

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/ CIVIL ENGINEERING/ CE(PC)603/ 2021-22
2022
WATER RESOURCES ENGINEERING

Full Marks: 70

Times: 3 Hours

The figures in the margin indicate full marks.

Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer all questions

5x2=10

1. In a certain soil system, horizontal hydraulic conductivities of two points A and B are K_{xA} and K_{xB} respectively; and vertical hydraulic conductivities are K_{zA} and K_{zB} respectively. State conditions for the soil to be heterogeneous isotropic. 2
2. Write down the depth conditions for S_2 and H_3 GVF profiles. 1+1
3. What is Storativity? 2
4. Define duty on capacity. 2
5. Define outlet discharge factor. 2

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any five questions

12x5 = 60

6. i) What is the classification of irrigation water having the following characteristics: concentration of Na, Mg and Ca are 25.3, 4.6, and 1.2 milli equivalents per litre respectively, and electrical conductivity is 320 mic.o mhos per cm at 25°C. 3
 ii) An unconfined aquifer ($K = 5.36 \text{ m/day}$) situated on the top of a horizontal impervious layer connects two parallel water bodies M and N which are 1280 m apart. The water surface elevations of M and N, measured above the horizontal impervious bed, are 12.00 m and 9.00 m. If a uniform recharge at the rate of $0.0025 \text{ m}^3/\text{day}$ per m^2 of horizontal area occurs on the ground surface, estimate
 (a) the water table profile
 (b) the location and elevation of the water table divide
 (c) the seepage discharges into the lakes and
 (d) the recharge rate at which the water table divide coincides with the upstream edge of the aquifer and the total seepage flow per unit width of the aquifer at this recharge rate. 9
7. i) Find the slope of the free surface in a rectangular channel of width 22.5 m, having depth of flow 5.5 m. The discharge through the channel is $45 \text{ m}^3/\text{s}$. The bed slope of the channel is 1 in 4500. Chezy's constant $C = 60$. 6
 ii) The depth of flow of water, at a certain section of a rectangular channel of 2.5 m wide, is 0.35 m. The discharge through the channel is $2.2 \text{ m}^3/\text{s}$. Determine whether a hydraulic jump will occur, and if so, find its height and loss of energy per kg of water. 6
8. i) Wheat is to be grown in a field having a field capacity equal to 27.8% by weight and the permanent wilting point is 13.5% by weight. Find the maximum storage capacity in 76 cm depth of the soil (root zone depth), if the dry unit weight of the soil is 15.25 kN/m^3 . If irrigation water must be supplied when the average soil moisture falls to 18%, find the water depth required to be supplied to the field if the water application efficiency is 80%. What is the amount of water needed at the canal outlet if the water lost in the water courses and the field channels is 14.42% of the outlet discharge? 8
 ii) Derive the magnitude of best side slope for the most economical trapezoidal section in open channel flow. 4
9. i) A 28-cm well completely penetrates an unconfined aquifer of a saturated depth 40 m. After a long period of pumping at a steady state rate of 1250 lpm, the drawdown in two observation wells 19 m and 55 m from the pumping well were found to be 3.9 m and 2.6 m respectively. Determine the transmissivity of the aquifer. What is the drawdown at the pumping well? 4+2

- ii) The rate of flow through circular channel of diameter 0.61 m is $170 \text{ m}^3/\text{s}$. Find the slope of the bed of the channel for maximum velocity. Take $C = 60$.
10. i) The CCA of a watercourse is 1500 hectares. Intensities of sugarcane and wheat crops are 25% and 43% respectively. The duties for the crops at the head of the watercourse are 650 hectares/cumec and 1670 hectares/cumec respectively. Find (a) the discharge required at the head of the watercourse (b) determine the design discharge at the outlet, assuming a time factor equal to 0.75.
- ii) Write down unit of Chezy's constant.
- iii) Differentiate between contour canal and side slope canal with proper line diagram.
11. i) Design a lined channel to carry a discharge of 500 cumecs at a slope of 1 in 5000. Side slope of the channel may be taken as 1.25:1. The value of rugosity coefficient of lining is 0.014. Assume limiting velocity of the channel as 2.5 m/s.
- ii) What are the conditions for a channel to be in true regime according to Lacey?
- iii) If the hydraulic radius and the bed slope of the channel is 3.35 m and 1 in 1000 respectively, find out average value of actual shear stress generated by the flowing water on the bed of the channel and on the slopes. γ_w for water is 9.81 kN/m^3 .
12. i) Design a regime channel for a discharge of 45 cumecs and silt factor 1.15, using Lacey's theory.
- ii) In a tile drainage system, the drains are laid with their centre 1.6 m below the ground level. The impervious layer is 11 m below the ground level and the average annual daily rainfall in the area is 100 cm. If 1% of thus rainfall is to be drained in 24 hours to keep the highest position of the water table to 1 m below the ground level. Find the spacing of the drains. Co-efficient of permeability is 0.001 cm/sec

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

[A GOVERNMENT AUTONOMOUS COLLEGE]

JGEC/B.TECH/CIVIL/CE(PC)602/2021-22

2022

ENGINEERING ECONOMICS, ESTIMATION & COSTING

Full Marks: 70

Times: 3 Hours

The figures in the margin indicate full marks.

