BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Surveying-I (CI301)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) Write a short note on uses of surveying.
b) What is ranging?
c) What are the instruments used for a chain surveying?
d) Define: i)True bearing ii) Magnetic bearing
e) How leveling is done using foot screws?
f) State the principle of plane table survey.
g) Explain the object of preparing a contour map.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Write note on general principles of surveying.
b) Discuss briefly the classification of surveying based on purpose and instrument.
c) Plot the following chain and cross staff observations and find the area of the field. (Refer fig.a))

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain the factors to be considered in deciding stations of chain survey.
b) The following are the observed bearing of the lines of a traverse ABCDEA with a compass in a place where local attraction was suspected:

Line	FB	BB
AB	191° 45'	13° 0'
BC	39° 30'	222° 30'
CD	22° 15'	200° 30'
DE	242° 45'	62° 45'
EA	330° 15'	147° 45'

Find the correct bearings of the lines.
c) Explain: i) Local Attraction ii) Bowditch Rule

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Define Bench Mark. State and explain different types of Bench Mark.
b) With the help of sketches explain simple leveling and differential leveling.
c) The following consecutive readings were taken with a leveling instrument at interval of 10m. Instrument was shifted after 4th and 8th readings. The last reading was taken on BM of RL 100m. Find RL of all reaming points 2.400, 1.800, 0.600, 2.900, 2.500, 2.100, 1.900, 1.000, 0.500, 1.650, 2.600 and 3.500

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain indirect method of contouring.
b) What are the characteristics of contour lines? Draw neat sketches.
c) Distinguish between: i) Contour and contour interval
ii) Foresight and Backsight

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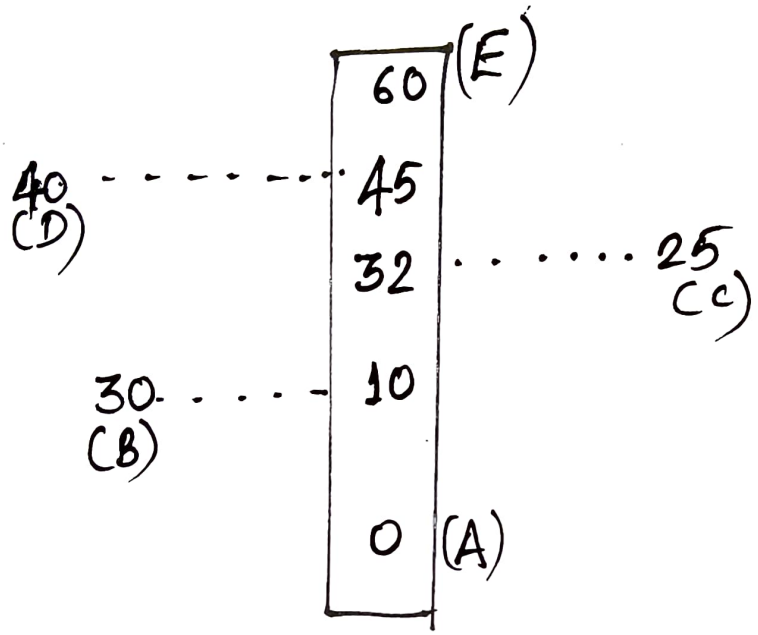
Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain with a neat sketch radiation method of plane table survey.

b) Explain setting operation of plane table.

c) i)Write merits of plane table surveying.
ii)Sketch the level page to record readings in leveling by Height of Instrument Method. Also mention the arithmetic check.



Q2.(c) fig. a

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Building Construction (CI302)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) Define the term foundation and state its function.
b) List various building components.
c) State the difference between standard brick and conventional brick.
d) List the different types of mortar and give its specific application.
e) Compare paint and varnishes.
f) Write a short note on ventilation.
g) What do you mean by site clearance?

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain any two types of door used in construction industry.
b) Draw a neat sketch of fully paneled window and louvered window.
c) What are communication spaces? Explain the requirement of good stair.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Enlist the common defects in timber. Explain any two defects in detail.
b) State the use of the following material: i)Glass(ii) Aluminum iii) Ceramic(iv) Galvanized iron v) CPVC vi) Terracotta
c) Explain the important precaution to be taken while constructing stone masonry.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain the various types of floor finishes used in building.
b) What are cladding? Enlist different types of cladding material and explain in brief any one.
c) List various types of plastering. Explain any two in detail.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) Define the term sound proofing. Enlist the material used for sound protection. Explain any one material in detail.
b) Define the term termite proofing. Explain the post construction anti-termite treatment.
c) What is damp proofing? Explain any two types of material used for damp proofing.

Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) What is the purpose of shoring? Explain any two types of shoring.
b) Write a note on excavation and backfilling in construction.
c) Explain the method of setting of building on ground.

