

Total No. of Printed Pages: 02

S.E - (Civil) (Sem-IV) (Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Transportation Engineering

[Time: 3:00 Hours]

[Max. Marks:100]

- Instructions:**
- Marks are indicated to the right of the question
 - Answer any 2 questions from Part A, 2 questions from Part B and 1 question from Part C
 - Illustrate your answers with neat figures wherever necessary.
 - Assume any additional data if required and mention them clearly.

PART-A

- Q.1**
- Elaborate on the classification of roads in India **10**
 - What are the salient features of Bombay Road Development Plan? How it differs from Nagpur Plan? **10**
- Q.2**
- Write a note on Interlocking Concrete block pavement? Write its advantages and draw the various types and shapes of concrete pavement **10**
 - Sketch and explain on street parking. Also Sketch and explain four types of road intersection **10**
- Q.3**
- What are the differences between Flexible and Rigid Pavements? What are the failures patterns seen in Rigid Pavements? **10**
 - Calculate the stresses at interior, edge and corner regions of CC pavement using Westergaard's stress equation. Use the following data: Wheel load= 5100 kg, modulus of elasticity is 3×10^5 kg/cm², pavement thickness =18cm, Poisson's ratio of concrete = 0.15, modulus of subgrade reaction 6 kg/cm³ and radius of contact area is 15cm. Radius of stiffness is 70.6 cm and Radius of equivalent distribution is 14cm. **10**

PART-B

- Q.4** a Write a note on different component of airport and site selection of the same **06**
- b Compute the corrected length of runway for an airport located at an elevation of 170m above MSL if the length of runway under standard conditions is 2100m. The airport reference temperature is 32.6°C and the runway has to be provided with an effective gradient of 0.23 percent **14**
- Q.5** a Elaborate on tunnel alignment and shapes of tunnels **15**
- b Elaborate on different types of gradients used in railway and Compute the corrected length of runway for an airport located at an elevation of 170m above MSL if the length of runway under standard conditions is 2100m. The airport reference temperature is 32.6°C and the runway has to be provided with an effective gradient of 0.23 percent **05**
- Q.6** a Write a note on classification of harbours? **06**
- b What are the objectives of dredging? Explain different types of dredging equipment's for different types of soils. **14**

PART-C

- Q.7** a Explain alternative bay method of construction of CC pavements **10**
- b Write a note on TBM and NATM method of tunnelling **10**
- Q.8** a Explain any 4 Navigational aids and landing platforms used in Harbours **10**
- b Explain tunnel surveying and alignment **10**

Total No. of Printed Pages: 4

S.E - (Civil) (Sem-IV) (Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Structural Analysis

[Time: 3 Hours]

[Max. Marks:100]

- Instructions:**
1. Attempt TWO questions from Part A, TWO questions from Part B and ONE question from Part C.
 2. Figures to the right indicate full marks.
 3. Make Suitable assumptions wherever necessary.

Part –A

- Q1 a) Determine the Static and Kinematic indeterminacy for the following pin jointed plane frame **05**

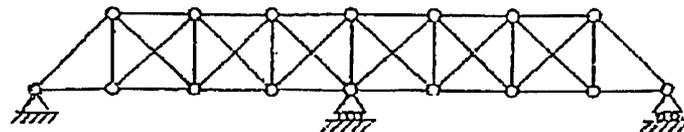


Fig Q1 (a)

- b) Determine the horizontal deflection at joint 'C' for the truss shown in the fig Q1.
 b. Cross sectional area of all the members is 600 mm^2 and $E = 200 \text{ kN/mm}^2$

15

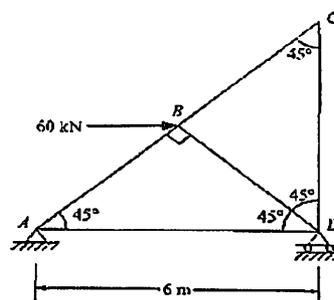


Fig Q1 (b)

- Q2 a) A Fixed beam is loaded as shown in fig. Q 2.a Determine the fixed end moments and draw SFD and BMD 10

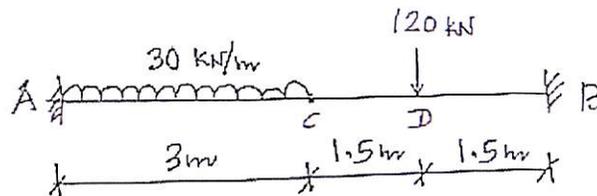


Fig Q2. a

- b) A simply supported beam of span 6 m is subjected to a point load of 50 kN at a distance of 2 m from the right support. Determine the deflection at a distance of 2 m from left support. ($EI = 8750 \text{ kN-m}^2$) 10
- Q3 Analyse the frame shown in fig. Q3 by Moment distribution method and draw SFD and BMD 20

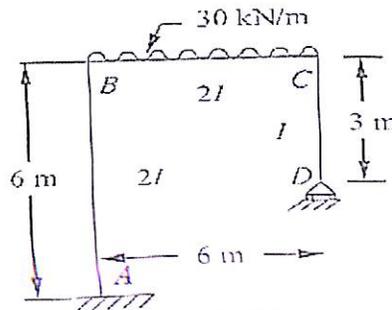


Fig Q3

Part -B

- Q4 Analyse the beam shown in the figure Q4 using slope deflection method and draw SFD and BMD 20

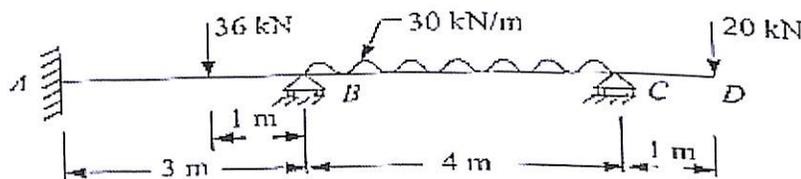


Fig Q4

- Q5 Analyse the beam shown in the figure Q 5 using Kani's Rotation Contribution method and draw SFD and BMD. 20

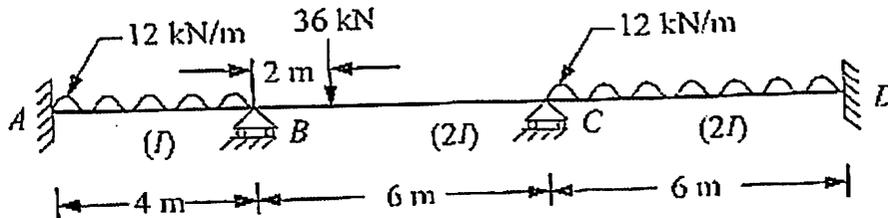


Fig Q5

- Q6 A three-hinged parabolic arch hinged at the supports and at the crown has a span of 24 m and a central rise of 4 m. It carries a concentrated load of 50 kN at 18 m from left support and a uniformly distributed load of 30 kN/m over the left-half portion. Determine the moment, thrust and radial shear at a section 6 m from the left support. Also draw BMD for the arch. 20

Part -C

- Q7 a) A system of four loads 80,160,160 and 120 kN crosses a simply supported beam of span 25 m with the 120 kN load leading. The loads are equally spaced at 1m. Determine the values of the following using influence lines. 10
- (i) Maximum bending moment at a section 10 m from left support and
(ii) Absolute maximum shear force and bending moment in the beam.
- b) A uniformly distributed load of 60 kN/m and 7 m long moves on a simply supported beam of span 10 m. The load moves from left to right. Using influence lines determine maximum positive shear force, maximum negative shear force and also maximum bending moment at a section 4 m from left support. 10
- Q8 a) A cable of span 100 m has its ends at heights 8 m and 15 m, above the lowest point of the cable. It carries a uniformly distributed load of 10 kN/m per unit horizontal run of the span. Determine the horizontal and vertical reactions at the support. Also determine the length of the cable? 8

- b) Develop Stiffness and flexibility matrices for the beam w.r.t the coordinates marked in fig. Q 8.b. 12

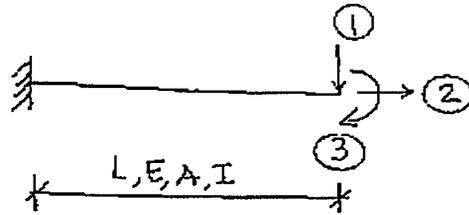


Fig Q8. b

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S.E. - (Civil) (Sem - IV) (Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Hydraulic Engineering

[Time: 3:00 Hours]

[Max. Marks: 100]

Instructions: 1) Marks are indicated to the right of the question.