Candidates are instructed to write the answers in their own words as far as practicable.

GROUP-A

[OBJECTIVE TYPE QUESTIONS]

Answer **all** questions

1. When are revised estimates prepared? 2
2. Define Marginal revenue with example. 2
3. What is MEP Engineering? 2
4. Write short notes on Minimum Wages Act. 2
5. What are the essential requirements for a valid contract? 2

5x2=10

2
2
2
2
2

GROUP-B

[LONG ANSWER TYPE QUESTIONS]

Answer any **four** questions

6. i) What information should a contract documents contain? 3
- ii) List out different methods adopted for approximate estimation. 2
- iii) A R.C.C. building was purchased for Rs. 5,00,000. Assuming its salvage value at the end of 10 years as Rs. 4,00,000. After 5 years calculate the depreciation for each year adopting
 - a) Straight line method
 - b) Constant percentage rate method
 - c) Sinking fund method

4x15=60

10
2
10

Express the results graphically age vs. book value.

7. i) What is Wholesale Price Index (WPI)? What are the advantages and disadvantages of WPI? 2+3
- ii) Prepare a detailed estimate for earthwork for a portion of a road from the following data:

Distance (m)	0	100	200	300	400	500	600
R.L. of ground (m)	114.50	114.75	115.25	115.2	116.1	116.85	118.0
Distance (m)	700	800	900	1000	1100	1200	
R.L. of ground (m)	118.25	118.1	117.8	117.75	117.9	119.5	

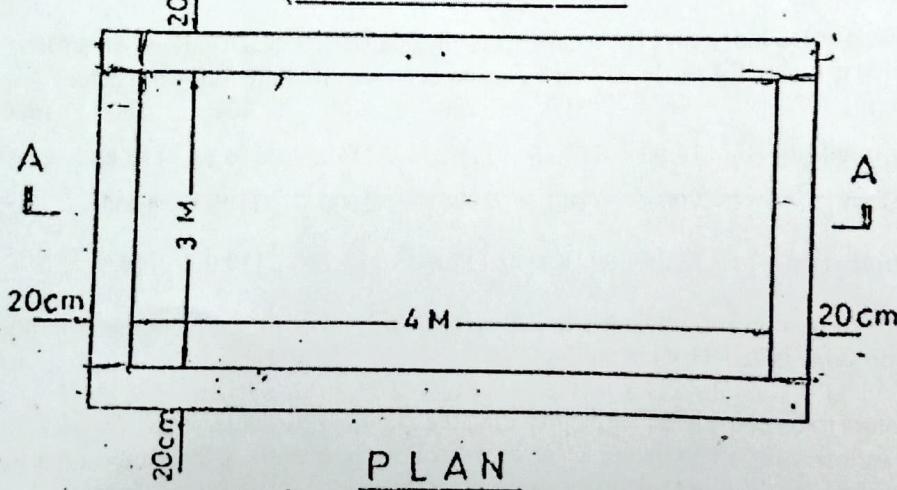
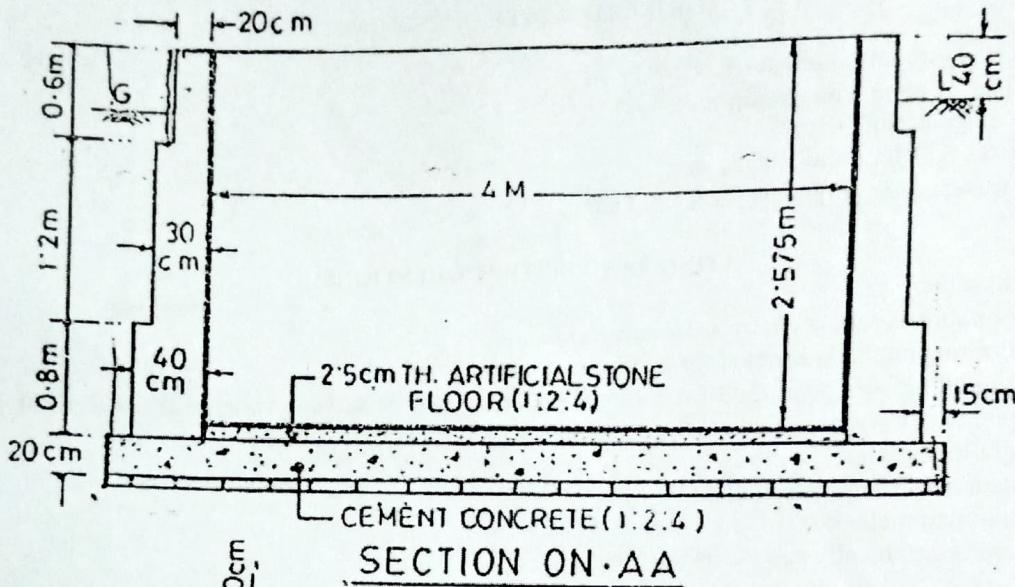
R.L. of formation is 115 m, upward gradient 1 in 200 up to 600m and downward gradient 1 in 400. Formation width is 10m and side slope is 2:1 (H:V) in cutting.