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Concrete Technology (CI303)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) What are precautions needed for storage of cement?
b) Why is it important to determine the flakiness and elongation indices for coarse aggregate?
c) Give classification of concrete mixers.
d) What is meant by compressive strength of concrete?
e) Explain use of pervious concrete.
f) List various methods of mix design of concrete.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) State and explain physical properties of cement essential in determining its quality and usability in construction.
b) Explain determination of fineness modulus of fine aggregates.
c) Describe the following tests on coarse aggregates:
i)Flakiness test ii) Elongation test

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain how following concrete admixtures are used to enhance the properties of concrete for application in concrete works:
i)Retarders ii) Air entraining agents iii) Super plasticizers
b) State various grades of concrete as per provision of IS 456-2000.
c) State precaution to be taken while transporting and placing of concrete.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) List different methods of curing the concrete. Explain any two methods in details.
b) Explain slump test with the help of neat sketch. Also state how concrete is classified based on slump observed.
c) With a neat sketch explain rebound hammer test.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) State properties and advantages of following types of concrete: i)Light weight concrete ii) High performance concrete
b) Describe the procedure of concreting under water by 'Tremie' method.
c) Explain how each of these affect while performing a concrete mix design: i)Grading of F.A ii) Slump value iii) Degree of quality control iv) W/C ratio

Q.No.6. Answer any three of the following Questions: **3 x 4 = 12**

a) What is the difference between OPC and blended cement?
b) What is yield of concrete? Explain how you will determine the same.
c) Explain procedure for determining compressive test of concrete as per IS 516.
d) State procedure and precautions required for concreting in cold weather conditions.

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Transportation Engineering-I (CI304)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) Differentiate between bridge and culvert.
b) State the classification of roads according to materials of construction.
c) Write down functions of sleepers.
d) Define: i) Tunnel ii) Cut water iii) Case water
e) Draw neat labelled sketches of any three informatory signs.
f) Define: i) Carriageway ii) Super-elevation iii) Shoulder
g) State the advantages of tunnels.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Write down the advantages and disadvantage of railways.
b) Describe briefly the following modern means of transportation: i)Bullet trains ii) Mag-lev trains
c) Explain the term arboriculture and state its purpose.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) With the help of neat sketch explain the construction procedure of cement concrete roads.
b) Explain how maintenance of WBM roads is carried out.
c) Explain in detail any two methods of sub-surface drainage.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain in detail the classification of airports based on function and aircraft approach speeds.
b) Explain different types of rail gauges used in India.
c) What are transit sheds? Write a short note on its functions and location.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain various types of tunnel linings.
b) Explain various types of causeways.
c) Define bridge bearings. What are the functions of bridge bearings?

Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) Write a note on accident studies.
b) Explain how traffic volume studies are carried out.
c) Explain the defects in bituminous roads.

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Surveying-II (CI401)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) List down the uses of EDM.
b) List down the advantages and disadvantages of total station.
c) Define degree of curve and super elevation.
d) State the difference between the theodolite and tacheometer.
e) Define: swinging the telescope, transiting and changing the face.
f) Define with neat sketch latitude and departure.
g) Explain Gale's traverse table method.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) With the help of neat sketch explain components of transit theodolite and their function.
b) Explain direct method of measuring horizontal angle by reiteration method.
c) Write down the sources of errors in the theodolite.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain the procedure for measurement of magnetic bearing of a line by theodolite.
b) Explain procedure for measurement of vertical angle by using transit theodolite.
c) The following observations were taken using tacheometer fitted with an anallactic lens, the staff being held vertically. Calculate the horizontal distance between PA and AB. Also find R_L of A:

Inst. Station	HI	Staff station	Vertical angle	Staff Reading	Remark
P	1.20	BM	-5° 20'	1.300,1.800, 2.300	R_L of BM=220m
P	1.20	A	+6° 30'	0.800, 1.600, 2.000	
B	1.40	A	-7° 24'	1.750, 2.350, 2.950	

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain method of traversing by included angle method.
b) Explain balancing the traverse by Bowditch's rule.
c) The following records are obtained in a traverse survey, where the length and bearing of the last line were not recorded. Compute the length and bearing of line DA:

Line	Length (m)	Bearing
AB	75.50	30° 24'
BC	180.50	110° 36'
CD	60.25	210° 30'
DA	?	?

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) Two tangents AB and BC intersect at a point B at chainage 150.5m. Calculate all the necessary data for setting out a circular curve of radius 100m and deflection angle of 30° by the method of offsets from the long chord.

b) Draw a neat sketch and explain the various types of horizontal curves.

c) Explain with neat sketch the procedure for setting out a curve using Rankine's tangential angle method.

Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) Write down the application of total station.

b) Write down the features of Electronic Digital theodolite.

c) Explain the procedure to determine the tacheometric constant by field measurement method.

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Hydraulics (CI403)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) State Pascal's law. Give its two applications.
b) How is a steady flow different from a uniform flow?
c) The absolute pressure at point M measures 156N/cm^2. Calculate the pressure head at M in terms of a liquid whose specific gravity is 0.857.
d) Define: i) Wetted perimeter b) Hydraulic radius
e) List various types of hydraulic turbines.
f) What is water hammer? State its effects.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Define: i) Mass density ii) Viscosity iii) Specific volume
b) A square shaped plate of 48cm length is dipped vertically in water in such a way that one of its sides coincides with the water surface. Calculate the total hydrostatic force on the plate and the location of the centre of pressure.
c) What is Reynold's number? State its significance. In a pipe flow the ratio of viscous force to inertia force is 2:18000, what type of flow is this?

