO | Blooms
Level |
|-------------|--|-------|-----|-----------------|
| 1. | <p>A cam is to be designed for a knife edge follower with the following data: 1. Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion. 2. Dwell for the next 30°. 3. During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion. 4. Dwell during the remaining 180°.</p> <p>Draw the profile of the cam when the line of stroke of the follower is passing through the axis of the cam shaft. The radius of the base circle of the cam is 40 mm.</p> | 10M | CO1 | L4 |
| (OR) | | | | |
| 2. | <p>Construct the profile of a cam to suit the following specifications:</p> <p>Cam shaft diameter = 40 mm;
 Least radius of cam = 25 mm;
 Diameter of roller = 25 mm;
 Angle of lift = 120°;
 Angle of fall = 150°;
 Lift of the follower = 40 mm;
 Number of pauses are two of equal interval between motions. During the lift, the motion is S.H.M. During the fall the motion is uniform acceleration and deceleration. The speed of the cam shaft is uniform. The line of stroke of the follower is off-set 12.5 mm from the centre of the cam</p> | 10M | CO1 | L4 |

UNIT-II

3. A shaft carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each has an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100° and that between the masses at B and A is 190° , both being measured in the same direction. The axial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, determine:
- The magnitude of the masses at A and D;
 - The distance between planes A and D; and
 - The angular position of the mass at D.

(OR)

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

UNIT-III

5. The measurements on a mechanical vibrating system show that it has a mass of 8 kg and that the springs can be combined to give an equivalent spring of stiffness 5.4 N/mm. If the vibrating system have a dashpot attached which exerts a force of 40 N when the mass has a velocity of 1 m/s, find:
- critical damping coefficient,
 - damping factor,
 - logarithmic decrement, and
 - ratio of two consecutive amplitudes..

(OR)

6. a) A vibrating system consists of a mass of 200 kg, a spring of stiffness 80 N/mm and a damper with damping coefficient of 800 N/m/s. Determine the frequency of damped vibrations of the system.
- b) A mass of 1 kg is to be supported on a spring having a stiffness of 9800 N/m. The damping coefficient is 5.9 N-sec/m. Determine
- the Natural frequency of the system,
 - the logarithmic decrement and
 - the amplitude after three cycles, if the initial displacement is 0.5cm.

UNIT-IV

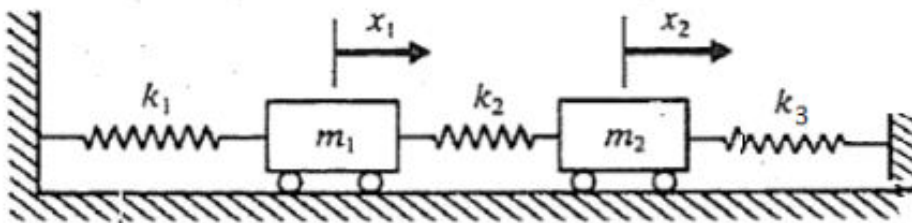
7. A vertical steel shaft of 15 mm diameter is held in long bearings 1 metre apart and carries at its centre a disc of mass 15 kg. The eccentricity of the centre of gravity of the disc from the centre of the rotor is 0.3 mm. The modulus of elasticity of the shaft material is 200 GN/m^2 and the permissible stress is 70 MN/m^2 . Determine 1. The critical speed of the shaft and 2. The range of speed over which it is unsafe to run the shaft. Neglect the mass of the shaft. 10M CO4 L3
CO4 L3

(OR)

8. A shaft 1.5 m long, 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. 10M CO4 L3

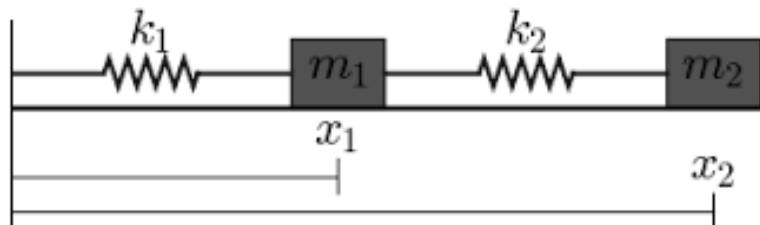
UNIT-V

9. Determine the Natural frequencies of the vibratory system shown in Fig. Take $m_1=7 \text{ kg}$, $m_2=8 \text{ kg}$ and $k_1= 100\text{N/m}$, $k_2=200\text{N/m}$ and $k_3= 200\text{N/m}$ 10M CO5 L4