8. i) What are the factors to be considered while preparing the rate for a particular item of work? 3
- ii) The abstract of estimate for a certain work shows the following quantities for some of the items. Prepare the material statement for different materials required for the work.
 - a) First class brickwork in super structure with 1:6 cement mortar – 65.6 cum
 - b) 12 mm thick plastering with 1:6 cement mortar – 575.5 sq.m.
 - c) R.C.C. (1:1.5:3) work with 1% steel – 19.35 cum
- iii) Consider the following data of a company for the year 2002, Sales= Rs. 2,40,000. Fixed Cost= Rs. 50,000. Variable cost= Rs. 75,000. Find (a) Contribution, (b) Profit, (c) BEP, and (d) Margin of safety. 5
9. i) What is sinking fund? What is its objective? 3
- ii) What is the purpose of valuation? What are the different types of lease? 3+2
- iii) Prepare a preliminary estimate of a four storied office building having total plinth area of 2000.sq.m for obtaining the administrative approval of the government. Given the following data: Plinth area rate is Rs. 1325/- per sq.m, Extra for special architectural treatment 0.5% of building cost, Extra due to deeper foundation at site 1% of building cost, Extra for water supply and sanitary installation 8% of building cost, Extra for internal electrical installation 12.5% of building cost, Extra for other services 5% of building

7

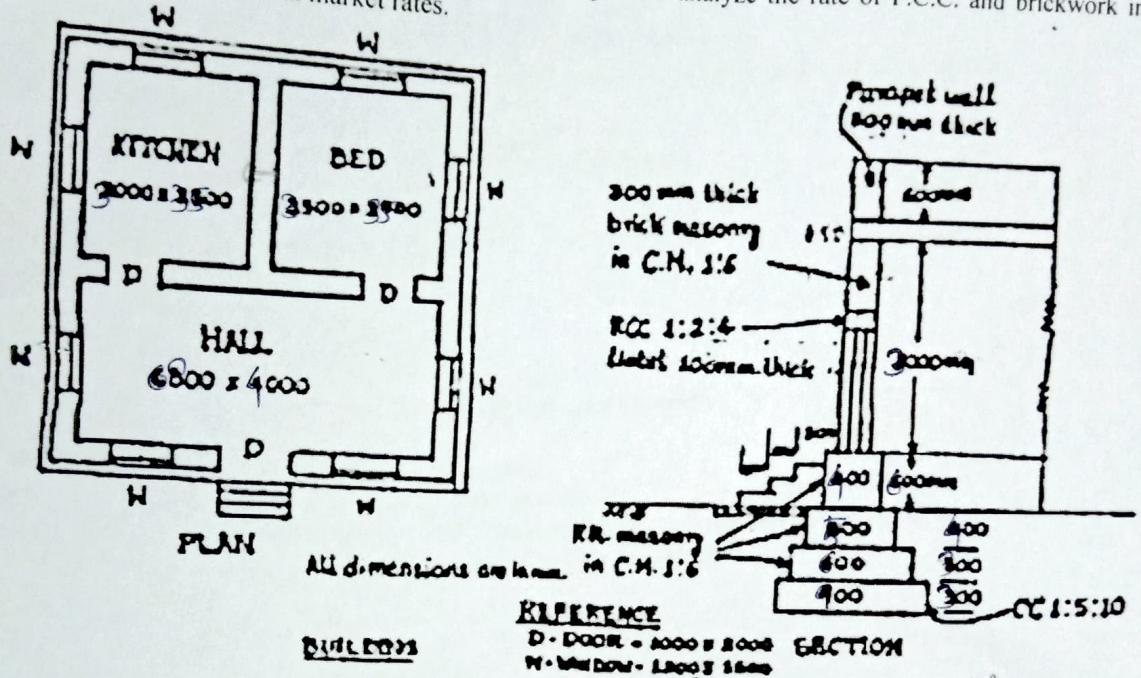
cost Contingencies - 2.5% Supervision charges + 10 %.

10. i) What are the differences between depreciation and obsolescence?
 ii) The internal length, breadth and height of an underground water tank are given in following figures. Estimate the cost of an underground water tank from the given drawings and specifications. Consider the local market rates. The general specifications are:
 a) Cement concrete in foundation (1:2:4)
 b) Masonry 1st class brickwork in cement mortar (1:4)
 c) 2.5 cm thick artificial stone flooring i.e. cement concrete (1:2:4)
 d) Floor and wall finishing inside 20mm thick cement plaster (1:3) finished smooth with neat cement
 e) Top and outside- 12mm thick cement plaster (1:4) upto 20cm below G.L.



11. i) Define the term specification. 2
 ii) Draw a flow diagram of tender process. 3
 iii) Prepare bar bending schedule of a R.C.C. beam and quantities of sand, cement, aggregates and shuttering with the following data: 10
 a) Clear span of the beam is 5.20m
 b) The width of supports are 250mm thick
 c) The depth of beam is 450mm and the width is 250mm
 d) 2 nos. 12 tor reinforcement at top and 3 nos. 16 tor reinforcement at bottom. Out of 3 nos. bottom bar, one is bent up from 1.3m from both the face. 8mm dia stirrups are provided @ 150mm c/c distance.
 e) Clear cover is 25mm, grade of concrete is M20, weight of 8mm, 12mm and 16mm dia bar are 0.39 kg/m, 0.89 kg/m and 1.58 kg/m respectively.