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain the construction and working of Bourdon's pressure gauge giving a neat sketch.
b) An inverted U-tube manometer is connected in between two pipes, both carrying water. If the manometer reads 12cm of mercury, calculate the pressure in the first pipe given the pressure in the second pipe is 4.5KPa. Assume that the centres of both the pipes are at the same level with respect to the ground.
c) A circular plate of 350mm radius is dipped vertically in a liquid of 0.902 specific gravity. If the lowest depth of the plate is 1.5cm, calculate the total hydrostatic force acting on the plate and determine the location of the centre of pressure.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) List various types of notches. Hence differentiate between notch and weir.
b) Design the most economical cross section of rectangular channel carrying water at the rate of 12m^3/s. The channel has slope of 1 in 1250. Take C=50.
c) A pitot tube is centrally inserted in a pipe carrying water. The mercury manometer connected to the pitot tube reads 8cm. If the diameter of the pipe is 2.54cm, calculate the discharge through the pipe. The ratio of the central velocity to the average velocity may be taken as 1.3 for all purposes. Take Cv=0.75

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Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) With the help of a neat sketch explain the construction and working of centrifugal pump.

b) List the various components of a reciprocating pump and explain its working giving a neat sketch.

c) Two large tanks are connected by a pipe whose length is 18m and diameter 5cm. Calculate the flow rate through the pipe if the water level difference in the two tanks is 4.2m. Consider all the losses. Take f=0.09

OR

c) Three pipes having length 20m, 25m and 30m, and their respective diameters being 8cm, 10cm and 12cm are connected in series. Calculate the diameter of the equivalent pipe if the length of the equivalent pipe is 75m.

Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) The water is flowing through a tapering pipe having diameter 280mm and 140mm at sections 1 and 2 respectively. The discharge through the pipe is 45litres/sec. The section 1 is 4.8m above the section 2. Find the pressure at the section 2 if the pressure at the section 1 is 500KN/m^2

b) Define: i) Coefficient of contraction ii)Coefficient of velocity iii)Coefficient of discharge

c) A trapezoid channel has side slopes of 3 horizontal to 4 vertical and the slope of the bed is 1 in 2000. Determine the most economical dimensions of the channel if it is to carry water at 0.52m^3/s. Take Chezy's constant as 80.

OR

c) List the major and minor head losses in pipe flow. Write down their mathematical expressions.

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Quantity Surveying & Costing (CI405)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) Explain the meaning of term estimating and costing.
b) What is revised estimate?
c) Explain class of contractor in government contract.
d) What is E-tendering?
e) Briefly explain 'termination of contract'.
f) What is the importance of framing specifications for construction project?

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Write short note on any two: i) Supplementary estimate ii) Maintenance and repair estimate iii) Typical bay method of estimate
b) State the role of IS 1200 for measurement of different items of work.
c) Explain in detail the concept of Provisional Sums, Lump sum terms and spot items in estimate.

Q.No.3. Answer the following Question: **(12)**

a) Fig1. shows a plan and wall section of a house. Work out quantities of any four of the following items. Prepare measurement sheet.
i)Earthwork in excavation in foundation
ii)P.C.C. 1:3:6 below foundation 10cm thick
iii) Rubble soling at plinth 20cm thick
iv)12mm thick internal plaster in CM:1:4
v) R.C.C. slab M20 mix, 12cm thick
vi) Ceramic tile flooring for rooms and verandah

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain provision made for following in detailed estimate: i)Contingencies ii) Electrical work a installations iii) Centage charges iv) Tools and plants
b) Prepare a standard abstract sheet for the quantities measured in Q.No.3.
c) Estimate the quantity of earthwork for an embankment between two stations A and B with following data:
Width of the road =12m, Side slope =1.5:1, Chain length=30m, R.L of formation is uniform at 123.00m

Chain	0	1	2	3	4	5
RL of Ground (m)	122.90	121.60	121.00	120.50	119.60	119.00

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) List and explain major and minor factors affecting rate analysis.
b) Carry out rate analysis for 12mm internal plaster in CM :1:4 for $100m^2$
c) List and explain content of contract document.

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Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) Draft a tender notice for inviting tenders for construction of health centre at an estimate cost of Rupees 1 cores to be completed in 2 years.

b) Briefly explain item rate contract and lump sum contract stating their merits and demerits.

c) Draft detailed specification for 12mm thick single coat internal plaster in CM1:4

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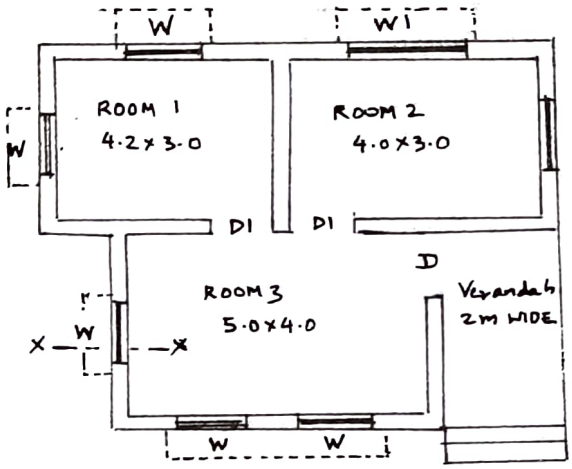

