

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Engineering & Technology**

Subject: **Engineering Mechanics (CC301)**

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

- Define force. Explain the systems of forces with neat sketches.
- What is Resultant and Equilibrant? State the relationship between the two.
- Explain the different types of loadings and supports for beams with sketches.
- Define centre of gravity. Locate the centre of gravity of hemisphere and cone.
- Define coefficient of friction and angle of repose.
- Define MA, V.R. and efficiency for simple machine.
- State and explain D'Alemberts' principle.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Find the resultant in magnitude and direction of the concurrent force system as in the table, forces acting from positive OX-axis:

Force in 'N'	1000	3000	2000	4000
Angle w.r.t.OX	60°	150°	270°	350°

- Find the resultant in magnitude and direction and find its position from A of non-concurrent force system. (Refer fig.1.)
- Find the resultant in magnitude and direction and find its position from first force. (Refer fig.2.)

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Using Lami's theorem find the tension in the strings AB and BC. (Refer fig.3.)
- A simply supported beam 7m in span is loaded with three point loads as shown in fig.4. Find the reactions at the supports.
- A beam of span 9m is hinged at A and supported on roller at B. It is loaded as shown in fig.5. Find the reaction at A and reaction at B.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- An object of weight 100N is kept in position on a plane inclined at 30° to the horizontal by a horizontally applied force 'P'. The coefficient of friction of the surface of the plane is 0.25. Determine the minimum magnitude of the force 'P'.
- A block of 100N weight is placed on a horizontal plane. It is being pulled by a string at an angle of 60°. Find the coefficient of friction between the surface if the tension in string is 50N.
- Find the centroid of the I section. (Ref fig.6)

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- A lift weighing 4000N when empty is lifted and lowered by means of a rope. A man of weight 600N is standing on it. Find the tension in the rope and the reaction of the lift on the man when the lift is moving up with an acceleration of 3m/sec^2 .

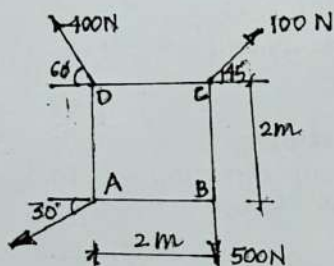
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- b) Two bodies of masses 50Kg and 30Kg are connected to the ends of light in extensible string. The string is passing over a smooth pulley. Determine the acceleration of the system and tension in the string. Take $g = 9.8\text{m/sec}^2$.
- c) A ball of mass 200g rolls with a velocity of 1m/sec. It is hit with a bat in the direction of its motion. The velocity changes to 25m/sec. If the bat is in contact with the ball for 0.01sec, find the impulse and impulsive force.

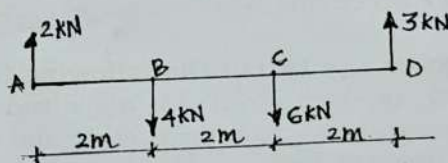
Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

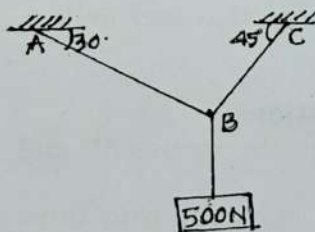
- a) Find the centre of gravity of remaining composite solid where in hemisphere of same diameter as that of cone is removed from the base of the cone. Height of cone is 100mm and base diameter of the cone and hemisphere is 20mm.(Refer fig.7.)
- b) A screw jack has a screw thread of 10mm pitch. What efforts applied at the end of the handle 400mm long will be required to lift a load of 20KN if the efficiency at this load is 45%?
- c) A lifting machine is having velocity ratio of 120. The machine can lift 300N load with effort of 10N and 900N load can be lifted by effort of 16N. Find the law of machine and efficiency at 300N.