- What is Earnest Money Deposit (EMD)? What are the objective of EMD?
- Write down the recommendation for degree of accuracy in measurements.
- What are different methods for estimating building works?
- From the given figure, calculate the centre line length and analyze the rate of P.C.C. and brickwork in foundation. Consider local market rates.



JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/CE/CE(PE)601B/2021-22
2022
FOUNDATION ENGINEERING

Full Marks: 70

Times: 3 Hours

*The figures in the margin indicate full marks.
 Candidates are instructed to write the answers in their own words as far as practicable.*

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer **all** questions

- | | |
|--|---|
| 1. Determine minimum depth of soil exploration for a footing 2m×4m placed at 1.5m depth. | 2 |
| 2. Write one major limitation of plate load test. | 2 |
| 3. What is L1-L2 method to analyze plate load test data? | 2 |
| 4. Explain effect of water table on correction of SPT N value. | 2 |
| 5. Two samples from same deposit were collected. Recovery ratio of two samples is 96% and 98%. State possible reason of higher/lower recover ratio of those collected samples. | 2 |

$$5 \times 2 = 10$$

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any **four** questions

- | | |
|---|---|
| 6. i) Write name of different methods of sub-soil exploration. | 2 |
| ii) Describe one method which is applicable to any soil. | 5 |
| iii) From DCPT test N_{cbr} is observed as 15. Using this value determine SPT N value. | 2 |
| iv) SPT N value is measured as 24 at a depth 6m below GL. Energy ratio of SPT set up is 45%. γ (soil) = 17.2kN/m ³ . Determine $(N_1)_{60}$. | 2 |
| v) Determine bearing capacity of a footing of size 2m×2m placed at 1.5m depth for 15mm settlement. Given: | |

$$4 \times 15 = 60$$

Depth, m	N_{60}
1	8
2	10
3	12
5	20
7	25
8	30

4

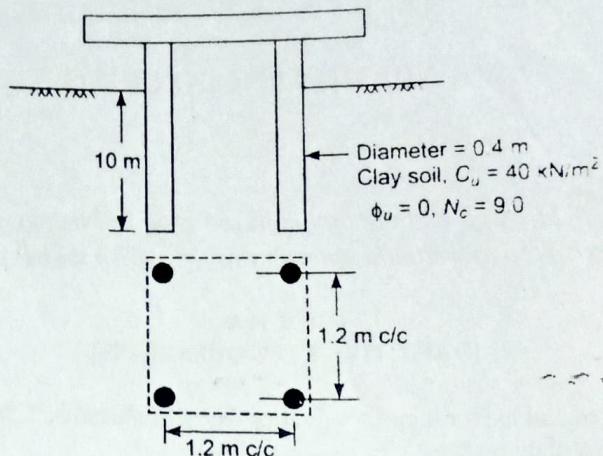
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|---|---|
| 7. i) Describe soil sampling operation in general. | 4 |
| ii) A sampler has following dimension: inside diameter = 34.50mm and outside diameter = 50.9mm. Whether this sampler can be used to collect undisturbed soil sample? Explain. | 2 |
| iii) Diameter and length of a pile embedded in sand is 0.5m and 20m respectively. $\gamma = 17.2\text{kN/m}^3$. $\phi = 32^\circ$. Determine effective stress at the tip of the pile for computation of end bearing capacity. | 2 |
| iv) Water in a bore hole was bailed to a depth of 12m below ground level and recorded rise in water table as follows: | |

65cm in 24h,
60cm in 24 h
55cm in 24h.

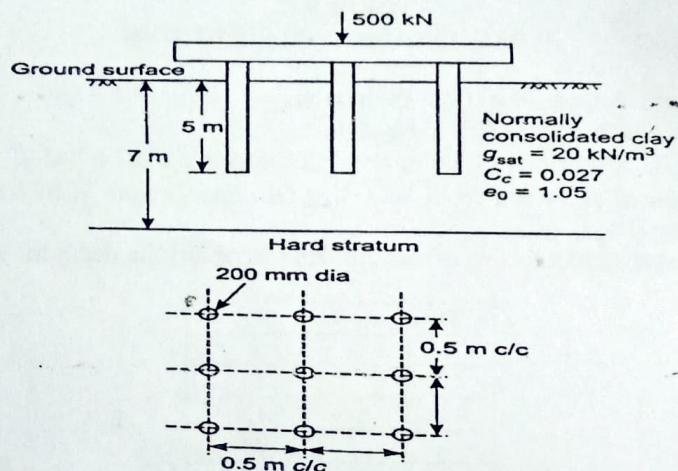
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- | | |
|--|---|
| i) Determine location of ground water table. | 3 |
| v) Write short note on bore log. | |

8. i) What is the ultimate capacity of the pile group shown in figure?



- ii) The (3x3) pile group is embedded in normally consolidated clay as shown in the figure below. Determine settlement of the pile group.



- iii) What is negative skin friction? How it can be reduced?