2) Answer any 2 Questions each from Part A & B and one question from Part C

3) Assume additional data if required and state them clearly

PART – A

- Q1 a) How does specific energy curve vary from specific force curve. (10)
- b) Derive an expression for hydraulically efficient rectangular section. Explain (10) hydraulically efficient section?
- Q2 a) A hydraulic jump occurs in a 0.2m wide rectangular channel at the point where (10) depth of water flow is 0.15m and the Froude number is 2. Make calculations for the specific energy, critical and sequent depths, loss of head and the energy dissipated.
- b) Design the pelton wheel for a head of 70m and speed 200 rpm. The pelton wheel (10) develops 100 kW shaft power, co-efficient of velocity is 0.95, speed ratio is 0.4 and overall efficiency is 0.9.
- Q3 a) A 1m wide rectangular channel conveys 10 cumecs of water at a depth of 1.5m. (10) Calculate: i) specific energy and the conjugate depth ii) critical depth, critical velocity and the minimum specific energy. Also compute the Froude number and comment on the nature of flow, i.e., whether subcritical or supercritical.
- b) Mention classification of turbines. A turbine is to operate under a head of 10m at (10) 120 rpm. The discharge is 15 cumec. If the efficiency is 90 %, find performance of the turbine under a head of 10m.

PART – B

- Q4 a) How does reciprocating pump work? A centrifugal pump requires 5 kW power (10) when running at 1400 rpm and delivering a total head of 10m. Find out the head developed and power required when the pump runs at 1200 rpm.
- b) Mention classification of various pumps. Explain differences between pumps in series and pumps in parallel? When priming is done? (10)
- Q5 a) A centrifugal pump is to discharge 0.1 cumec at a speed of 1400 rpm against a (10) head of 20m, the impeller diameter is 200mm, its width at outlet is 40mm and manometric efficiency is 70%, find vane angle at the outer periphery of the impeller.
- b) Explain the components of centrifugal pump and its advantages. How does (10) reciprocating pump work?
- Q6 a) What is suction stroke and delivery stroke? A single stage centrifugal pump (10) discharges 0.4 cum of water per minute producing a head of 10m. A motor drives the pump and speed is 1200 rpm. The brake power is 5kW. If the number of revolutions is increased to 1300 rpm, find the new discharge, head and brake power.
- b) A Francis turbine has an inlet diameter of 2m & an outlet diameter of 1.2m. The (10) breadth of blades is constant at 0.15m. The runner rotates at a speed of 200rpm with discharge of 8 cumec. The vanes are radial at inlet & discharge is radially outwards at the outlet. Calculate the angle of guide vane at the inlet & blade angle at the outlet.

PART – C

- Q7 a) With the help of neat diagram explain indicator diagram. A pelton wheel is (10) required to develop 4MW when working under a head of 120m. It rotates with a speed of 150 rpm. Assuming jet ratio as 15 and overall efficiency as 90%, find i) diameter of wheel ii) quantity of water required iii) number of jets. Assume coefficient of velocity as 0.8 and speed ratio as 0.25.
- b) Explain the following i) hydraulic crane ii) air lift pump iii) hydraulic ram iv) jet (10) pump

- Q8
- a) Explain which safety measures to be considered in hydro-power plant? Write a (10) note on advantages of hydropower plants? Explain hydropower development in India.
 - b) The discharge through a single acting reciprocating pump is 0.01 cumec of water per sec when running at 30 rpm. Stroke length is 40cm and the diameter of the (10) piston is 10cm. If the total lift is 10m, find i) theoretical discharge of the pump ii) slip and percentage of slip of the pump iii) co-efficient of discharge iv) Power required

Total No. of Printed Pages: 3

S.E. - (Civil) (Sem-IV) (Revised Course 2019-2020)

EXAMINATION DECEMBER 2023

Surveying and Geomatics

[Time: 3:00 Hours]

[Max. Marks: 100]

- Instructions:** 1) Answer any FIVE questions; At least TWO from PART-A, TWO from PART-B and ONE from PART-C
- 2) Make suitable assumptions wherever required
- 3) Supplement your answer with neat sketches wherever required

Part-A

- Q1
- A. Define survey station. Explain the types. 4
- B. Write short notes on the types of direct levelling. 5
- C. The following offsets were taken at 15 m intervals from a survey line to an irregular boundary line: 5
- 3.50, 4.30, 6.75, 5.25, 7.50, 8.80, 7.90, 6.40, 4.40, 3.25 m
- Calculate the area enclosed between the survey line, the irregular boundary line, and the first and last offsets by: (a) The Trapezoidal rule (b) Simpson's rule
- D. The following consecutive readings were taken with a levelling instrument at intervals of 20 m. 6
- 2.375, 1.730, 0.615, 3.450, 2.835, 2.070, 1.835, 0.985, 0.435, 1.630, 2.255 and 3.630 m The instrument was shifted after the fourth and eighth readings. The first reading was taken on chainage of 120 m where the RL is 110.50 m. Apply check

- Q2
- A. Define the terms on a contour map. Explain the characteristics of contour lines. 6
 - B. Write short notes on (i) Magnetic declination (ii) Principles of surveying 4
 - C. Mention the steps involved in temporary adjustments in a level. 4
 - D. The following are the bearings of a closed traverse 6

Side	FB	BB
AB	45°30'	225°30'
BC	120°	300°
CD	190°30'	10°30'
DA	284°15'	104°15'

Calculate the interior angle of the traverse and correct them if necessary.

- Q3
- A. Define the terms used in vernier theodolite: Line of collimation, Transiting, swinging, right face, centering. 5
 - B. (i) Mention the characteristics of tacheometer. 5
(ii) Write short notes on stadia diaphragm of tacheometer.
 - C. A tacheometer was setup at a station A and the following readings were obtained on a staff vertically held. 10

Inst Station	Staff station	Vertical angle	Hair readings (m)	Remark
A	BM	-4°30'	1.60, 1.80, 2.50	RL of BM
A	B	+7°20'	0.70, 1.60, 2.35	450.50 m

Calculate the horizontal distance between BM and B and RL of B, when the constants of instrument are 100 & 0.25

Part-B

- Q4 A. Explain the procedure of Rankine's method of simple curve with a neat sketch. 8
B. Two tangents intersect at chainage 1190 m, with 36° deflection angle. Calculate all the required data for setting out a simple circular curve of 60 m radius by the long chord method. 7
C. Define the elements in a Compound Curve with a neat sketch. 5
- Q5 A. Discuss the centre line method of setting out for a foundation of building with a sketch. 7
B. Explain the procedure for setting out a culvert. 6
C. Describe the Setting out centre line for a tunnel with a neat sketch. 7
- Q6 A. List out the parts of Total station. What are the functions? Give the operations involved in Total station. 10
B. Explain the various segments in GPS. 5
C. Mention the types of EDM's. Explain the principle of EDM. 5

Part-C

- Q7 A. Explain any one method of taking horizontal angle with theodolite. 5
B. Explain the principle of triangulation and the types of schemes. 5
C. Write short notes on (i) Satellite stations (ii) types of signals in triangulation. 6
D. How the selection of site for base line is done? 4
- Q8 A. Give the various purposes of Hydrographic Survey. What are the various surveys done in River survey? 7
B. What are the stages in Remote sensing? Give a brief note on types of Remote sensing. 7
C. Write short notes on (i) GIS (ii) Drone surveying 6

Total No. of Printed Pages: 03

S.E - (Civil) (Semester-IV) (Revised Course 2019-2020)

EXAMINATION JUNE 2023

Surveying and Geomatics

[Time: 3:00 Hours]

[Max. Marks:100]

- Instructions:**
1. Do make suitable assumptions wherever found necessary and state them clearly.
 2. Substantiate your answers with sketches wherever felt necessary.
 3. Answer any two questions each from Part A and Part B and any one question from Part C.