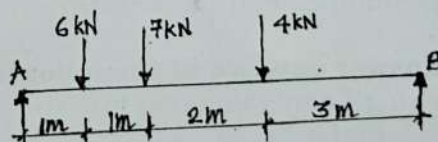
Q.No.2(a) fig.1



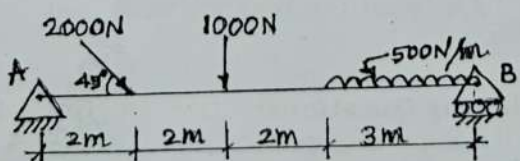
Q.No.2(b) fig.2



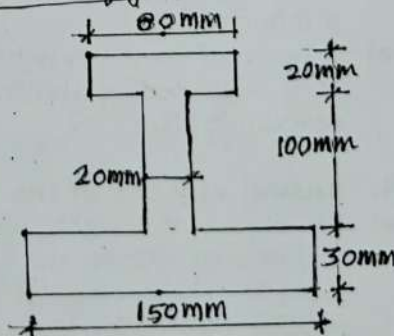
Q.No.3(a) fig.3



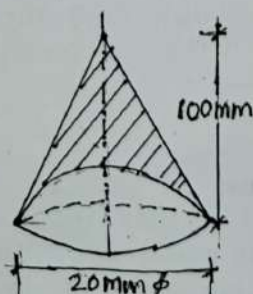
Q.No.3(b) fig.4



Q.No.3(c) fig.5



Q.No.4(a) fig.6



Q.No.6(a) fig.7

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Electrical Engg./E&EE/FT/FT&EE**

Subject: **Elements of Mechanical Engineering (CC307)**

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 is a compound gear train?
- b) What is the function of bearing?
- c) What is meant by stroke volume of engine?
- d) Write a short note on IBR.
- e) Differentiate between Air conditioning and Refrigeration.
- f) List various maintenance tools used for maintenance of mechanical equipment.
- g) What is meant by discharge of a pump?
- h) What is the difference between condenser and evaporator in refrigeration?

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- a) With the help of a neat sketch explain construction and working of bush pin type flexible coupling.
- b) Explain various types of roller bearing and state application of each type.
- c) Explain following terminologies related to gears:
i) Gear ratio ii) Module iii) Spur gear

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain in detail, each stroke of a 4 stroke diesel engine.
- b) Differentiate between 2 stroke and 4 stroke engine.
- c) With the help of a neat sketch, explain working of a 2 stroke petrol engine.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- a) With a neat sketch explain construction and working of Cochran boiler.
- b) Differentiate between water tube and fire tube boiler.
- c) With a neat sketch explain construction and working of a reciprocating pump.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- a) List various boiler mounting and accessories and state their function in short.
- b) With a neat sketch explain working of split air conditioner.
- c) Write short note on following:
i) Refrigerant ii) Unit of refrigeration iii) C.O.P

Q.No.6. Write short note on any three:

3 x 4 = 12

- a) Chain pulley block
- b) Grease cup lubrication
- c) Prevention maintenance
- d) Compression ratio of I.C. engine

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Basic Welding Technology (FB301)**

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 welding and state any two advantages of welding.
- b) What is heat affected zone? State its importance.
- c) What do you mean by metal transfer in arc welding?
- d) State any three functions of electrode coating.
- e) State any three advantages of gas welding.
- f) Define braze welding and state any two applications.
- g) Define arc welding.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- a) Define welding as a fabrication process. Explain the classification of welding process with suitable examples.
- b) Explain the following welding terms: base metal, filler metal, fusion zone and weld penetration.
- c) Explain the classification and coding of welding electrodes.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- a) Discuss protection of welders and safety recommendation in arc welding.
- b) Explain any three arc welding equipments.
- c) List the types of arc blow and state the factors affecting arc blow.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain leftward and rightward welding techniques and compare them.
- b) Explain the principle working of oxy-acetylene welding. Also describe the different types of flames.
- c) Discuss the safety recommendations for gas welding.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain the principle of brazing operation. State the advantages and limitations also.
- b) Describe the arc initiation methods.
- c) Describe any two power sources used in MMAW.

Q.No.6. Write note on any three:

3 x 4 = 12

- a) Oxy-acetylene welding equipments
- b) Air acetylene welding
- c) Welder qualification based on welding position
- d) Braze welding applications

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Fabrication Drawing (FB302)**

Time Duration: **4 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 SP:6(1), IS Code 800 Handbook is permissible.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- What do you understand by machine drawing and erection diagram?
- Draw a sketch of snap head and flat head rivet.
- Calculate end distance and distance between two consecutive rivets when a rivet of diameter 10mm is used to join IAS7575x5 to main truss.
- Differentiate between design drawing and fabrication drawing.
- Sketch three different types of trusses.
- Sketch typical section of crane girders.
- What is the purpose of pipeline?