Schedule of Openings

Door D - 1.10 x 2.20
D1 - 1.00 x 2.10

Windows
W - 1.50 x 1.30
W1 - 2.00 x 1.30

- DIMENSIONS ARE IN MTS. UNLESS OTHERWISE SPECIFIED
- SKETCH NOT TO SCALE

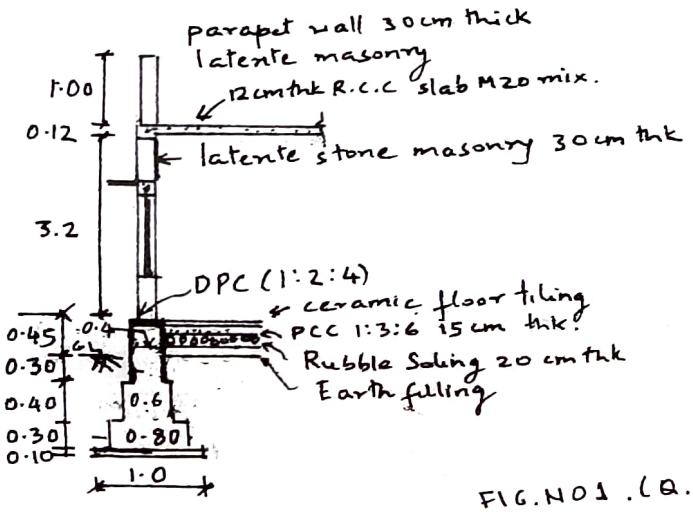

FIG.NO1. (Q.No 3)

SECTION X-X

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Soil Mechanics (CI406)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) Define faults and folds.
b) Define seepage velocity, flow-lines and equipotential line.
c) Define cohesive and cohesionless soil.
d) Briefly state difference between compaction and consolidation.
e) State the necessity of site investigation.
f) Define active and passive earth pressure.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain particle size distribution of soil. Also mention effective diameter of soil, uniformity coefficient, coefficient of curvature and its significance.
b) Explain various type of rocks. Also mention few properties of lateritic soil in Goa.
c) Define permeability and state factors affecting permeability.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain in detail the procedure to determine coefficient of permeability using constant head permeability test.
b) Explain Mohr–Coulumb's failure theory.
c) Explain the detailed procedure of plate load test.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain the procedure of standard Procter test. Also define OMC, MDD and zero air void line.
b) Briefly explain any two methods soil stabilization.
c) Explain the criteria of deciding location and number of boreholes.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain various types of site investigation.
b) Define the following terms:
i)Voids ratio ii) Porosity iii) Specific gravity iv) Dry unit weight v) Density index vi) Degree of saturation
c) Sketch a typical flow net through earth dam and below concrete dam.

Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) With the help of neat sketch explain direct shear test on soil.
b) Explain various field compaction method of soil.
c) Explain the concept of ground improvement using natural fibre. (jute, coir etc)

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Materials & Structures (CI402)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) Draw the graph of stress v/s strain for mild steel subjected to axial tension and write the salient points on the graph.
b) Define shear stress, shear strain and modules of rigidity.
c) Define volumetric strain, Poisson's ratio and punching shear.
d) Define M.I and radius of gyration. How they are expressed?
e) State the relation between bending moment, shear force and rate of loading. (any three points)
f) Explain in brief concept of pure bending.
g) Draw any three types of beams and any three types of loading.
h) Write the assumptions ins analysis of trusses. (any three)

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) A bar is subjected to tensile load of 45KN. The total length of the bar is 600mm, where in first 200mm is of diameter 20mm, the next 250mm is of diameter 25mm and remaining 150mm is of diameter of 30mm. Find the stresses developed in each portion and total extension if $E=100x10^3 N/mm^2$
b) A bar of 20mm diameter subjected to a pull of 50KN. The measured extension on gauge length of 250mm is 0.12mm and change in diameter is 0.00375mm. Calculate: i)Poisson's ratio ii)Values of three modulii
c) A steel rod is 2m long and 60mm in diameter. An axial pull of 100KN is suddenly applied to the rod. Calculate the: i)Instantaneous stress induced ii)Instantaneous elongation produced in the rod iii)Strain energy absorbed in the rod
Take $E= 2x10^5 N/mm^2$

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Determine moment of inertia of the triangular section. Explain perpendicular axis theorem.
b) Find the moment of inertia of I-section about the centroid axis X-X perpendicular in the web. Given top flange 100mmx20mm, web 20mmx150mm and bottom flange 200mmx20mm
c) A cantilever beam of length 2m carries the point load 800N at free end, 500N from 0.8m from the free end and 300N at 1.5m from free end. Draw SFD and BMD.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) i)Differentiate between determine and indeterminate structures. (3 points each)
ii)Explain concept of sagging and hogging bending moments.
b) A simply supported beam of length 6m, carries point load of 3KN and 6KN at distance of 2m and 4m from the left end. Draw shear force and bending moment diagrams for the beam.

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c) Draw the SFD and BMD for the over-hanging beam AB, carrying uniformly distributed load of 2KN/m over the entire length. Span AB=4m and BC=2m. Locate the point of contra flexure.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) A beam is simply supported and carries a uniformly distributed load of 40KN/m run over the whole span. The section of the beam is rectangular having depth as 500mm. IF the maximum stress in the material of the beam is 120N/mm^2 and moment of inertia of the section is 7x10^{8}mm^4, find the span of the beam.

b) A simply supported wooden beam of span 1.3m having a cross section 150mm wide by 250mm deep carries a point load W at the centre. The permissible stress are 7N/mm^2 in bending ~~shearing~~ and 1N/mm^2 in shearing. Calculate the safe load W.

c) An I-section beam 400mm x 200mm has a web thickness of 20mm wide and a flange thickness of 20mm. If the shear force acting on the section is 40KN, find the maximum shear stress developed in the I-section.

Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) Find the forces in the members AB, AC and BC of the truss as shown in fig.6.a.

b) Find the forces in any five members of simply supported truss. (Ref fig.6.b.)

c) Determine the forces in all the members of a cantilever truss. (Refer fig.6.c.)