PART - A

- Q1 a) What are the sources of errors in compass survey and what precautions will you take to eliminate them? 05
- b) Obtain RL's of A & B 10

BS	IS	FS	RL	Remarks
3.920				A
1.460		7.780		
7.050		3.270		
	2.360			B
4.810		0.850		
8.630		2.970		
7.020		3.190		
		4.280	127.300	BM

- c) Derive the distance and elevation equation for the object whose base is inaccessible and instrument axis is not at same level. 05
- Q2 a) The following bearings were observed with a compass: 10

LINE	FB	BB
AB	38°30'	219°15'
BC	100°45'	278°30'
CD	25°45'	207°15'
DE	325°15'	145°15'

Find the corrected fore and back bearings and the true bearing of each of the lines given that the magnetic declination was 10° W.

- b) Determine the gradient from a point A to a point B from the following observations made with a tachometer fitted with an anallactic lens. The constant of the instrument was 100 and the staff was held vertically. 10

Instrument Station	Staff Point	Bearing	Vertical angle	Staff readings
P	A	134°	+10°32'	1.360, 1.915, 2.470
	B	224°	+5°6'	1.065, 1.885, 2.705

- Q3 a) Name and explain the different types of signals used in triangulation. 10
- b) The triangulation stations A & B, 60 km apart have elevations 250m and 270m resp. the intervening ground may be assumed to have a uniform elevation of 200m. Find the minimum height of the signal required at B so that the line of sight may not pass nearer the ground than 2.0m. 10

PART – B

- Q4 a) Name components of remote sensing system. 04
- b) Two straights meet with deflection angle 110°. These are to be connected by a simple circular curve with radius 150m. Calculate the length of the connecting curve and length of chord. Also calculate the offsets at 24.5m interval by 10
- a) Radial offsets and b) Perpendicular offsets
- c) Give any two graphical solutions of three-point problem. 06
- Q5 a) Explain any two methods of locating soundings. 08
- b) What are transition curves? Why are transition curves provided? 06
- c) Write a note on Topology. 06
- Q6 a) List and explain all the elements of compound curve with appropriate diagram. 06
- b) Write the properties of electromagnetic waves with respect to EDM. 06
- c) Write a note on surface survey in setting out tunnels. 08

PART – C

Q7 a) Two sets of tacheometric readings were taken from an instrument station A, the reduced level of which was 100.06 m to a staff station B. **10**

a) Instrument P - multiplying constant 100, additive constant 0.06m, staff held vertical.

b) Instrument Q - multiplying constant 90, additive constant 0.06 m, staff held normal to the line of sight. What should be the stadia readings with instrument Q?

Instrument	At	To	Height of Instrument	Vertical angle	Stadia Reading (m)
P	A	B	1.5 m	26°	0.755, 1.005, 1.255
Q	A	B	1.45m	26°	?

b) Name the features and applications of total stations. **05**

c) Describe methods of triangulation in Bridge survey. (any two). **05**

Q8 a) Two tangents intersect at chainage 1190m, the deflection angle being 36°. **10**
Calculate all the data necessary for setting out a curve with a radius of 300m by deflection angles peg interval being 30m.

b) The altitudes of two proposed stations A and B, 100 km apart are respectively 420 m and 700 m. The intervening obstruction situated at C, 70 km from A has an elevation of 478 m. Ascertain if A and B are intervisible and if necessary, find by how much B should be raised so that the line of sight must be nowhere be less than 3 m above the surface of the ground. **10**

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S.E - (Civil) (Sem-IV) (Revised Course 2019-2020)
EXAMINATION JULY 2023
Economics for Engineers

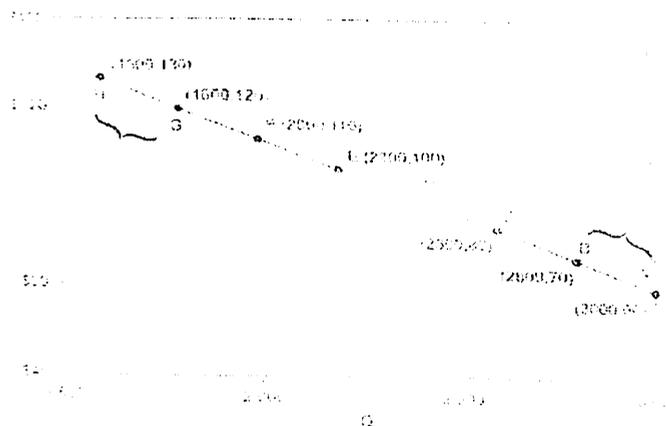
[Time: 03:00 Hours]

[Max. Marks: 100]

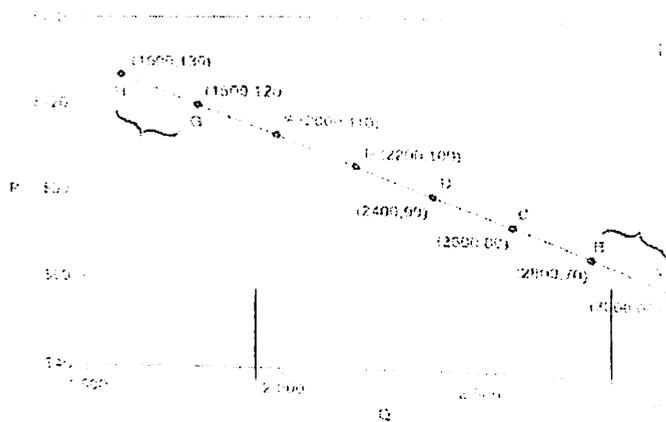
- Instructions:**
1. Answer any five questions by selecting two questions from Part A, two questions from Part B and one question from Part C.
 2. Each question carries 20 marks.
 3. Assume suitable data wherever necessary.

PART A

- Q.1 a) What is a market structure? Explain the perfect and imperfect competition? **10**
- b) Explain in brief the variables of microeconomics and macroeconomics? With a neat sketch also explain the various factors that affect the supply curve. **10**
- Q.2 a) Show how market equilibrium is attained? draw neat sketch and explain the graph **10**



- b) What is the price elasticity for of demand for point A to B also comment on the answer. **10**



- Q.3 a) Why is estimation and forecasting of demand important? Forecast the demand for the 2019 year by exponential smoothing method and 3 years moving average (smoothing constant $\alpha=0.4$) **10**

Year	Actual demand (A_t)	Forecasted demand (f_t)
2011	410	
2012	465	
2013	500	
2014	650	
2015	690	
2016	700	
2017	720	
2018	790	
2019		

- b) Assume you are owning a business car rentals, explain the fixed and variable cost in that business **10**

Part B

- Q.4 a) What is macroeconomics? What are the objectives of macroeconomics explain each in brief **10**
- b) "Economic growth rides on four wheels" Elaborate on the statement. **10**
- Q.5 a) Write a short note on **10**
- Index of human development.
 - The determinants of investments
- b) Write a note on **10**
- Per Capita Income
 - Goals of Monetary policies
- Q.6 a) What is Aggregate Demand comprised off? Explain each of them in brief **10**
- b) Write a short note on Real and Nominal GDP and why is GDP important to economist and investors? **10**