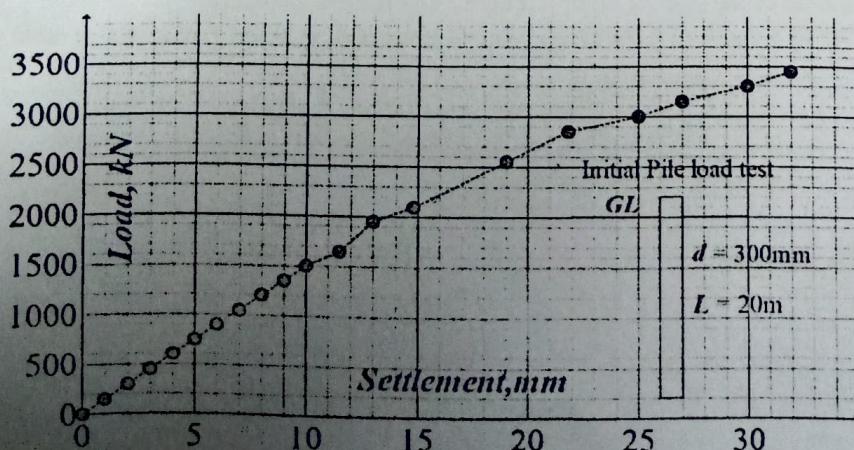
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3

9. i) Write purpose of initial pile load test.
ii) Describe maintained load test to determine pile capacity.
iii) Pile load test data (maintain load test) is plotted in figure below. Determine safe capacity of pile.

2

5



3

- iv) What is cut off level of pile? 1

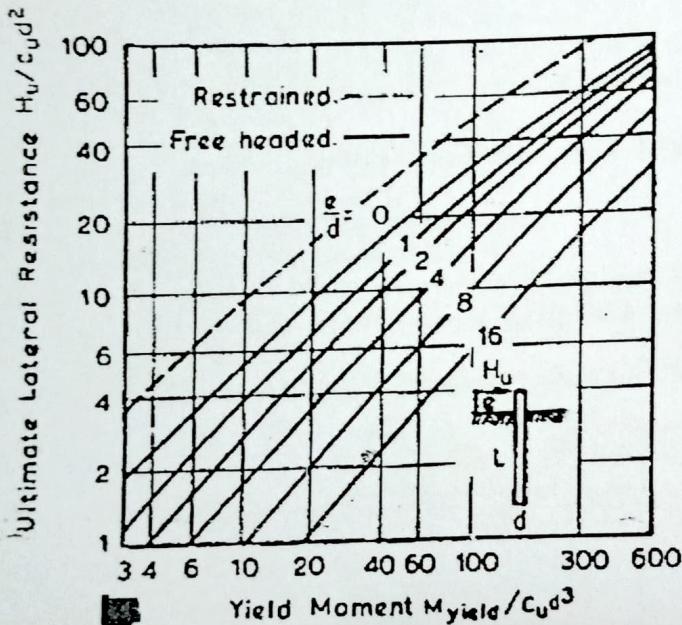
v) Describe procedure to separate skin friction using cyclic load test data. 4

10. i) Height of a cantilever sheet pile wall penetrating sand is 5m. Water table is at 1.5m below GL. $\gamma = 16.9 \text{ kN/m}^3$ and $\gamma_{\text{sat}} = 19.4 \text{ kN/m}^3$ and $\phi = 31.5^\circ$. Depth of penetration is such that equilibrium condition is achieved. Determine maximum moment. 5

ii) Height of an anchored sheet pile wall is 7m. Water table is at 2m below GL. Anchor is placed at 1.5m below GL. $\gamma = 16.5 \text{ kN/m}^3$ and $\gamma_{\text{sat}} = 19.2 \text{ kN/m}^3$ and $\phi = 32^\circ$. Determine depth of penetration and anchor force. Consider free earth support method of analysis. 8

iii) What is the effect of increase of depth of penetration of an anchor bulk head beyond equilibrium depth? 2

11. i) Describe preloading and vibroflotation method of soil improvement.
 ii) A steel pipe pile of 61 cm outside diameter with 2.5 cm wall thickness is driven into saturated cohesive soil up to a depth of 20 m. The un-drained cohesive strength of the soil is 85 kPa. Calculate the ultimate lateral resistance of the pile by Broms method with the load applied at ground level considering free head. Assume $f_y = 275000$ kPa. Chart given below can be used if required.



12. i) Describe seismic exploration method of soil exploration.
ii) In a large site for an industrial complex seismic refraction test was conducted and the following data are obtained:

Distance of Geophone from source (m)	100	200	300	400	500	600	700
Time recorded in Geophone (ms)	110	220	340	400	440	475	510

Determine the depth at which hard layer is available.
iii) Describe sheet pile construction/installation methods.

- iii) Describe sheet pile construction/installation methods.

Note: Arrange for mm graph paper.

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
(A GOVERNMENT AUTONOMOUS COLLEGE)
JGEC/B.TECH/CE/CE(OE)601A/2022-23

2022

SOFT SKILLS AND INTERPERSONAL COMMUNICATION

Full Marks: 70

Time Allotted: 3 Hours

The figures in the margin full marks. Candidates are required to give their answer in their own wards as per as practicable.