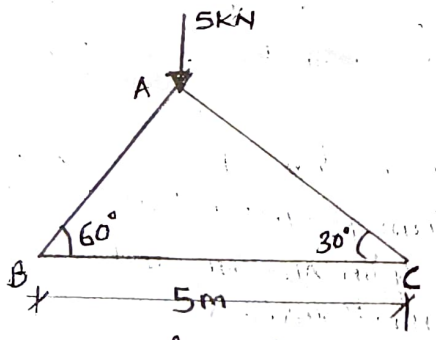

fig 6(a)

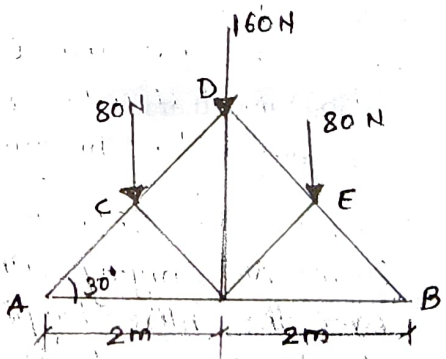

Fig 6(b)

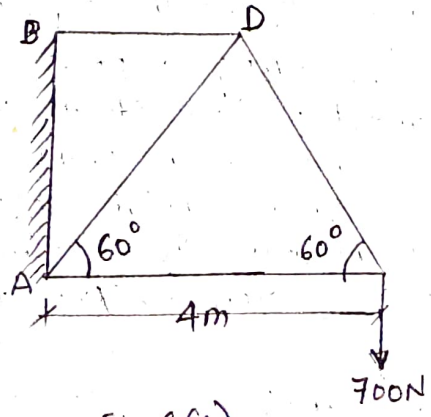

Fig 6(c)

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Quantity Surveying & Costing (CI405)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) Explain the meaning of term estimating and costing.
b) What is revised estimate?
c) Explain class of contractor in government contract.
d) What is E-tendering?
e) Briefly explain 'termination of contract'.
f) What is the importance of framing specifications for construction project?

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Write short note on any two: i) Supplementary estimate ii) Maintenance and repair estimate iii) Typical bay method of estimate
b) State the role of IS 1200 for measurement of different items of work.
c) Explain in detail the concept of Provisional Sums, Lump sum terms and spot items in estimate.

Q.No.3. Answer the following Question: **(12)**

a) Fig1. shows a plan and wall section of a house. Work out quantities of any four of the following items. Prepare measurement sheet.
i)Earthwork in excavation in foundation
ii)P.C.C. 1:3:6 below foundation 10cm thick
iii) Rubble soling at plinth 20cm thick
iv)12mm thick internal plaster in CM:1:4
v) R.C.C. slab M20 mix, 12cm thick
vi) Ceramic tile flooring for rooms and verandah

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain provision made for following in detailed estimate: i)Contingencies ii) Electrical work a installations iii) Centage charges iv) Tools and plants
b) Prepare a standard abstract sheet for the quantities measured in Q.No.3.
c) Estimate the quantity of earthwork for an embankment between two stations A and B with following data:
Width of the road =12m, Side slope =1.5:1, Chain length=30m, R.L of formation is uniform at 123.00m

Chain	0	1	2	3	4	5
RL of Ground (m)	122.90	121.60	121.00	120.50	119.60	119.00

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) List and explain major and minor factors affecting rate analysis.
b) Carry out rate analysis for 12mm internal plaster in CM :1:4 for $100m^2$
c) List and explain content of contract document.

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Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) Draft a tender notice for inviting tenders for construction of health centre at an estimate cost of Rupees 1 cores to be completed in 2 years.

b) Briefly explain item rate contract and lump sum contract stating their merits and demerits.

c) Draft detailed specification for 12mm thick single coat internal plaster in CM1:4

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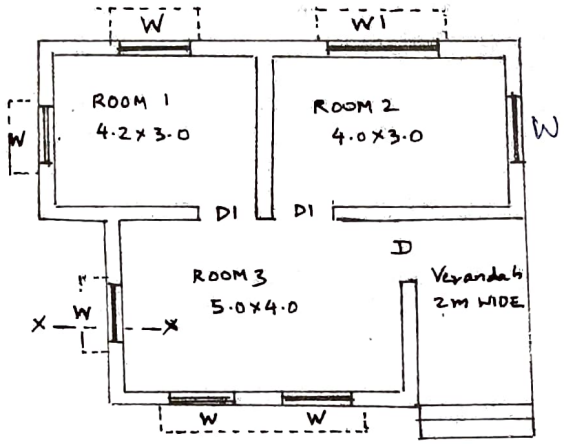