Part C

- Q.7 a) Consumer behavior is understood in 3 distinct steps, once all these are satisfied. the demand for the product increases, explain the theory on production and cost associated with the product **10**
- b) Find the market clearing quantity for soft drinks for an event, **10**
 where Q_s is the quantity supplied ; $Q_s = - 500 + 60P$
 Q_d is the quantity demanded ; $Q_d = 1800 - 35P$
 Find the equilibrium price and equilibrium quantity
 How would the demand supply curve look like? Determine the price for which the quantity demanded is higher than the quantity supplied?
- Q.8 a) "What are the various instruments of Indian money market? Explain in brief the role of stock exchange and stock indices? **10**
- b) Calculate the Real GDP nominal GDP and GDP deflector for the year 2018,2019,2020,2021. Take the base year as 2012 **10**

Year	Product A	Price A	Product B	Price B	Product C	Price C
2018	180	500	1850	1250	900	1300
2019	149	600	760	1180	1050	900
2020	160	500	1600	2900	600	700
2021	100	820	1200	1850	600	900

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S.E - (Civil) (Sem-IV) (Revised Course 2019-2020)

EXAMINATION JULY 2023

Low Cost Construction Techniques

[Time: 03:00 Hours]

[Max. Marks: 100]

Instructions: 1) Answer **5 questions** with at least **Two question** each from **Part A and Part B** and at least **one** question from **Part C**

2) Assume additional data if required and state it clearly

3) Show the necessary diagram properly

4) Questions carry **10 marks each**

PART A

- Q1 A. Describe the need for low cost housing. Also state its advantages? **10**
- B. What are the factors to be considered during the selection of materials for low cost housing? **10**
- Q2 A. Describe the uses of following materials (ANY TWO) in low cost housing? **5x2=10**
(i) Stabilised and sundried soil blocks
(ii) Ferro-cement partitions
(iii) Fibre roofs
- B. Suggest low cost alternative for natural wood in affordable housing? **10**
- Q3 A. Briefly explain Local Cost Construction Materials/Techniques that can be used for low cost housing in rural/urban areas for the following: (ANY TWO) **5x2=10**
i) Foundation
ii) Plinth/Flooring
iii) Structural members
iv) Plumbing/electrical wires
- B. Explain in detail curved masonry roof construction? **10**

PART B

- Q4 A. Explain in brief on present status housing requirement for low cost rural and urban housing? **10**
- B. Describe different techniques used for cost analysis of low cost materials? **10**
- Q5 A. Write a note on comparison of costs with conventional materials? **10**
- B. Explain types and applications of fire-retarding treatment? **10**

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- Q6 A. Explain in detail use of mud housing technology in low cost rural housing? 10
B. Describe on houses to be constructed in disaster prone areas? 10

PART C

- Q7 A. Write short notes on (ANY TWO) 5x2=10
(i) Precast funicular shells
(ii) Use of bamboo in construction
(iii) Testing of low cost construction products
B. Explain in detail Precast RC and ferro-cement construction? 10
- Q8 A. Write a note on low cost waste water disposal system for rural and urban areas? 10
B. Discuss on different types of machines which are used in the construction of low cost materials? 10

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S.E - (Civil) (Sem-IV) (Revised Course 2019-2020)

EXAMINATION JULY 2023

Transportation Engineering

[Time: 3:00 Hours]

[Max. Marks: 100]

- Instructions:**
1. Answer any TWO questions EACH from PART A and PART B, ANY ONE from PART C
 2. SUPPORT YOUR ANSWERS with neat sketches
 3. Assume suitable additional data if required

PART A

- Q.1**
- a) Briefly explain the types of surveys and investigations required for the initiation of a highway project. **10**
 - b) What camber should be provided on a road having a width of 7m with a bituminous concrete surface located in a heavy rainfall area? **5**
 - c) What are the standards for road gradients in India? Explain where i) ruling ii) limiting and iii) exceptional gradients are used. **5**
- Q.2**
- a) Describe with neat sketches the various types of grade-separated intersections and the conditions under which they are provided. **10**
 - b) Sketch a typical cross-section of a National Highway with a dual carriageway indicating its various dimensions. Design a highway lighting system with the following data: **10**
Street width=15m
Mounting height =9m
Lamp size=6000 lumens
Flux=5, assume coefficient of utilization=0.36
- Q.3**
- a) What are the various stresses acting on Rigid pavements. **5**
 - b) Explain the necessity of providing extra width to the pavement surface, The design speed of a highway is 80K/hr. There is a horizontal curve of radius 200m, calculate the maximum allowable speed on this curve. **10**
 - c) What are the various grades of bitumen used in road construction? What are the various tests conducted and the permissible values? **5**

PART B

- Q.4 a) Sketch a typical labeled cross-section of a runway. The length of the runway under standard conditions is 1620m. The airport site has an elevation of 270m. Its reference temperature is 32.90°C. If the runway is to be constructed with an effective gradient of 0.20%. Determine the corrected runway length. 10
- b) How are airports classified based on ICAO? Explain the factors to be considered for the selection of a site for a commercial airport. 10
- Q.5 a) Explain in brief: (a) Littoral drift (b) Wharves and Jetties (c) Fenders (d) Dolphins. Compare Dry Docks and Wet Docks. 10
- b) What is creep effect in Rails. How is it caused? Explain the rail fastenings used in Indian railways. 5
- c) Draw the diagram of the "Points & Crossing" showing all components of it in detail. 5
- Q.6 a) Using a sleeper density of $N+5$, determine the number of sleepers required for the construction of a 2000 m BG track. Enumerate the various stresses a rail is subjected to on the track. 5
- b) What are the site investigations to be carried out before the commencement of tunnel construction? 5
- c) List the various methods of tunneling in hard and soft rocks. Explain in detail any one method in hard and soft rock. 10

PART C

- Q.7 a) What are the advantages and disadvantages of interlocking concrete blocks? What is its composition? 5
- b) What is grade compensation and why is it necessary? How are sight distances estimated? 5
- c) Explain the CBR test and its importance in the design of flexible pavement. 5
- d) Draw a typical layout of a runway at any international airport in India and explain its concept. 5
- Q.8 a) What are the factors considered in the geometrical design of a railway track? 5
- b) Explain the use of TBM in India. What are its advantages? 5
- c) Discuss the factors to be considered while selecting a suitable site for the construction of a Port. 5
- d) Explain the various types of wearing courses on highway pavement. What measures will you adopt to ensure its durability? 5

Total No. of Printed Pages: 4

S.E - (Civil) (Sem-IV) (Revised Course 2019-2020)
EXAMINATION JUNE 2023
Structural Analysis

[Time: 3:00 Hours]

[Max. Marks:100]

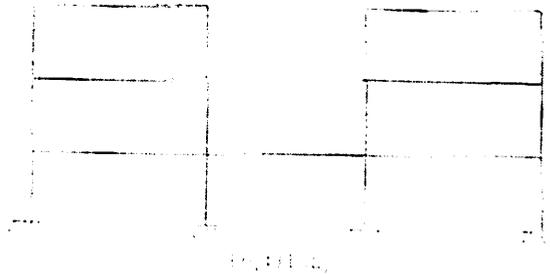
Instructions: 1) Attempt TWO questions from Part A, TWO questions from Part B and ONE question from Part C.