Group - A
[OBJECTIVE TYPE QUESTIONS]

Answer all questions:

5x2=10

Fill in the blanks with appropriate prepositions

1. We walked ____ the edge of the desert.
2. It is another three weeks ____ the holidays.
3. Granny is arriving ____ the 3:30 train.
4. His house is ____ the way from Mumbai to Thane.
5. A few days after the accident she died ____ the injuries.

Group - B
[LONG ANSWER TYPE QUESTIONS]

Answer any four questions:

4x15=60

6. Write an essay describing the effective methods of decision making. (250 words)

15

7. He had a working analysis of mankind's troubles: marriage, money, and the tangles of human ties. Long practice had sharpened his perception. Within five minutes he understood what was wrong. He charged three pies per question, never opened his mouth till the other had spoken for at least ten minutes, which provided him enough stuff for a dozen answers and advices. When he told the person before him, gazing at his palm, "In many ways you are not getting the fullest results for your efforts," nine out of ten were disposed to agree with him. Or he questioned: "Is there any woman in your family, maybe even a distant relative, who is not well disposed towards you?" Or he gave an analysis of character: "Most of your troubles are due to your nature. How can you be otherwise with Saturn where he is? You have an impetuous nature and a rough exterior."

This endeared him to their hearts immediately, for; even the mildest of us loves to think that he has a forbidding exterior. The nuts vendor blew out his flare and rose to go home. This was a signal for the astrologer to bundle up too, since it left him in darkness except for a little shaft of green light which strayed in from somewhere and touched the ground before him. He picked up his cowrie shells and paraphernalia and was putting them back into his bag when the green shaft of light was blotted out; he looked up and saw a man standing before him. He sensed a possible

client and said: "You look so careworn. It will do you good to sit down for a while and chat with me."

- a) Make a précis of the above passage and give a suitable title. 15
- 8. Write an essay on creativity and lateral thinking. (250 words) 15
- 9. What is technical communication? What are its objectives? Briefly describe the communication cycle. 15
- 10. Write an email to a colleague congratulating him on his success in a grand project. 15
- 11. Write a letter to the editor of a national daily, expressing your opinion and views on the increased human dependence on technology. 15

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
 [A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/ CE/ CE(PC)601/ 2021-22
2022
CONSTRUCTION ENGINEERING & MANAGEMENT

Full Marks: 70

Times: 3 Hours

*The figures in the margin indicate full marks.
 Candidates are instructed to write the answers in their own words as far as practicable.*

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer **all** questions

5x2=10

1. What do you mean by Arbitration?
2. Define EMD & SD in Departmental Procedure.
3. Differentiate clearly between an 'event' and an 'activity'
4. What is the ratio of probability of occurrence of optimistic and most likely time?
 PERT calculations indicate that duration of a given project is 102 weeks. With the variance of 15, workout
5. number of weeks within which the project is expected to be completed with probability of 50%

number of wee

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any **four** questions

4x15 = 60

10

6. i) Enlist principles of building planning and explain in detail.
- ii) Write down the rights and responsibilities of an Engineer in Construction
7. i) Write brief note on departmental procedure.
- ii) Describe Fire fighting arrangements in public assembly buildings
8. Fig1 shows the network for a construction project ,with the three time estimates of such activity marked
 Determine (a) Critical path and its standard deviation
- (b) Probability of completion in 38 days
- (c) Time duration that will provide 95% probability of completion time.

5

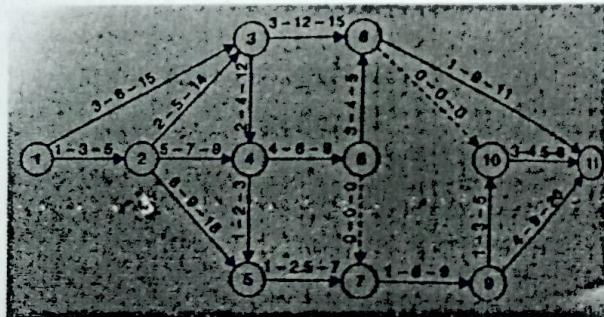
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7

5

5

5



(FIG-----1)

9. i) A construction material trading company receives a total of 200 t as annual demand for steel reinforcement .The annual cost of carrying per unit t of reinforcement is Rs 2000t and cost to place an

7

order is Rs 25000. What is economic order quantity?

(ii) Find the number of transit mixers (TM) required for transporting concrete from central batching plant to site. The cycle time data of 6 m³ typical transit mixers is given below.

loading time of TM=10min,

Travel time of loaded TM at site =40 mins,

Average waiting time at site=5 min,

Discharge time of concrete at site through concrete pump=15 min,

travel time to return trip =30 min

if the central batching plant having average output of 60 m³/hr is to run continuously ,

workout the requirement of no. of concrete pumps and TM

10.

8
2

i) What is float or slack?

ii)

Activity	Normal duration (weeks)	Normal cost (Rs)	Crash duration (weeks)	Crash cost (Rs)
1-2	5	3000	2	10000
2-3	6	4000	2	7000
2-4	7	3500	4	5000
3-4	5	5000	2	8000

The project overhead costs are Rs 2500 per week . Find the optimum duration and the cost associated with it. 13
Draw also the least cost network.