(OR)

10. Determine the Natural frequencies of the vibratory system shown in Fig. Assume no friction. $K_1=100 \text{ N/m}$, $K_2=200 \text{ N/m}$. $m_1=100\text{kg}$. $m_2 =200\text{kg}$. 10M CO5 L4



UNIT-VI

11. The mass of an electric motor is 120 kg and it runs at 1500 r.p.m. The armature mass is 35 kg and its C.G. lies 0.5 mm from the axis of rotation. The motor is mounted on five springs of negligible damping so that the force transmitted is one-eleventh of the impressed force. Assume that the mass of the motor is equally distributed among the five springs. Determine: 1. stiffness of each spring; 2. dynamic force transmitted to the base at the operating speed; and 3. natural frequency of the system. 10M CO6 L4

(OR)

- 12 A steel shaft ABCD 1.5m long has flywheels at its ends A and D. The mass of the flywheel at A is 600kg and has a radius of gyration 0.6m. The mass of the flywheel at D is 800 kg and has a radius of gyration 0.9m. The shaft has a diameter of 50mm for the portion AB which is 0.4m long and has a diameter of 60mm for the portion BC which is 0.5m long; and has a diameter of d mm for the portion CD which is 0.6m long. Determine: 1. The diameter of the portion CD so that the node of the torsional vibrations of the system will be at the centre of the length BC and 2. The natural frequency of the torsional vibrations. Take $C = 80 \text{ GN/m}^2$. 10M CO6 L3

AR18

CODE: 18CST315

SET-1

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

III B. Tech II Semester Supplementary Examinations, July, 2025

**UNIX Internals
(COMPUTER SCIENCE AND ENGINEERING)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Discuss about different modes used by vi editor, how to switch between modes. [6M]
- b) Explain Unix commands mv, grep & rmdir. [6M]

(OR)

2. a) What is an Operating System? Explain the main functions of UNIX Operating System. [6M]
- b) Explain file handling utilities in detailed. [6M]

UNIT-II

3. a) Write about if control structure for decision making in shell scripting? [6M]
- b) Write shell script program to check whether the given number is prime [6M]

(OR)

4. a) Explain about the different types of variables available in Unix. [6M]
- b) Write a shell script to print "Good Morning", "Good Afternoon" and "Good Evening" based on user login time. [6M]

UNIT-III

5. a) Discuss in detail about file descriptors with examples. [6M]
- b) Differentiate fseek () & lseek () and fgetc () and gets () system calls. [6M]

(OR)

6. a) Write about directory handling system calls. [6M]
- b) Write a C program which uses the following standard I/O system calls fopen, fclose, fseek, fgetc. [6M]

UNIT-IV

7. a) Write a short note on reliable and unreliable signals. [6M]
- b) Distinguish fork () and vfork () system calls. [6M]

(OR)

8. Explain alarm, abort and sleep functions with suitable programmes. [12M]

UNIT-V

9. What is shared memory? Explain in detail about the process of "allocating a shared memory segment", Explain with a program. [12M]

(OR)

10. How can we create a new process in UNIX? What are various characteristics inherited by a child process from a parent process? Explain by program. [12M]

AR18

CODE: 18EET314

SET-1

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

III B. Tech II Semester Supplementary Examinations, July, 2025

**SWITCHGEAR AND PROTECTION
(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 with suitable sketches, the working of oil circuit breaker 6M
b) Define recovery voltage and restriking voltage. 6M
- (OR)
2. a) Discuss about current chopping in the Circuit Breakers. 6M
b) With the help of neat diagram, explain the operation of Air Blast Circuit Breaker. 6M

UNIT-II

3. a) With the help of neat diagram explain the principle of static differential relay. 6M
b) Draw the block diagram for static time- over current relay and explain how IDMT characteristic is obtained. 6M
- (OR)
4. a) What are the different types of distance relay? Compare their merits and demerits and give their field of applications 6M
b) Describe the operating principle, constructional features of directional relay 6M