2. Figures to the right indicate full marks.

3. Make Suitable assumptions wherever necessary.

Part -A

- Q1 a) Determine the Static and Kinematic indeterminacy for the following rigid jointed plane frame (Members inextensible) **05**

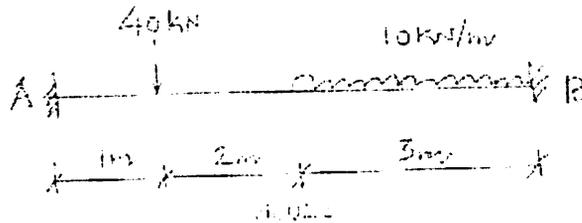


- b) Determine the vertical deflection at joint 'D' for the truss shown in the fig Q1. b. **15**
Cross sectional area of all the members is 400 mm^2 and $E = 200 \text{ kN/mm}^2$



FIG Q1 (b)

- Q2 a) A Fixed beam is loaded as shown in fig. Q 2.a Determine the fixed end moments and draw SFD and BMD 10



- b) A simply supported beam of span 4.5 m is subjected to a point load of 20 kN at a distance of 1.5 m from the right support. Determine the deflection at a distance of 1.5 m from left support. Use Castigliano's theorem ($EI = 9000 \text{ kN-m}^2$) 10

- Q3 Analyse the frame shown in fig. Q3 by Moment distribution method and draw SFD and BMD 20

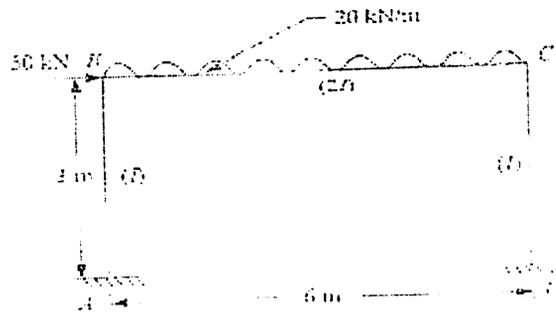


Fig Q3

Part-B

- Q4 Analyse the beam shown in the figure Q4 using slope deflection method and draw SFD and BMD 20

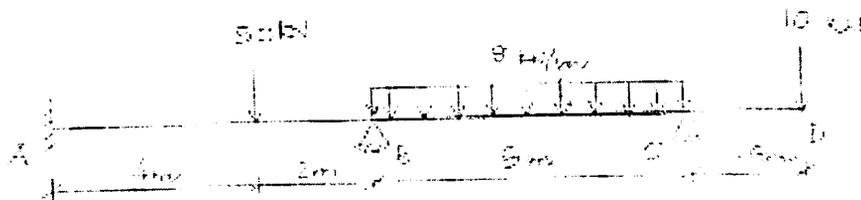


Fig Q4

- Q5 Analyse the beam shown in the figure Q5 using Kani's Rotation Contribution method and draw SFD and BMD. 20

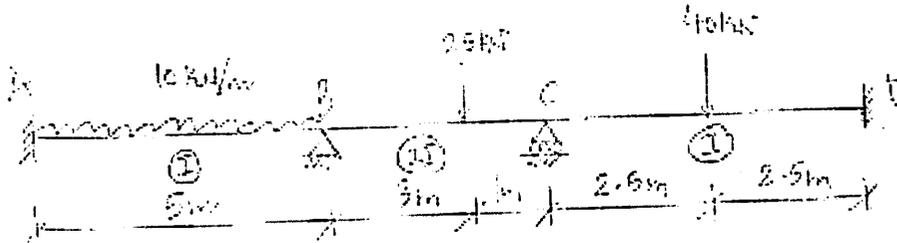


Fig Q5

- Q6 A three hinged parabolic arch of span 30 m has its supports A and B at depths of 4 m and 16 m below crown C. The arch carries a load of 80 kN at a distance of 5 m to the left of C and a second load of 100 kN at 10 m to the right of C. Determine the reactions at supports and bending moments under the loads. Draw BMD 20

Part - C

- Q7 a) A system of four loads 90, 150, 150 and 120 kN crosses a simply supported beam of span 32 m with the 120 kN load leading. The loads are equally spaced at 1 m. Determine the values of the following using influence lines. 10
- (i) Maximum bending moment at a section 12 m from left support and
 - (ii) Absolute maximum shear force and bending moment in the beam.
- b) A uniformly distributed load of 50 kN/m and 6 m long moves on a simply supported beam of span 10 m. The load moves from left to right. Using influence lines determine maximum positive shear force, maximum negative shear force and also maximum bending moment at a section 4 m from left support. 10
- Q8 a) A cable of span 100 m has its ends at heights 8 m and 15 m, above the lowest point of the cable. It carries a uniformly distributed load of 15 kN/m per unit horizontal run of the span. Determine the horizontal and vertical reactions at the support. Also determine the length of the cable? 08

- b) Develop Stiffness and flexibility matrices for the beam w.r.t the coordinates marked in fig. Q 8.b.

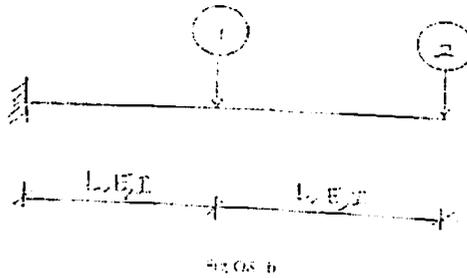


FIG. Q. 8. b

Total No. of Printed Pages:03

S.E.(Civil) Semester-IV (Revised Course 2019-20)
EXAMINATION JANUARY 2023
Surveying and Geomatics

[Duration : 3 Hours]

[Total Marks :100]

Instructions:

1. Do make suitable assumptions wherever found necessary and state them clearly.
2. Substantiate your answers with sketches wherever felt necessary.

PART A

- Q.1
- a) Local attraction and magnetic declination both affect the position of a magnetic needle at a place: Differentiate between two. And also calculate true bearing of a line if magnetic bearing is $N 60^{\circ}30' W$ and magnetic declination is $3^{\circ} W$. 08
- b) A tacheometer was set up at a station A and the readings on the vertically held staff at B were 2.255, 2.605, 2.955, the line of sight being at an inclination of $8^{\circ}24'$. Another observation on vertically held staff at B.M. gave the readings 1.640, 1.920, 2.200 the inclination of the line of sight being $1^{\circ}6'$. Calculate the horizontal distance between A & B and the elevation of B if the R.L. of B.M. 418.685m. The constants of instrument were 100 & 0.3. 08
- c) Write Short notes on 04
- I. Selection of stations
 - II. Station marks
- Q.2
- a) It is required to ascertain elevations of A and B. A line of levels was taken from A to B and then continued to a bench mark of elevation 127.30 ft. The observations are recorded below. 10

Obtain the RL's of A and B.

BS	IS	FS	RL	Remarks
3.92				A
1.46		7.78		
7.05		3.27		
	2.36			B
4.81		0.85		
8.63		2.97		
7.02		3.19		
		4.28	127.30	

- b) The triangulation stations A & B, 60 km apart have elevations 250m and 270m resp. the intervening ground may be assumed to have a uniform elevation of 200m. Find the minimum height of the signal required at B so that the line of sight may not pass nearer the ground than 2.0m. 10

- Q.3 a) Name and explain the different types of signals used in triangulation. 10
 b) The following notes refer to reciprocal levels taken with one level: Find the 06
 a) the true RL of Q
 b) the combined correction for curvature and refraction
 c) the angular error in the collimation adjustment

Instrument near P	Staff reading on		Remarks
	P	Q	
P	1.824	2.748	Distance PQ = 1010m RL of point P = 126.386
Q	0.928	1.606	

- c) Describe briefly the temporary adjustments of a dumpy level. 04

PART B

- Q.4 a) Two tangents intersect at chainage 1190m, the deflection angle being 36°. Calculate all the 10
 data necessary for setting out a curve with a radius of 300m by offsets from long chord peg
 interval being 30m.
 b) Explain the method of setting out building. 07
 c) Name components of remote sensing system 03

- Q.5 a) Explain any two methods of locating soundings 08
 b) What are the advantages and disadvantages of using remotely sensed data? 08
 c) Name the features and applications of total stations. 04