11. Write short notes on (any three)

3x5

- i) Formwork
 - ii) Batching plants
 - iii) Bid Document
 - iv) Provisions of Stair/Lift as per NBC
 - v) Basic construction methods for steel structures
 - vi) Ventilation
-

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

[A GOVERNMENT AUTONOMOUS COLLEGE]

JGEC/B.TECH/ CE / CE(PC)604/ 2021-22

2022

DESIGN OF STEEL STRUCTURES

Full Marks: 70

Times: 3 Hours

The figures in the margin indicate full marks.

Candidates are instructed to write the answers in their own words as far as practicable. Use of IS 800:2007 and SP 6/ Steel tables are allowed. Assume any other suitable data, if required.

GROUP-A

[OBJECTIVE TYPE QUESTIONS]

Answer **all** questions

5x2=10

1. What are the advantages of a steel structure?
2. What are the various types of rolled structural steel sections manufactured and used as a structural steel
3. Define slenderness ratio. State its uses.
4. What is a shear lag?
5. Explain plastic section in steel structures.

GROUP-B

[LONG ANSWER TYPE QUESTIONS]

Answer any **four** questions

4x15 = 60

6. i) What are the different bolted joints? 5
ii) Design a lap joint connecting two plates 120 mm x 6 mm to transmit a factored load of 150 KN. Use 16 mm diameter black bolts of grade 4.6 and steel having $f_u = 410 \text{ N/mm}^2$ 10
7. i) What are the different types of failures exhibited by the tension member? 5
ii) Design a suitable angle section to carry a factored tensile force of 210 KN assuming a single row of M20 bolts. Assume the length of the member is 3 m. Use Fe 410 grade of steel. 10
8. i) Discuss briefly the advantages and disadvantages of welded connection. 5
ii) A tie member of a truss is made of ISA 75x75x6 mm and is subjected to a factored tensile force of 100 KN. Design a welded joint. Use Fe 410 grade of steel. 10
9. i) Discuss the different types of sections that are used as a compression member. 5
ii) Determine the design axial load on the column section ISMB450 @ 710.3 N/m, height of column is 4m and it is pin ended. Use Fe 410 grade of steel. 10
10. i) Explain different classes of section of beam as per IS 800:2007. 5
ii) Determine the design bending strength of a beam ISMB300 @ 434 N/m. Assume that the factored shear force is less than the design shear strength. Use Fe 410 grade of steel. 10
11. i) Illustrate the different elements of plate girder. 5
ii) The section of a welded plate girder consists of flange plates 600 mm x 40 mm and web plate 1800 mm x 12 mm. Determine the moment capacity of the section. Intermediate stiffeners are not provided. Use Fe 410 grade of steel. 10
12. i) What are the different kinds of load to be considered for the design of a gantry girder? 6
ii) Explain the specifications (IS code provisions) and the design steps for gantry girder. 9

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE
[A GOVERNMENT AUTONOMOUS COLLEGE]
JGEC/B.TECH/CE/CE(PE)602B/2021-22
2022
STRUCTURAL ANALYSIS II

Full Marks: 70

Times: 3 Hours

*The figures in the margin indicate full marks.
Candidates are instructed to write the answers in their own words as far as practicable.*

GROUP-A
[OBJECTIVE TYPE QUESTIONS]

Answer **all** questions

5x2=10

1. Write the significances of the statement "Plane sections remain plane before and after bending".
 2. Consider a hinged-hinged simply supported beam [L, A, E, I]. Then write the magnitude of translational flexibility coefficient at mid-span along normal to the axis of the beam.
 3. Write the translational stiffness coefficient, along normal to the axis of the beam, at B of a beam AB (L, A, E, I) whose end A is fixed and end B is restrained against rotation.
 4. Write the plastic moment capacity [kN-m] required for a 5.0m long fixed ended single span beam subjected to uniformly distributed load of 10kN/m.
- A horizontal semi-circular BOW GIRDER ACB of radius R, is fixed at A and subjected to a concentrated load P normal to the plane of the bow girder/ ring at free end B. Write the magnitude of induced bending moment at A.

GROUP-B
[LONG ANSWER TYPE QUESTIONS]

Answer any **four** questions

4x15=60

6. Analyze the prismatic beam shown in the Fig.1 below using Moment Distribution Method [perform three iterations for convergence]. The end A is fixed and the end B, supported by translational spring, is free to rotate. Also, draw BMD and SFD. Given, Spring Stiffness K = 10000 kN/m.
7. Analyze the portal frame shown in the Fig.2 using Slope Deflection Method and determine the magnitude of side-sway at top of the frame.
8. Apply Portal Method to determine axial force, shear force and bending moment for members 1-2, 4-5, 1-4, 2-5, 4-7 and 5-8 of the portal frame shown in the Fig. 3. Depict magnitude and direction of axial and shear forces pictorially. Also, draw tension-side BMD for said members.
9. Determine the value of P for the portal frame shown in the Fig.4 by Plastic Analysis Method.
10. A suspension bridge has span of 125m. The stiffening girder has three hinges: one at the mid-point and other two hinges at both ends. The central dip of the cables is 12.5m. The stiffening girder is subjected to a dead load of 20kN/m including self-weight for full length and a live load of 30kN/m of length 20m long. Determine the maximum cable tension when the live load extends from the center of the stiffening girder towards the RHS support. Also draw the BMD and SFD for the girder.