UNIT-III

5. a) Explain about protection of generators against stator faults. 6M
b) A 11 kV 100 MVA alternator is grounded through a resistance of 4Ω . The C.T.s have a ratio of 500/5. The relay is set to operate when there is an out of balance current of 2 A. What percentage of generator winding will be protected by the percentage differential protection scheme? 6M
- (OR)
6. a) Explain about protection of transformers. 6M
b) A 3-phase, 66/11 kV star delta connected transformer is protected by Merz-price system. The CTs on low voltage side have a ratio of 420/5 A. Find the ratio of CTs on the high voltage side 6M

UNIT-IV

7. a) Explain the protection of feeders by using three zone protection 6M
b) Explain about the Carrier current protection. 6M
- (OR)
8. With neat sketch discuss the differential scheme for bus zone protection 12M

UNIT-V

9. a) Explain with neat sketch the operation of valve type lightning arrester. 6M
b) Distinguish between grounded neutral and ungrounded neutral systems. 6M
- (OR)
10. a) Explain the different methods of Neutral Grounding. 6M
b) What are the effects of Ungrounded Neutral in a power system ? 6M

AR18

CODE: 18MET315

SET-1

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

III B. Tech II Semester Supplementary Examinations, July, 2025

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, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is required to give following motion to the roller follower: 12M

- i. To raise the valve through 50 mm during 120° rotation of the cam;
- ii. To keep the valve fully raised through next 30° ;
- iii. To lower the valve during next 60° ; and
- iv. To keep the valve closed during rest of the revolution i.e. 150° .

Take the radius of the roller as 10 mm. The displacement of the follower while being raised and lowered is to take place with Simple Harmonic Motion (SHM). Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam.

(OR)

2. Draw the cam profile using the following data in which Knife-edge follower is raised with uniform acceleration and deceleration and is lowered with SHM. 12M

Least radius of cam = 60 mm.

Lift of follower = 45 mm

Angle of ascent = 60°

Angle of dwell between ascent and descent = 40°

Angle of descent = 75°

If cam rotates at 180 rpm, determine the maximum velocity and acceleration during ascent.

UNIT-II

3. A, B, C and D are four masses carried by a rotating shaft at radii 100mm, 150mm, 150mm and 200mm respectively. The planes in which the masses rotate are spaced at 500mm apart and the magnitude of the masses B, C and D are 9Kg, 5Kg and 4Kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balancing. 12M

(OR)

4. 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° , B to C 70° and C to D 120° . 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. 12M

UNIT-III

5. A coil of spring stiffness 4 N/mm supports vertically a mass of 20 kg at the free end. The motion is resisted by the oil dashpot. It is found that the amplitude at the beginning of the fourth cycle is 0.8 times the amplitude of the previous vibration. Determine the damping force per unit velocity. Also find the ratio of the frequency of damped and undamped vibrations. 12M

(OR)

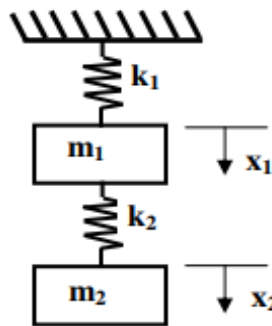
6. a) Classify the vibrations 6M
b) A vibrating system consists of a mass of 8 kg, spring stiffness 5.6 N/mm and a dash pot of damping coefficient of 0.04 N/mm/sec. Find (i) damping factor, (ii) logarithmic decrement and (iii) ratio of the two consecutive amplitudes 6M

UNIT-IV

7. a) Discuss Vibration Isolation and Transmissibility in detail 6M
b) Discuss whirling of shafts with neat diagram 6M

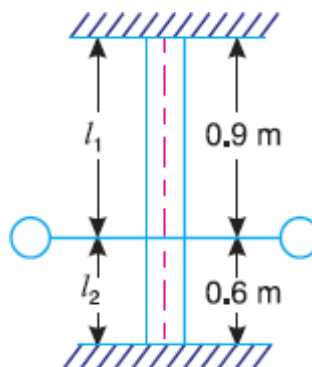
(OR)

8. Obtain the frequency equation for the system shown in Figure. Also determine the natural frequencies and mode shapes when $k_1 = 2k$, $k_2 = k$, $m_1 = m$ and $m_2 = 2m$. 12M