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Determine values of I_{xx} , Z_{yy} and C_{xx} of ISBA200@33.6Kg/m and ISA12575x8mm. Also sketch cross section of ISMC175@19.1Kg/m and indicate dimensions clearly by referring handbook.
- Calculate the weight of the following:
 - Steel plate of size 256mm(l)x173mm(b)x10mm(t)
 - Rolled steel section ISA8080x10mmx1729mm(l)
 - Steel strip of size 1550mm(l)x160mm(b)x1.80mm(t)
- Sketch a column splicing of bottom column ISHB400@77.4Kg/m and top column ISHB200@37.3Kg/m. Indicate dimensions clearly.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Sketch a double riveted, single strap, zig-zag, riveted joint to join two plates of 10mm and 12mm together. Indicate dimensions clearly.
- Interpret the symbolic weld representations shown in fig.1.
- What is pipe bend? Sketch gland and stuffing box expansion joint.

Q.No.4. Answer the following Question:

(12)

- Draw the fabrication drawing of the gusset plates at 'A' and 'B' and determine the exact length of the member A-B in the portion of truss whose design drawing is shown in fig.2:
Note: i) All members used are ISA5050x 5mm
ii) Minimum weld length used to join every member to gusset plate is 150mm and fillet leg is 5mm iii) 6mm thick gusset plates are used

Q.No.5. Answer the following Questions:

- Draw the FV, TV and SV of the pictorial (single line) view of structure shown in fig.3. Use ISLC75@ 5.7Kg/m **(08)**
- Make bill of material for support structure shown in fig.3. **(04)**

OR

- Explain the essential columns to prepare bill of material. **(04)**

Q.No.6. Answer the following Questions:

- a) Sketch a screwed pipe joint (03)
- OR**
- b) Sketch single line diagram for reducer, globe valve and coupling (03)
- c) Draw the orthographic views(FV,TV,SV) of portion of pipeline whose isometric view is shown in fig.4. (09)

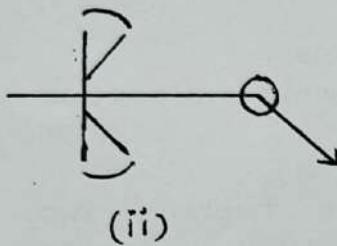
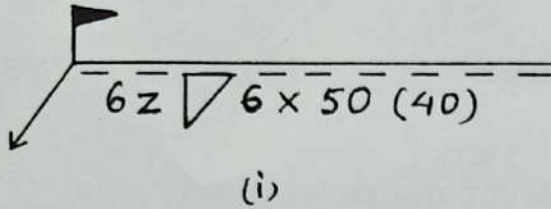


Fig 1, Q.3(b)

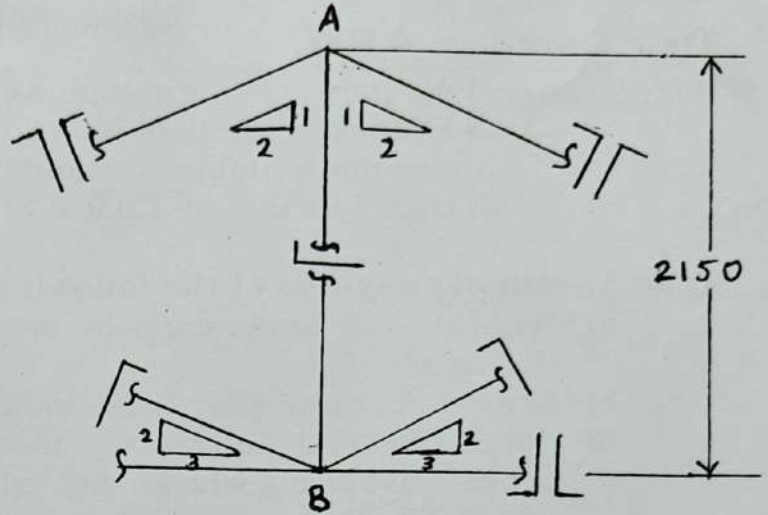


Fig 2, Q.4(a)