Schedule of Openings

Door D - 1.10 x 2.20
D1 - 1.00 x 2.10

Windows
W - 1.50 x 1.30
W1 - 2.00 x 1.30

- DIMENSIONS ARE IN MTS. UNLESS OTHERWISE SPECIFIED
- SKETCH NOT TO SCALE

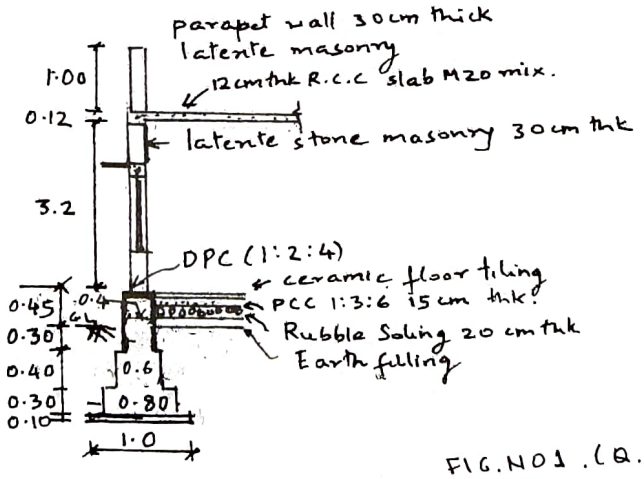

FIG.NO 1. (Q.No 3)

SECTION X-X

XXXXX

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Design of Concrete Structures (CI501)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.
4) Use of IS Code 800-2007, Steel tables is permissible.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) List types of load and load combinations in RCC design.
b) Compare working stress method and ultimate load method.
c) Write partial safety factors for materials and loads.
d) Draw neatly stress block diagram and strain diagram for concrete.
e) Explain the concept of bond and development length.
f) Write the effective width of flange as per IS 456:2000 Code provision.
g) Explain the situation where you would recommend doubly reinforced beam.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) A reinforced beam section 250mmX500mm(overall) reinforced with 4 20 as tensile reinforcement with 50mm effective cover. Take M_{25} grade concrete and Fe_{415} grade steel. Determine NA depth, lever arm and moment of resistance of beam.
b) Design a rectangular beam to carry an udl of 40KN/m under working condition in addition to its own weight. The beam is simply supported over an effective span of 3.5m. Use M_{20} concrete and Fe_{415} steel.
c) A beam 300mmx500mm(overall) consist of 4ϕ16mm as tensile R/F. Determine the safe working load the beam can support over simply supported span of 4m. Use M_{25} grade concrete and Fe_{500} grade steel.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Describe the concept of truss analogy with neat sketch.
b) Calculate the development length for 20mm and 16mm bars provided in tension zone. Assume Fe_{45} and M_{25} grade for steel and concrete respectively. Fe_{415}
c) An RC beam 250mmx400mm(overall) is reinforced with 5ϕ12mm. Two bars are bent at 45° near the support. If maximum shear force is 60KN, design shear reinforcement. Take M_{20} concrete grade and Fe_{415} grade of steel.

Q.No.4. Answer the following Questions:

a) Design a cantilever chajja for an effective span of 650mm subjected to factored UDL of 7KN/m. Use M_{20} concrete grade and Fe_{415} steel grade. **(04)**
b) Design the RC slab provided for a room 3.5mx4.5m having two adjacent edges discontinuous and other two edges continuous. Live load on slab is 3KN/m² and floor finish is 1KN/m². Use M_{25} concrete grade and Fe_{415} grade steel. **(08)**

OR

c) Design RC slab for a hall with clear dimension with a wall thickness at 230mm all around. Take live load 2KN/m² and finishing load 1KN/m². Use M_{25} grade concrete and Fe_{415} steel grade. **(08)**

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Analysis of Structures (CI502)/(CE504) [Rat/Rev]**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any three of the following Questions: **3 x 5 = 15**

a) Write expression for determination of maximum slope and deflection in cantilever beam carrying udl throughout and explain each term of the expression and state its units.

b) Define eccentric load. Explain maximum and minimum stresses in case of column subjected to eccentric load. Draw stress diagram.

c) State carry over theorem and moment distribution theorem. **(Only for students of Rationalised scheme)**

c) Define flitched beam and draw its sketch. Also explain how to calculate moment of resistance for flitched beam. **(Only for students of Revised scheme)**

d) List down the limitations of Euler's formula. **(Only for students of Rationalised scheme)**

d) Explain one dimensional and two dimensional stress system with neat sketch. **(Only for students of Revised scheme)**

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) A cantilever beam AB of span 6m is fixed at A and carries two concentrated load of 26KN and 36KN at free end and at 3m from free end respectively. Calculate maximum deflection and maximum slope for beam using Macaulay's method. Take EI = 15×10^{12} N – mm^2

b) A simply supported beam of 5m span carries udl of 20KN/m over entire span and a point load of 15KN at the centre. Determine deflection under load and maximum deflection. Take EI = 18×10^{12} N – mm^2. Use Macaulay's method.

c) A column is (200mm x 400mm) in size. A load of 600KN is placed along shorter axis at an eccentricity of 20mm from longer axis. Find maximum and minimum stress intensity at the base of column. **(Only for students of Rationalised scheme)**

c) A flitched beam consists of two wooden joists 100mm wide and 180mm deep with a steel plate of 10mm thickness and 180mm deep placed symmetrically between them. If maximum stress in wooden joist is 6.0N/mm^2, find moment of resistance of beam. Take $E_s = 20E_w$ **(Only for students of Revised scheme)**

Q.No.3. Answer the following Questions:

a) State advantages of fixed beam. **(Only for students of Rationalised scheme)** **(03)**

a) Explain Mohr's Circle with a sketch. **(Only for students of Revised scheme)** **(03)**

b) A fixed beam of span 7m carries a point of 10KN, 15KN and 20KN at a distance of 2m, 4m and 6m respectively from right hand support. Analyse the beam and draw SFD and BMD **(09)**