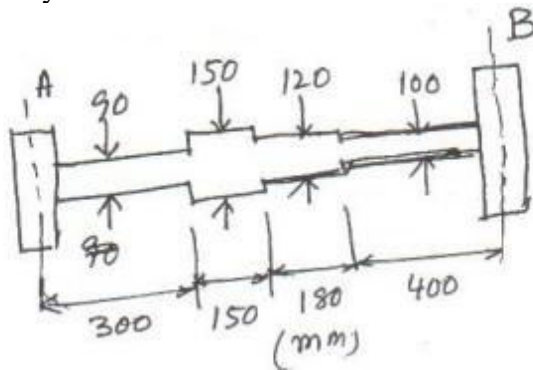
UNIT-V

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/m². 12M



(OR)

10. The shaft shown in figure carries two masses A and B. The mass A is 300kg with a radius of gyration 0.9m and the mass b is 400kg with a radius of gyration 1.2m. Determine the frequency of the torsional vibration. 12M



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CODE: 18CET316

SET-1

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

III B.Tech II Semester Supplementary Examinations, July, 2025

**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) Explain in detail about standard penetration test with neat sketch. 6M
- b) Distinguish disturbed and undisturbed samples. How would you obtain undisturbed samples. 6M

(OR)

2. a) Discuss the limitations of geophysical investigations also explain anyone method in detail. 6M
- b) Explain in detail about Plate load test with neat sketch. 6M

UNIT-II

3. a) What are the assumptions that are generally made in the analysis of stability of slopes? Discuss briefly their validity. 6M
- b) An embankment is inclined at an angle of 35° and its height is 15 m. The angle of shearing resistance is 15° and the cohesion intercept is 200 kN/m^2 . The unit weight of soil is 18.0 kN/m^3 . If Taylor's stability number is 0.06, find the factor of safety with respect to cohesion. 6M

(OR)

4. a) Distinguish finite and infinite slopes. Derive factor of safety of an infinite slope of dry cohesionless soil. 6M
- b) An embankment 10 m high is inclined at an angle of 36° to the horizontal. A stability analysis by the method of slices gives the following forces per running meter: Σ Shearing forces = 450 kN Σ Normal forces = 900 kN Σ Neutral forces = 216 kN The length of the failure arc is 27 m. Laboratory tests on the soil indicate the effective values c' and ϕ' as 20 kN/m^2 and 18° respectively. Determine the factor of safety of the slope with respect to (a) shearing strength and (b) cohesion 6M

UNIT-III

5. a) What are assumptions in Rankine's pressure. Derive the expression for passive pressure. 6M
- b) Excavation was being carried out for a foundation in plastic clay with a unit weight of 22.5 kN/m^3 . Failure occurred when a depth of 8.10 m was reached. What is the value of cohesion if $\phi = 0^\circ$? 6M

(OR)

6. a) What are assumptions in Coulomb's earth pressure theory? Compare Rankine's theory with Coulomb's theory. 6M
- b) A retaining wall, 7.5 m high, retains a cohesionless backfill. The top 3 m of the fill has a unit weight of 18 kN/m^3 and $\phi = 30^\circ$ and the rest has unit weight of 24 kN/m^3 and $\phi = 20^\circ$. Determine the pressure distribution on the wall 6M

UNIT-IV

7. a) How would you fix the depth of foundation? Discuss Rankine's for minimum depth. 6M
- b) A circular footing is resting on a stiff saturated clay with $q_u = 250 \text{ kN/m}^2$. The depth of foundation is 2 m. Determine the diameter of the footing if the column load is 600 kN. Assume a factor of safety as 2.5. The bulk unit weight of soil is 20 kN/m^3 . 6M

(OR)

8. a) List and explain different types of settlements that can occur in a foundation. 6M
- b) Compute the safe bearing capacity of a square footing $1.5 \text{ m} \times 1.5 \text{ m}$, located at a depth of 1 m below the ground level in a soil of average density 20 kN/m^3 . $\phi = 20^\circ$, $N_c = 17.7$, $N_q = 7.4$, and $N_\gamma = 5.0$. Assume a suitable factor of safety and that the water table is very deep. Also compute the reduction in safe bearing capacity of the footing if the water table rises to the ground level. 6M

UNIT-V

9. a) Describe various types of pile foundations. 6M
- 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 90 kN/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

(OR)

10. a) How would you estimate pile group capacity in sand. 6M
- b) Determine the group efficiency of a rectangular group of piles with 4 rows, 3 piles per row, the uniform pile spacing being 3 times the pile diameter. If the individual pile capacity is 100 kN, what is the group capacity according to this concept? 6M