- Q.6 a) Two straights intersect in an inaccessible point B and were joined by a circular curve of 10
 480m radius. Two points M & N were selected on AB and BC respectively and following
 data was obtained
 Angle AMN=159°48'; Angle CNM=155°42'; MN=127.5m

Make necessary calculations for setting out the curve by method of tangential angles, given
 that the chainage of M was 1400.00m

- b) List and Explain all the elements of compound curve with appropriate diagram 0
 c) Write a note on Energy Interactions with atmosphere 05

PART C

- Q.7 a) Work out the true difference in level between points A and B if curvature and refraction 12
 effects are taken into account in the following case:
- Level set up over point A
 - Staff held over point B
 - RL of point A = 100m
 - Height of instrument at A = 1m
 - Reading at staff on point B = 2m
 - Distance AB = 300m

- Assume diameter of the earth = 12742km

b) Derive rules to calculate reduced bearings from whole circle bearing for all the quadrants. 08

a) The following traverse angles were measured clockwise from the back station: 08

$$MAB = 136^{\circ}14'$$

$$ABC = 172^{\circ}16'$$

$$BCD = 96^{\circ}37'$$

What is the bearing of CD if that of MA is $327^{\circ}18'$?

b) The altitudes of two proposed stations A and B, 100 km apart are respectively 420 m and 700 m. The intervening obstruction situated at C, 70 km from A has an elevation of 478 m. Ascertain if A and B are inter-visible and if necessary find by how much B should be raised so that the line of sight must be nowhere be less than 3 m above the surface of the ground. 12

▪ Assume diameter of the earth = 12742km

b) Derive rules to calculate reduced bearings from whole circle bearing for all the quadrants. 08

Q.8 a) The following traverse angles were measured clockwise from the back station: 08

MAB = $136^{\circ}14'$

ABC = $172^{\circ}16'$

BCD = $96^{\circ}37'$

What is the bearing of CD if that of MA is $327^{\circ}18'$?

b) The altitudes of two proposed stations A and B, 100 km apart are respectively 420 m and 700 m. The intervening obstruction situated at C, 70 km from A has an elevation of 478 m. Ascertain if A and B are inter-visible and if necessary find by how much B should be raised so that the line of sight must be nowhere be less than 3 m above the surface of the ground. 12

Total No. of Printed Pages: 3

S.E. (Civil) Semester-IV (Revised Course 2019-20)
EXAMINATION JANUARY 2023
Transportation Engineering

[Time: Three Hours]

[Max. Marks: 100]

- Instructions:**
1. Answer any TWO questions EACH from PART A and PART B. ANY ONE from PART C
 2. SUPPORT YOUR ANSWERS with neat sketches
 3. Assume suitable additional data if required

PART A

Q1 a. What are the objectives of: 1. NHAI 2. CRRI 3. IRC. Explain the various stages in Highway planning. How are the plans prepared towards arriving at a good road network? (10)

b. Three new roads P, Q, R are planned in a district. Check the order for priority of these roads. (05)

Road	Length	No of villages with population		
		<2000	2000-5000	>5000
P	20	06	6	1
Q	28	19	8	4
R	12	07	5	2

c. Sketch a typical cross section of a 4 -lane road with all the cross section elements and dimensions. (05)

Q2 a. What are the conditions for stability of vehicles on curves against skidding and overturning? What are the various methods of introducing superelevation? (05)

b. How is grade compensation estimated? Explain. Calculate the length of a transition curve required for a carriageway of 7.5m width if the design speed is 65kph and the road is passing through a rolling terrain. The radius of the horizontal curve is 200m. (10)

c. Calculate the stopping sight distance and the overtaking sight distance for a design speed of 80kph considering the speed of the slow moving vehicle as 65kph. (05)

Q3 a. Classify various types of pavement courses clearly indicating its various types as used in road constructions. What are the materials required for road constructions and the test to be conducted on the same? State the limiting values of the tests as per IRC. (10)

- b. Compare 1. Bitumen Emulsion and Cutback Bitumen. (05)
2. Flexible and Rigid pavements.
3. Sheet Asphalt and Mastic Asphalt
- c. Explain the method of preparing and laying Bituminous Concrete mix pavements. How will you ensure durability of these pavements (05)

PART B

- Q4** a. Draw a typical layout of an International Runway with markings. What are the functions of AAI and ICAO? How are airports classified based on the runway length. (10)
- b. What are the factors considered in the site selection of an airport? An airport is proposed at an elevation of 400m above MSL. The mean of maximum and average daily temperature of the hottest month is 44.8° and 26.2° C respectively. The effective gradient is 0.5%. Basic length of runway is 1260m. Determine the actual length of the runway provided. (10)
- Q5** a. Explain the various components of a harbour. What are the factors to be considered in the site selection of a harbour? What is littoral drift? (10)
- b. What are the functions of the following: 1. Breakwaters 2. Dolphins 3. Dry Dock. Sketch and briefly explain its construction. (10)
- Q6** a. Sketch a typical of a double gauge Railway track formation showing the various components of a railway track. Compare concrete sleepers over wooden sleepers. Using a sleeper density of N+3, determine the number of sleepers required for the construction of a 1800m BG track. (10)
- b. What are the site investigations to be carried out before commencement of tunnel construction? Explain any one method of tunnelling through hard rocks. (10)

PART C

- Q7** a. Sketch a typical cross section of block pavement Explain the construction of Interlocking Concrete Block Pavement. (05)
- b. Calculate the maximum permissible speed on a horizontal curve of radius 125m of a highway designed for a speed of 65kph to carry mixed traffic. (05)
- c. Explain with a neat sketch the functions of seal coat, Tack coat and prime coat. (05)
- d. Explain the necessity of joints in Rigid pavements .Also explain the stresses in a rigid pavement. Which stress is critical? (FIG ATTACHED) (05)

Wind Direction	Percentage of Time
N	10.9
NNE	8.3
NE	4.2
ENE	1.3
E	0.9
ESE	0.3
SE	8.1
SSE	7.9
S	14.6
SSW	9.8
SW	5.6
WSW	1.8
W	0.3
WNW	0.2
NW	7.5
NNW	5.7

- Q8** a. Following are the average wind data for 10yrs when wind intensity is above 6kph. An airport is to be designed for a single runway. Determine the best runway orientation and calculate the total wind coverage. (05)
- b. Using a sleeper density of $N+5$, determine the number of sleepers required for the construction of a 1800m BG track. Enumerate the various stresses a rail is subjected to on the track (05)
- c. Classify different types of dredging works. What are the types of dredgers used for rocks and loose sediments? (05)
- d. What are the various types of tunnel linings? Why are flat roofs not preferred for tunnel sections? (05)

Wind Direction	Percentage of Time
N	10.9
NNE	8.3
NE	4.2
ENE	1.3
E	0.9
ESE	0.3
SE	8.1
SSE	7.9
S	14.6
SSW	9.8
SW	5.6
WSW	1.8
W	0.3
WNW	0.2
NW	7.5
NNW	5.7

Total No. of Printed Pages: 02

S.E. (Civil) Semester-IV (Revised Course 2019-20)
EXAMINATION JANUARY 2023
Economics for Engineers

[Time: Three Hours]

[Max. Marks:100]

Instructions:

1. Attempt any five questions in all.
2. It is compulsory to answer two questions each from Part-A and Part-B
3. Answer any one question from Part-C.
4. Figures to the right indicate marks.