OR

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg.**

Subject: **Solid Waste Management (CI612)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) State how solid wastes are classified based on their source.
b) What are compositions of municipal solid waste?
c) State the chemical properties of municipal solid waste.
d) State how the quantities of solid wastes are measured.
e) What are factors affecting rate of generation of solid wastes?
f) State how the processing of solid waste from industries and residences are verifying.
g) State the effects of combustion of solid waste.
h) What is bio-medical waste? State their source.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) State and explain various stages in waste composition analysis.
b) List out various materials recovered from municipal solid waste and also explain, the materials that can be recycled.
c) Explain the effect of time and rain on the characteristics of municipal solid waste.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain the formation and effects of leachate.
b) Explain various physical properties of municipal solid wastes.
c) Describe various methods adopted for solid waste collection.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain how the solid wastes are separated by electro mechanical method.
b) Stating their importance, explain storage of solid waste by various methods.
c) Explain necessary measures needed in handling wastes from residential, commercial and industrial sources.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) With reference to material recovery from municipal solid waste, explain its economical viability and environmental impact.
b) With reference to disposal of solid waste, explain methane generation by a anaerobic digestion.
c) Explain combustion and energy recovery by municipal solid waste.

Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) Differentiate sanitary land fill and incineration as final disposal system for solid waste.
b) With reference to hazardous waste, explain:
i)Toxicity ii)Infectiousness
c) State necessary measures required in storage, transportation and disposal of biomedical waste.

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg.**

Subject: **Construction Advanced (CI614)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) What are coffer dams? State their functions.
b) For concreting under water, what are the requirements of concrete with reference to workability and w/c ratio?
c) State the necessity and uses of ready mix concrete.
d) With the aid of neat sketch, state the uses of telescopic props.
e) What are the safety measures needed in constructing multistoryed buildings?
f) What is day light factor? State its uses.
g) State advantages of prefabricated constructions.
h) Explain the integral water proofing.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Describe the dewatering of trenches by well point systems.
b) With the aid of neat sketch describe "braced coffer dams".
c) List out various methods adopted for deep trench excavations. Describe any one method in detail.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Describe with the aid of neat sketch Tremie method of underwater concreting.
b) Explain the properties, uses and procedure of roller compacted concrete.
c) Describe steel fibre reinforced concrete. How the aspect ratios of fibres affect the properties of concrete?

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Describe the concreting process with slip forms.
b) With the aid of neat sketch describe monitor roof.
c) Describe the process of strengthening of embankments by geosynthetics method.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) With the aid of an example, explain how prefabricated members are joined at the construction site.
b) Describe the procedure involved in demolition of structure by pusher arm methods.
c) What are necessities of structural demolition? Explain required safety measures to be taken in demolition process.

Q.No.6. Write short note on any three: **3 x 4 = 12**

a) Cobba water proofing
b) Chemical water proofing
c) Glass cladding
d) ACP cladding

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg.**

Subject: **Sustainable Design of Buildings (CI625)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) Define: i) Embodied energy ii) Sustainability
b) Stating the percentage score, define the rating benchmarks as per BREEAM.
c) What is the issue with using CFC as refrigerant? Give one example.
d) Give three examples of chemical factors of the indoor environment quality.
e) Write a short note on site protection plan.
f) Give two examples and define soft costs.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain loss of biodiversity with reference to the major environment issues of building design and construction.
b) Why is it generally said that the construction industry is responsible for climate change?
c) Explain the LEED certification process in brief.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain internal load reduction as a means of trimming down the heat loads of the building.
b) How would you carry out the process of minimizing energy transmission through the building skin?
c) State and explain the four major components of the carbon footprint of the built environment.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Write a note on 'global water resource depletion'.
b) Explain the water supply strategy with reference to the building plumbing fixtures and controls.
c) Explain thermal conditions as an issue of the indoor environment quality. Give examples.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain indoor air quality during construction.
b) What are the essentials of building commissioning?
c) Explain HVACOR system commissioning.

Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) Write a note on performance goals for future green buildings.
b) Explain the benefits of other materials which can be used to substitute cement partially in the preparation of greener concrete.
c) Explain with examples role of: i) Green building products
ii) Green building materials

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Public Health Engineering (CI601)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) Explain the factors affecting location of intake structures.
b) Explain 'ground water recharging'.
c) State the object of aeration in purification of water.
d) Define water sampling and explain its significance in evaluating water quality.
e) Describe the importance and necessity of sanitation.
f) What are manholes in sewerage system?
g) Give a brief comparison between oxidation ponds and oxidation ditches.
h) Write a brief note on 'losses of water'.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain continuous and intermittent system of water supply. Write advantages and disadvantages of it.
b) Draw a neat labelled sketch of ground service reservoir.
c) What are the five important water demands? Explain each in brief. Show the values of each for an average Indian city.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) State physical tests required to be conducted while performing water quality analysis. Explain each in brief.
b) Explain break point chlorination. Write any two methods of disinfection of water.
c) Explain electrolysis and reverse osmosis treatment.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain the working of aqua privy with the help of sketch.
b) Discuss the different types of pipe joints used in water distribution networks.
c) Draw neat sketches of various traps used in building sanitation.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) State various pipe materials and shapes used as sewers. What are the advantages of using egg shaped pipes in sewer systems?
b) What is Chemical Oxygen Demand (C.O.D.) and how does it differ from B.O.D in measuring water quality?
c) How does domestic sewage differ from industrial sewage? State the norms for discharge of treated sewage.

Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

a) Draw a neat labelled sketch of 'septic tank.
b) Enlist the types of industrial waste water. State the measures to control air pollution and food pollution.
c) Draw flow diagram of activated sludge process and explain functions of each unit.

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Irrigation Engineering (CI602)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) State the necessity of irrigation.
b) Define the crop seasons in Goa with their crop period.
c) Define dead, live and gross storage in reservoir.
d) Draw a neat layout of lift irrigation scheme.
e) State the necessity of canal linings.
f) State any three remedial measures of strengthening earth dams.
g) Explain hydrological cycle.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) With the help of neat sketch explain how the rainfall is measured using Symon's rain gauge.
b) Define runoff. State the factors affecting runoff.
c) Explain the relationship between duty and delta and discuss the factors that affect duty.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Determine the head discharge of a canal from the following data. The value of time factor may be assumed as 0.75:

Crop	Base Period (days)	Area (Hectares)	Duty in (Hect./Cumec)
Rice	120	3500	1500
Wheat	100	4000	2000
Sugarcane	200	5000	1200

b) What are the factors to be considered for the selection of site for a reservoir? Also enlist the losses in reservoir.
c) Explain the suitability and limitations of earth dam.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Define the following terms: i) Gross commanded area ii) Culturable commanded area iii) Base period iv) Crop period v) Time factor vi) Capacity factor
b) Explain various types of energy dissipaters used in dams.
c) State the necessity and importance of percolation tanks.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) What are Khazan lands? Also state the significance of bunds in these areas.
b) Explain various types of canal linings.
c) With the help of neat sketch explain aqueduct and super passage.

Q.No.6. Write short note on any three: **3 x 4 = 12**

a) Isohyetel method of calculating rainfall
b) Type of failures in gravity dams
c) Bandhara
d) Cross regulators

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg./CT**

Subject: **Design of Steel Structures (CI603)/Design of Structures-II(Steel) (CE602) [Rat/Rev]**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.
4) Use of IS Code IS 800-2007, IS 875 Part I,II and III, Steel Tables is Permissible.

Q.No.1. Answer any three of the following Questions: **3 x 5 = 15**

a) Enlist the advantages and disadvantages of steel structures.
b) What is meant by slenderness ratio of tension member?
c) State the different steps to be followed while designing a slab base.
d) Why are rolled I sections widely used as beam members?
e) How is spacing of purlin fixed?
f) List the various steps involved in the design of truss members?

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) ISA 100x100x10mm angle is to be welded is shop to 16mm gusset plate. The angle carries an ultimate pull of 350KN applied along its centroidal axis which is 28.40mm from the back of the angle. Determine the length of side fillet weld required at the heel and toe of the angle.
b) Design a suitable unequal angle section to carry a tensile load of 300KN.
c) Design a connection to join two plates of size 300x12mm to carry full tensile strength of the plate using shop welds adopting lap joint. Draw a neat sketch showing welding details.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Design a double angle discontinuous strut to carry a load of 250KN. The length of strut is 3.40m. Design the end connections using fillet weld. Use Fe_{410} steel.
b) A column 5.0m long is effectively held in position and restrained against rotation at both ends. If ISHB 400 at 744.5N/m is used, calculate the load carrying capacity of the column. Assume fy=250Mpa and Fu=410Mpa.
c) A single angle section ISA 60x60x8mm, 3m long is used as a strut. The ends are welded to the gusset plate. Compute the maximum load it can carry.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

a) Design a slab fare for a single section ISHB 300 carrying a factored load of 1000KN, concrete grade M_{20} and Fe_{410}. Take SBC as 300KN/m^2.
b) Design a single angle strut for a roof truss to carry a compressive load of 125KN. Take effective length of the member as 2.0m. Also design the welded connection.
c) Explain the procedure for design of angle purlin.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) A steel floor beam in an industrial building has a span of 6.0m. The beam carries at service condition a udl of 30KN/m over the entire span and a point load of 60KN at

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Civil Engg.**

Subject: **Construction Management (CI605)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

a) Define 'Management'. State the functions of management.
b) State the requirements of an ideal leader.
c) Draw neatly interrelationship diagram of construction team.
d) Define planning. State its importance.
e) Explain briefly organization of construction industry.
f) Write the importance of quality control for construction work.
g) List the precautions to be taken to prevent accidents on construction site.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain Harry Foyal's principles of management.
b) Explain different types of communication.
c) Explain the role of engineer on construction site.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

a) Write the stages of planning and explain any one in detail.
b) With aid of neat flow chart explain line and staff organization. State its merits and demerits.
c) Write the salient features of sole proprietorship construction firm with merits and demerits.

Q.No.4. Answer the following Questions:

a) Write short note on updating of network and rescheduling of resources. **(04)**

b) Construct network, mark critical path, calculate total project duration, compute total float, EST and EFT for each activity: **(08)**

Activity	1-2	1-3	2-4	2-5	4-7	5-7	7-8
Duration	5	10	1	6	12	3	4

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

a) Explain inspection and supervision techniques for:
i)Wood work ii)Painting
b) Mention the safety measures adopted at work site for scaffolding and formwork.
c) Write short note on inventory control and stores management.

Q.No.6. Write short note on any three: **3 x 4 = 12**

a) ISO-9000 series with its features and drawbacks (any two)
b) Scheduling and monitoring of construction project
c) Methods of scheduling
d) Manpower and material scheduling
e) Private limited company- salient features

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