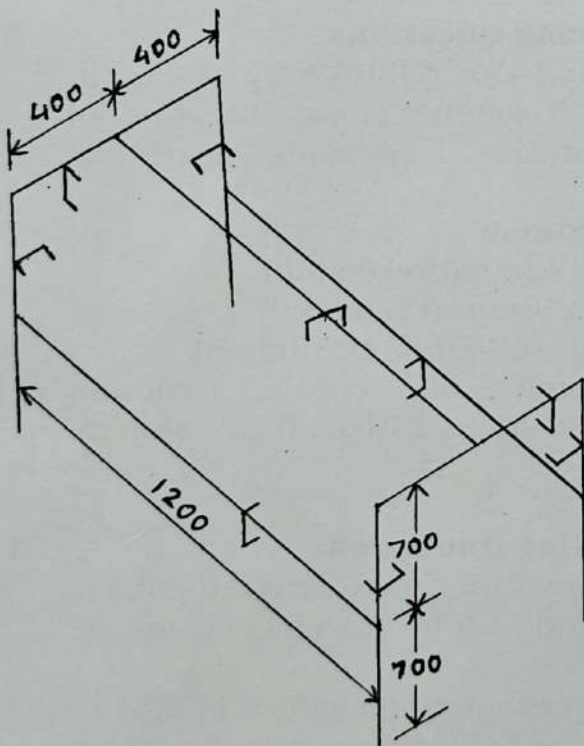


Fig 3, Q.5(a), (b)

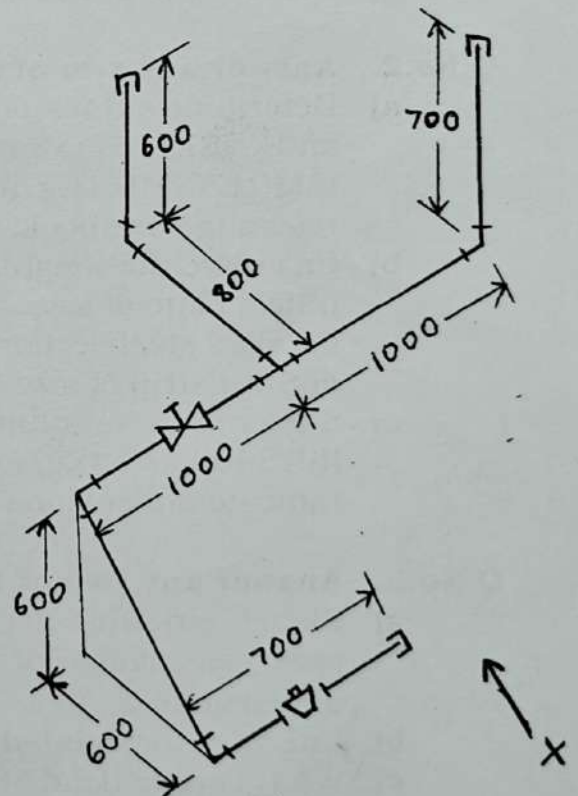


Fig 4. Q.6(c)

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Basic Fabrication Process (FB303)**

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) Draw neat sketches wherever required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- What is Physical Measurement? Define.
- What do you mean by horizontal datum?
- Sketch a scribing block. What is it used for?
- Explain the need for templates.
- What are the safety precautions for a band sawing machine?
- Explain the procedure to extinguish the flame in flame cutting.
- When should pencils be used in marking?

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- What is calibration of measurements? When is it necessary?
- i) What are the factor affecting precision?
ii) What is a pitch gauge?
- Draw a neat labeled diagram of an external micrometer. What is its least count? Define least count.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- How will you check the flatness of surface using Engineers' Blue?
- Explain roundness testing with dial indicator.
- Explain any three of the following:
i) Clearance fit ii) Transition fit iii) Interference fit iv) Tolerance grades for shafts and holes v) System of designation of limits and fits for shafts

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Sketch any two of the following and explain their uses:
i) Angle plate ii) Pipe square iii) Centre punch
- Discuss method of drawing long straight line using chalk line.
- Explain the procedure for marking holes in an angle section or a channel section.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Sketch a reciprocating power hacksaw and explain its working.
- Discuss any three factors influencing quality of cut in flame cutting.
- Discuss procedure for lighting the cutting torch.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- Discuss line standard or wavelength standard.
- What is a progressive plug gauge?
- What is a beam trammel?
- Describe a circular metal saw.
- How will you protect and store wooden templates?