Part A

- Q1 a. Explain why the price in competitive market settles down at the equilibrium intersection of supply and demand. Explain what happens if the market price starts out too high or too low. 6
- b. State & explain the main characteristics of a Sole Proprietorship & Partnership type of enterprise. 6
- c. Write short notes on (4+4)
- i. Fixed costs
 - ii. Price Elasticity of Demand.
- Q2 a. What is Production Function? Elaborate on the Law of Variable Proportion. 6
- b. Due to advertisements, the demand of a certain brand of product increases. Explain this concept with the help of demand shift. 6
- c. Veblen goods & Giffen goods are considered as exceptions to the Law of Demand. Explain. 4
- d. Write short note on Increasing Returns to Scale. 4
- Q3 a. Why is forecasting an important part of the planning process? Using exponential smoothing method, forecast the demand for the month of May 2022. Using starting forecast as 26 and $\alpha = 0.2$ 6
- | Month | Jan 22 | Feb 22 | March 22 | April 22 |
|----------------|--------|--------|----------|----------|
| Sales in units | 24 | 35 | 29 | 44 |
- b. Define market structures. Differentiate between monopoly and perfect competition. 6
- c. Explain various problems that a firm is likely to face as it expands? How can these be solved by changing the form of ownership? 4
- d. Write a short note on Variable costs. 4

Part B

- Q4 a. Explain the various factors considered as Fuel for Economic Growth. Do you think that economic growth and Economic Development are two names for the same concept? 8
- b. Explain the two types of monetary policy. When is it appropriate to use the expansionary monetary policy? 8
- c. Write a short note on Demand Pull Inflation. 4
- Q5 a. Distinguish between primary and secondary market. Explain in detail the instruments of secondary market. 8
- b. Explain the effect of inflation on Real and Nominal Gross Domestic Product. 6
- c. Human Development is a better measure of Economic Development as it places human being at the center stage of Development. Explain. 6
- Q6 a. Give meaning of money market and explain its instruments in detail. 8
- b. Explain the concept of Macroeconomic Equilibrium. Describe the various factors determining aggregate demand. 6
- c. What is investment? Explain the various determinants of investments. 6

Part C

- Q7 a. Examine 'stable prices' as an objective of macroeconomics. Explain any one measure used by government to track prices or measure overall price level. 6
- b. Demand and supply functions for the manufacturing company are as follows: 6
 Demand equation: $Q_d = 140 - 8P$, Supply equation: $Q_s = 40 + 6.5P$
 i. Calculate the market equilibrium price/output combination.
 ii. Draw the Demand and Supply schedule for price ranging from Rs. 5 to Rs.12.
- c. Write short notes on (4+4)
 i. Gross National Product
 ii. Bombay Stock Exchange
- Q8 a. Suppose that the demand for X in terms of the price of Y is given below by $Q_x = 100 + 0.5 P_y$ 5
 If P_y increases from 50 to 100, Calculate and comment on the Cross elasticity of demand.
- b. Write short notes on (5x3=15)
 i. National Stock Exchange
 ii. Cost Push Inflation
 iii. Marginal Costs

Total No. of Printed Pages: 02

S.E. (Civil) Semester-IV (Revised Course 2019-20)
EXAMINATION JANUARY 2023
Economics for Engineers

[Time: Three Hours]

[Max. Marks:100]

Instructions:

1. Attempt any five questions in all.
2. It is compulsory to answer two questions each from Part-A and Part-B
3. Answer any one question from Part-C.
4. Figures to the right indicate marks.

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- c. Write short notes on (4+4)
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 - ii. Price Elasticity of Demand.

- Q2 a. What is Production Function? Elaborate on the Law of Variable Proportion. 6
- b. Due to advertisements, the demand of a certain brand of product increases. Explain this concept with the help of demand shift. 6
- c. Veblen goods & Giffen goods are considered as exceptions to the Law of Demand. Explain. 4
- d. Write short note on Increasing Returns to Scale. 4

- Q3 a. Why is forecasting an important part of the planning process? Using exponential smoothing method, forecast the demand for the month of May 2022. Using starting forecast as 26 and $\alpha = 0.2$ 6

Month	Jan 22	Feb 22	March 22	April 22
Sales in units	24	35	29	44

- b. Define market structures. Differentiate between monopoly and perfect competition. 6
- c. Explain various problems that a firm is likely to face as it expands? How can these be solved by changing the form of ownership? 4
- d. Write a short note on Variable costs. 4

Part B

- Q4 a. Explain the various factors considered as Fuel for Economic Growth. Do you think that economic growth and Economic Development are two names for the same concept? 8
- b. Explain the two types of monetary policy. When is it appropriate to use the expansionary monetary policy? 8
- c. Write a short note on Demand Pull Inflation. 4
- Q5 a. Distinguish between primary and secondary market. Explain in detail the instruments of secondary market. 8
- b. Explain the effect of inflation on Real and Nominal Gross Domestic Product. 6
- c. Human Development is a better measure of Economic Development as it places human being at the center stage of Development. Explain. 6
- Q6 a. Give meaning of money market and explain its instruments in detail. 8
- b. Explain the concept of Macroeconomic Equilibrium. Describe the various factors determining aggregate demand. 6
- c. What is investment? Explain the various determinants of investments. 6

Part C

- Q7 a. Examine 'stable prices' as an objective of macroeconomics. Explain any one measure used by government to track prices or measure overall price level. 6
- b. Demand and supply functions for the manufacturing company are as follows: 6
 Demand equation: $Q_d = 140 - 8P$, Supply equation: $Q_s = 40 + 6.5P$
 i. Calculate the market equilibrium price/output combination.
 ii. Draw the Demand and Supply schedule for price ranging from Rs. 5 to Rs.12.
- c. Write short notes on (4+4)
 i. Gross National Product
 ii. Bombay Stock Exchange
- Q8 a. Suppose that the demand for X in terms of the price of Y is given below by $Q_x = 100 + 0.5 P_y$ 5
 If P_y increases from 50 to 100, Calculate and comment on the Cross elasticity of demand.
- b. Write short notes on (5x3=15)
 i. National Stock Exchange
 ii. Cost Push Inflation
 iii. Marginal Costs

Total No. of Printed Pages: 4

S.E. (Civil) (Semester-IV) (RC 2019-20)
 EXAMINATION JANUARY 2023
 Structural Analysis

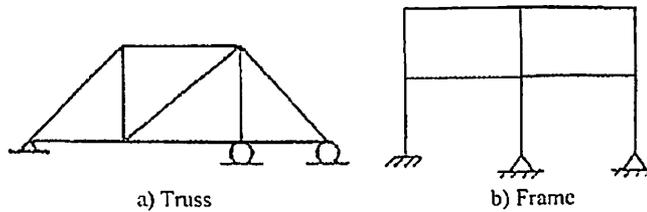
[Time: 3:00 Hours]

[Max. Marks:100]

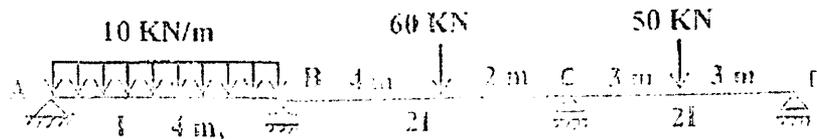
- Instructions:**
- 1) Answer any **TWO** questions from **PART A**, any **TWO** questions from **PART B** and **ONE** question from **PART C**.
 - 2) Figures to the right indicate full marks assigned to the question.
 - 3) Make suitable assumptions wherever necessary.