11. A steel beam consists of Z - Section as shown in Fig. 5; The section is subjected to sagging bending moment 100kN-m about Z-axis in XY plane. Determine the stresses at points A and C. Locate the neutral axis. Also locate principal axes. Given, AB = 250mm; BC = 300mm; Flange thickness = 25mm and web thickness = 20mm.
12. Identify kinematic indeterminacies and form corresponding redundant matrix, action (load) matrix as well as stiffness matrix for the continuous beam shown in Fig. 6. Also, write the equilibrium equation to determine kinematic indeterminacies.

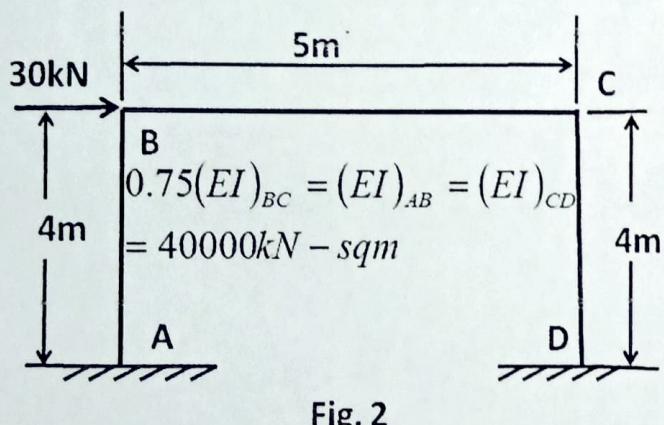
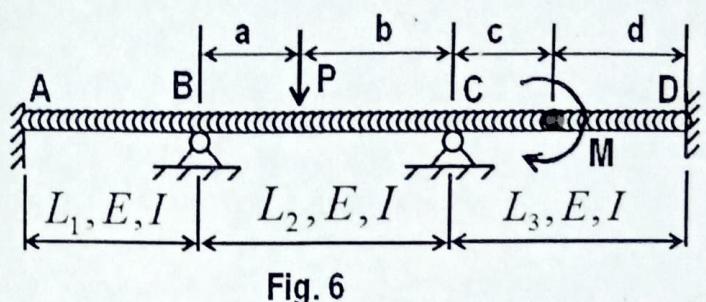
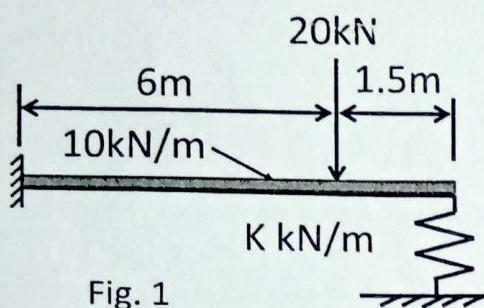


Fig. 6

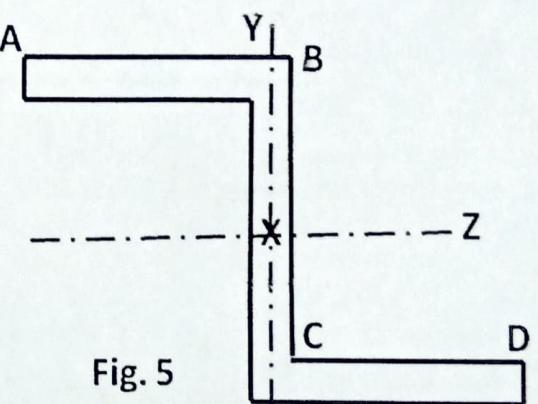


Fig. 2

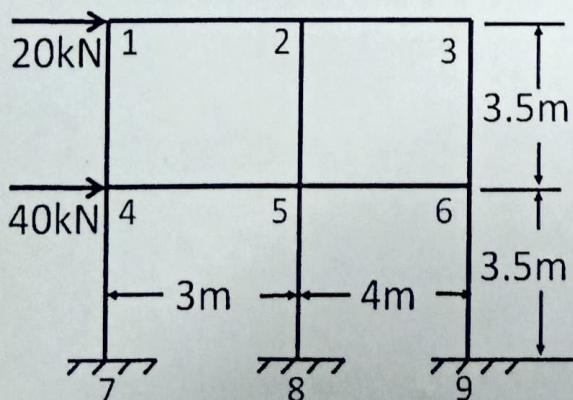


Fig. 3

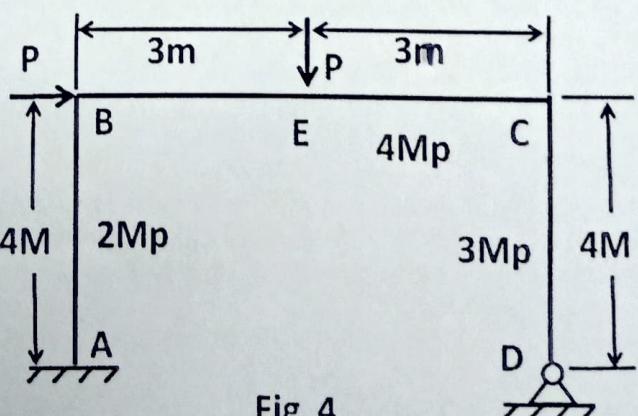


Fig. 4