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Advanced Welding Technology (FB401)**

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 significance of shielding gas in GTAW.
- b) Differentiate between electrode positive and electrode negative polarity in GTAW.
- c) Discuss repair of hair line crack in casting.
- d) Explain the concept of self adjusted arc in GMAW.
- e) List the advantages of SAW over other arc welding processes.
- f) What are the factors affecting the weld quality in SAW?
- g) Explain the principle of operation of projection welding.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain the principle of operation of GTAW with a neat sketch. Discuss the factors affecting the stability of the arc.
- b) Discuss the different types of wire feed mechanisms in GMAW.
- c) Discuss the advantages and limitations of FCAW compared to SAW and GMAW.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain the principle of operation of spot welding with a neat sketch. Discuss the factors affecting the strength of the spot weld.
- b) Differentiate between seam welding and spot welding w.r.t. their principle of operation and welding.
- c) Explain the principle of operation of flash Butt welding. Discuss its advantages and limitations compared with upset Butt welding.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- a) Discuss the sources and effects of gas absorption during welding. Explain the methods to prevent gaseous contamination in welds.
- b) Explain the concept of carbon equipment and its significance in welding.
- c) Discuss the different types of corrosion that can occur in welded joints.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- a) What are residual stresses in welded joints and their causes?
- b) Discuss the methods of correction of distortion in welded joints, including mechanical techniques and thermal techniques.
- c) Explain the concept of weldability and discuss different weldability tests.

Q.No.6. Write short notes on any three:

3 x 4 = 12

- a) Welding Robots and Automation
- b) Procedure for maintenance welding
- c) Weld cracking and weld decay
- d) Projection welding
- e) Need for CO₂ gas preheater in MAG welding

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Advanced Fabrication Process (FB402)**

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: **5x 3 = 15**

- a) What is metal shearing used for? List the types of machines used for shearing.
- b) Explain the rivet removal process in flame cutting.
- c) What is precision grinding used for? Name the machines used in precision grinding.
- d) Compare 'up milling' with 'down-milling'.
- e) Explain the meaning of cropping and notching.
- f) Write a short note on plate edge preparation machine.

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

- a) Explain the principle and working of laser cutting of steel.
- b) How are portable nibblers classified? Briefly describe any one type of nibbler.
- c) With a neat sketch explain the working of parallel shaft rotary shearing machine.

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

- a) Explain the following terms with reference to centre lathe:
i)Cutting speed ii)Feed iii)Depth of cut
- b) What is the purpose of grinding? Briefly explain cylindrical grinding process.
- c) With a neat sketch explain the Whitworth quick return mechanism in shaper.

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

- a) Explain the principle of straightening with heat. State the use of heat triangle and heat strip.
- b) Explain the technique of cutting thick plates near edge.
- c) Explain the various parts of jig boring machine with neat sketch.

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

- a) Explain the procedure of adjusting the length of stroke in shaping machine.
- b) With a neat sketch describe the constructional features of a column and knee type machine.
- c) Explain with a neat sketch the following operation performed on a drilling machine: i) Reaming ii) Spot facing

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

- a) Removal of defective weld by gouging
- b) Manual straightening
- c) Counter boring
- d) Planer operations
- e) Power guillotine machine
- f) Rank angle of blades in shearing

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Treatment on Steel (FB403)**

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 Bessemer process of steel making in brief.
- b) What is meant by interstitial solid solution?
- c) Explain the effect of alloying elements in steel. What is the effect of carbon and silicon on steel?
- d) Why is heat treatment done on steel? What are the factors affecting good results of heat treatment?
- e) Explain the process of shot blasting on steel.
- f) Describe the theory of protection by barrier coatings.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- a) Briefly explain pig iron and its manufacturing.
- b) Discuss and give the composition of the following steel structures: i) Pearlite ii) Austenite iii) Martensite
- c) Discuss the effect of grain size and atmospheric exposure on the mechanical properties of steel.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain the process of barrel tumbling.
- b) What are the factors heating heat treatment of steel.
- c) Explain the following heat treatment methods applied to steel: i) Hardening ii) Tempering iii) Normalising