PART A

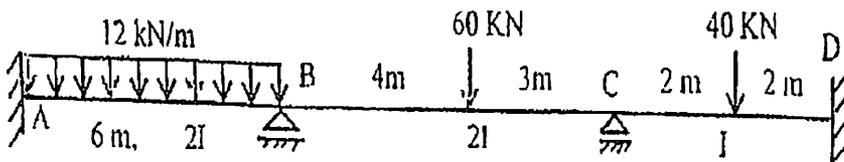
- Q1 A) Determine the static and kinematic indeterminacy for the following structures: 10



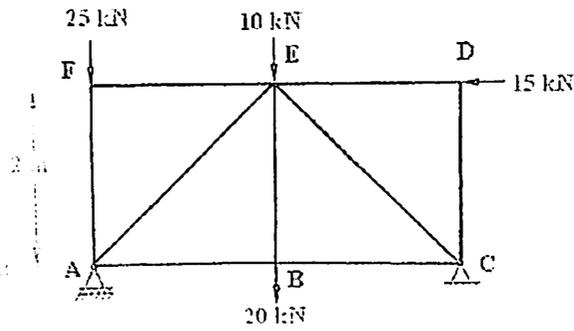
- B) Analyse the continuous beam shown in Figure below by using three moments theorem. 10



- Q2 Analyse the continuous beam shown in Figure below by using moment distribution method. Draw SFD and BMD. Support B sinks by 5 mm. Take $E=2 \times 10^5 \text{ N/mm}^2$ and $I=10^{-4} \text{ m}^4$. 20

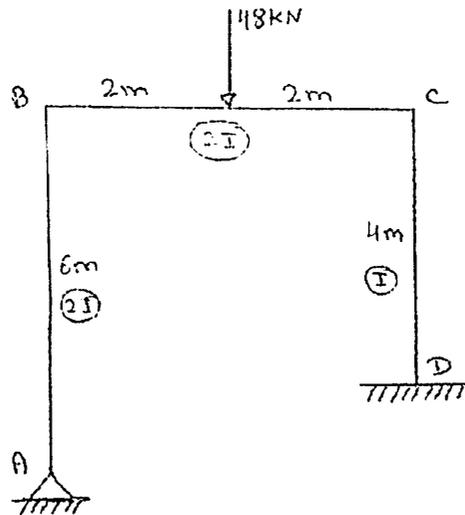


- Q3 A pin jointed truss is as shown in Figure below. Determine the vertical displacement of joint E using unit load method. All members have cross sectional area 250mm^2 and $E=200\text{ Gpa}$.

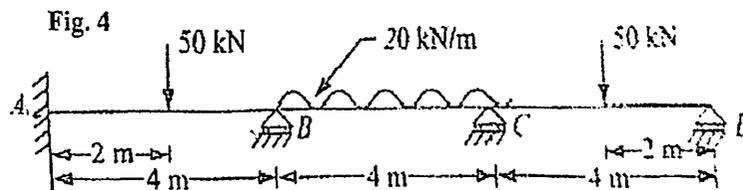


PART B

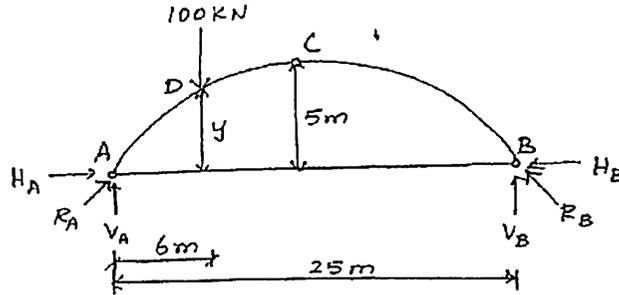
- Q4 Analyse the frame shown in Figure below by using slope deflection method. Take $E=2 \times 10^5\text{ N/mm}^2$ and $I=10^{-4}\text{m}^4$. Draw SFD and BMD.



- Q5 Analyse the continuous beam shown in Figure below using Kanis method. Take $EI=5000\text{ kN-m}^2$. Draw SFD and BMD. Assume all members have same EI



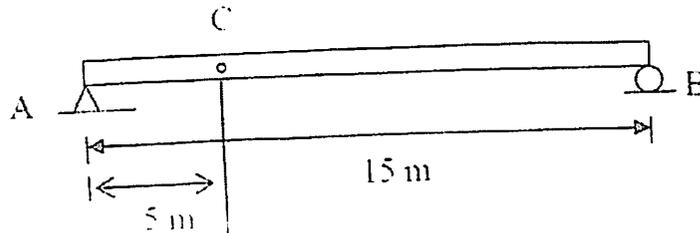
- Q6 A) A circular (three hinged) arch of span 25 m with a central rise of 5 m is hinged at 10 m from the crown and the end supports. It carries a point load of 100 kN at 6 m from the left support. Calculate
- a) The reaction at the supports and b) Moment at 5 m from the left support.



- B) For the beams shown in Figure below construct Influence line Diagrams for:

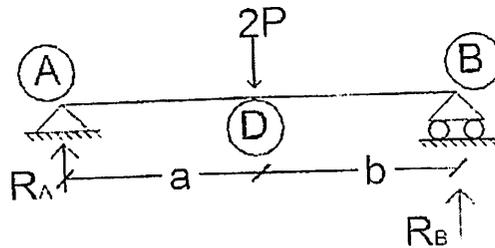
10

- Vertical reaction at A and B
- Shear at C
- Bending moment at C

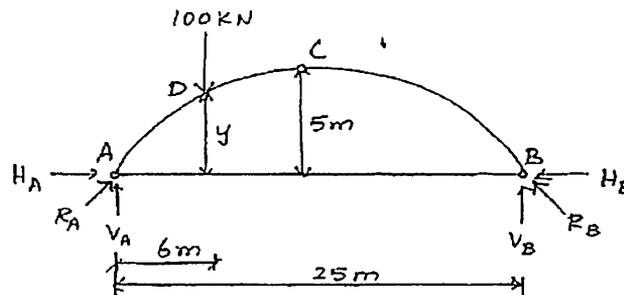


PART C

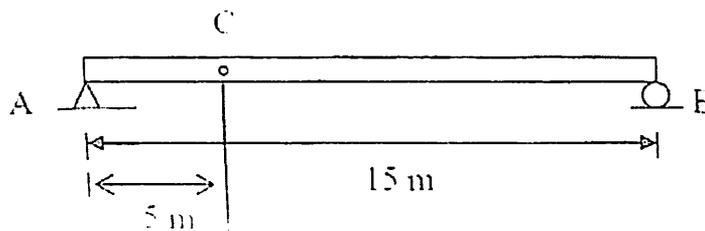
- Q7 A) Calculate the deflection at point D for the beam loaded as shown in Figure using 10 Castiglianos theorem as well as moment area method.



- Q6 A) A circular (three hinged) arch of span 25 m with a central rise of 5 m is hinged at 10 the crown and the end supports. It carries a point load of 100 kN at 6 m from the left support. Calculate
 a) The reaction at the supports and b) Moment at 5 m from the left support.

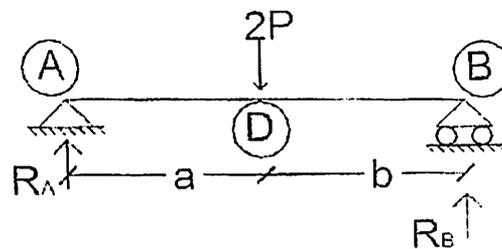


- B) For the beams shown in Figure below construct Influence line Diagrams for: 10
 i) Vertical reaction at A and B
 ii) Shear at C
 iii) Bending moment at C

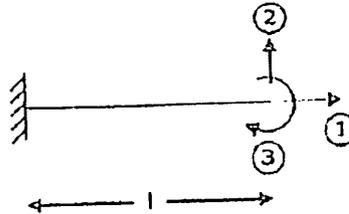


PART C

- Q7 A) Calculate the deflection at point D for the beam loaded as shown in Figure using 10 Castiglianos theorem as well as moment area method.



- B) For the beam shown in Figure obtain the stiffness and flexibility matrix and prove reciprocity. 10



- Q8 Analyse the frame shown in Figure below using moment distribution method. Draw SFD and BMD. Assume E and I same for all members. Take $E=2 \times 10^5 \text{ N/mm}^2$ and $I=10^{-4} \text{ m}^4$ 20