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- a) Write a brief note on shot blasting and sand blasting.
- b) Briefly describe galvanizing and powder coating.
- c) Explain the following with respect to protection of steel: i) Cathodic protection ii) Sacrificial anode protection

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain the following processes of chemical cleaning of steel: i) Degreasing ii) Acid pickling
- b) State the requirements of steel coating. Name any three coatings done on steel.
- c) Write short note on zinc coating and chrome plating.

Q.No.6. Write short note on any four:

4 x 3 = 12

- a) Steps involved in hardening.
- b) Rotary blasting
- c) Full annealing v/s process annealing
- d) Types of solid solutions
- e) Quenching media

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Mechanics of Solids (FB404)**

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

- Define shear stress, shear strain and modules of rigidity.
- Define volumetric strain and bulk modulus.
- State and explain parallel axis theorem.
- Explain theory of pure bending using an example.
- Define centre of gravity and locate CG of hemisphere, cone and cylinder.
- A circular rod 2m long and 15mm diameter is subjected to an axial tensile load of 30KN. Find the elongation of the rod if $E = 2 \times 10^5 \text{ N/mm}^2$.
- Determine the value of Poisson's ratio and Young's modulus if modulus of rigidity of the material is $0.5 \times 10^5 \text{ N/mm}^2$ and bulk modulus is $1.12 \times 10^5 \text{ N/mm}^2$.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- The temperature of a steel rod is raised from 40°C to 70°C . Find the stress induced in steel rod when expansion is prevented. Also find expansion of the rod. $E = 2 \times 10^5 \text{ N/mm}^2$ and $\alpha = 12 \times 10^{-6}/^\circ\text{C}$
- Compression member is subjected to forces as shown in fig.1. Find the stresses in each of the portion and total decrease in the rod. $E = 2 \times 10^5 \text{ N/mm}^2$
- A composite member has core of steel with diameter 200mm encased with aluminum tube of outer diameter 220mm and inner diameter 200mm. The composite member is subjected to axial compressive force 200KN. Find the stresses in each material. $E_s = 2 \times 10^5 \text{ N/mm}^2$ and $E_a = 0.7 \times 10^5 \text{ N/mm}^2$.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Find the centroid of the area. (refer fig.2.)
- Find the centre of gravity of composite solid wherein cone is placed on cylinder of same diameter of 20mm and same height of 30cm. (refer fig.3.)
- Find the moment of inertia of 'T' section top flange $150\text{mm} \times 20\text{mm}$, bottom flange $200\text{mm} \times 40\text{mm}$, web thickness is 30mm and overall depth 300mm, about horizontal centroidal axis. (refer fig.4.)

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- A simply supported beam 8m span is subjected to loading as shown in fig.5. Draw SFD and BMD.
- A cantilever beam of span 7m is subjected to point loads 4KN, 2KN and 1KN as shown in fig.6. Draw SFD and BMD.
- An overhang beam ABC is subjected to udl 2KN/m throughout as shown in fig.7. Draw SFD and BM.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- A beam is 3m long of the section 200mm wide and depth 300mm. What uniformly distributed load per metre the beam can carry safely, if bending stress is not to exceed 100N/mm^2 ?

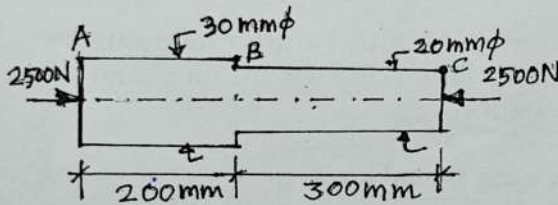
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- b) A cantilever beam of span 2.5m has a rectangular cross section 100mm x 200mm. Find the point load, which the cantilever beam can carry at its free end, if the bending stress is not to exceed 80N/mm^2 .
- c) Shear force 50kN is acting on a beam of 'T' section having top flange 200mm x 20mm, web thickness 30mm and overall depth 200mm. Find the maximum shear stress intensity and sketch the shear stress distribution diagram.

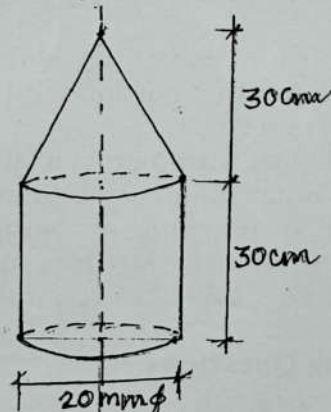
Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

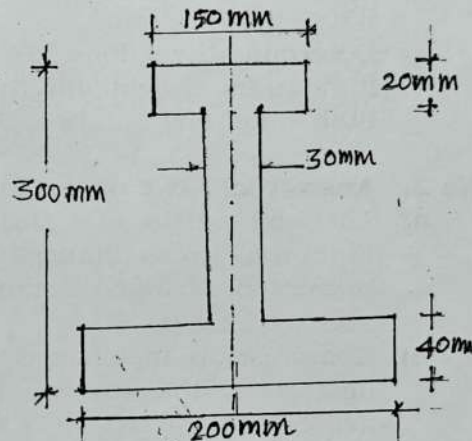
- a) A hollow cylindrical drum 800mm in diameter has thickness of 8mm. If the drum is subjected to an internal air pressure of 5N/mm^2 , determine hoop stress, longitudinal stress, longitudinal strain and circumferential strain.
- b) A thick cylindrical shell has an internal diameter of 200mm and is under an internal fluid pressure of 20N/mm^2 . If the permissible tensile stress in the material of the shell is 40N/mm^2 find the required thickness of the cylinder.
- c) An axial pull of 10kN is suddenly applied on a steel rod of 500mm length and 8mm diameter. Calculate the elongation of the rod and the absorbed strain energy. Also find the modulus of resilience. Take $2 \times 10^5 \text{N/mm}^2$.



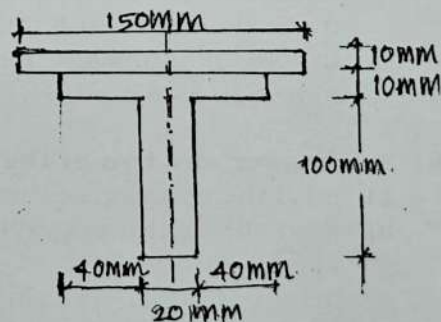
Q.No.2 b) Fig1



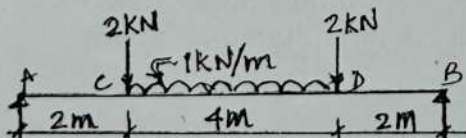
Q.No. 3b Fig3



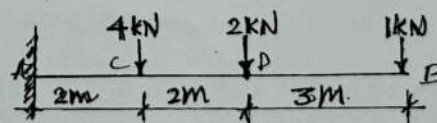
Q.No.3 c) Fig4



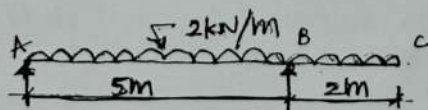
Q.No.3a Fig2



Q.No. 4a) Fig5



Q.No. 4b) Fig6



Q.No.4c Fig7

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA
April, 2026 Examinations

Programme: **Common**

Subject: **Industrial Organisation & Management (CC601)**

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 the advantages of partnership organization.
- b) Explain the packing and forwarding function in the industry.
- c) What do you understand by economic order quantity?
- d) Explain the term arbitration.
- e) Write down any three points of difference between PERT and CPM.
- f) Differentiate between incentive and wage.

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

- a) Write down the salient features of a public limited company.
- b) Explain line organization with the help of a sketch.
- c) Why management is called an art as well as science?

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

- a) Explain the following functions of management:
i) Forecasting ii) Controlling
- b) Write a note on marketing and sales promotion function in the industry.
- c) Explain ABC analysis in materials management with a neat sketch.

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

- a) Explain the elements of cost.
- b) Explain the importance of break-even chart with a neat sketch.
- c) A machine was purchased for Rs.91,000. The estimated life of machine is 14 years and scrap value is Rs.20,000. If the rate of interest is charged at 5%, calculate the rate of depreciation by sinking fund method. What will be depreciation amount after 3 years?

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

- a) Differentiate between selection and recruitment.
- b) Write the characteristics of a good incentive plan.
- c) Write a note on the Workmen Compensation Act 1923.

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

- a) Explain in brief grievance handling mechanism.
- b) i) Write a note on GST.
ii) Define the following terms with respect to network analysis: i) Critical path ii) Most likely time iii) Pessimistic time.
- c) The activity details and their predecessor are given below along with their activity times:

-2-

Activity	Predecessor	Activity time (days)
A	-	11
B	A	09
C	B	08
D	B	10
E	B	07
F	C, D, E	14

Draw network diagram. Determine the critical path and project duration.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Theory of Structures (FB601)**

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

- Explain the middle third rule for rectangular sections.
- Explain what a perfect, deficient and redundant frame is.
- Differentiate between statically determinate structure and statically indeterminate structure.
- What is stiffness of a member? Explain relative stiffness of a member with example.
- State the assumptions in the theory of pure torsion.
- State the expression for torque transmitted by: i)Hollow circular shaft ii)Solid circular shaft
- Draw the deflected slope of a cantilever beam and state the expression for slope and deflection.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- A short column of diameter 400mm carries an eccentric load of 80KN. Find the greatest eccentricity which the load can have without producing tension on the cross section.
- A rectangular strut in 20cm wide and 15cm thick. It carries a load of 60KN at an eccentricity of 2cm in the plane bisecting the thickness. Find the maximum and minimum intensities of stress in the section.
- A masonry chimney 25m high of uniform circular section, 3.5m external diameter and 2m internal diameter is subjected to a horizontal wind pressure of 1KN/m² of projected area. Find the maximum and minimum stress intensities at the base if the specific weight of masonry is 22KN/m³.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- A cantilever truss is loaded as shown in fig.1. Find the forces in all the members of the truss.
- A simply supported truss is loaded as shown in fig.2. Find the forces in all the members using method of joints.
- A truss shown in fig.3. is carrying a point load of 5KN at E. Find the forces in member CE, CD and BD of the truss.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- A fixed beam of span 8m is subjected to two point loads of 100KN at 2m from each support. Find the fixed end moments. Draw SFD and BMD.
- A fixed end beam AB of span 6m is subjected to a udl of 100 KN/m over its entire span. Draw SFD and BMD.
- A continuous beam ABC consists of two spans AB=6m and BC=8m. The span AB carries a point load of 50KN at mid span and span BC carries a udl of 30KN/m over its entire span. Draw BMD.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- A hollow steel shaft of external diameter 120mm and internal diameter 80mm is 1.5m long. Find the maximum torque required to produce a twist of 0.5 degrees over the length of the shaft. Take $C = 8 \times 10^6 \text{ N/mm}^2$

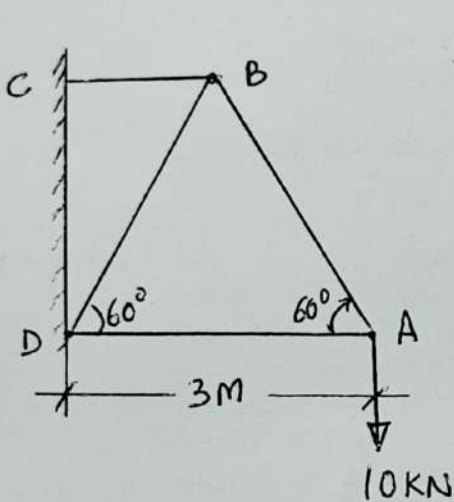
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- b) A solid shaft is 100mm in diameter. It transmits 150KW at 250rpm. Find the maximum intensity of shear stress induced and the angle of twist for a length of 5.0m. Take $C = 8 \times 10^4 \text{ N/mm}^2$.
- c) A steel shaft is subjected to a torque of 25KNm and a bending moment of 10KNm. The diameter of the shaft is 150mm. Calculate the maximum and the minimum principal stresses and also the maximum shear stress in the shaft at its surface.

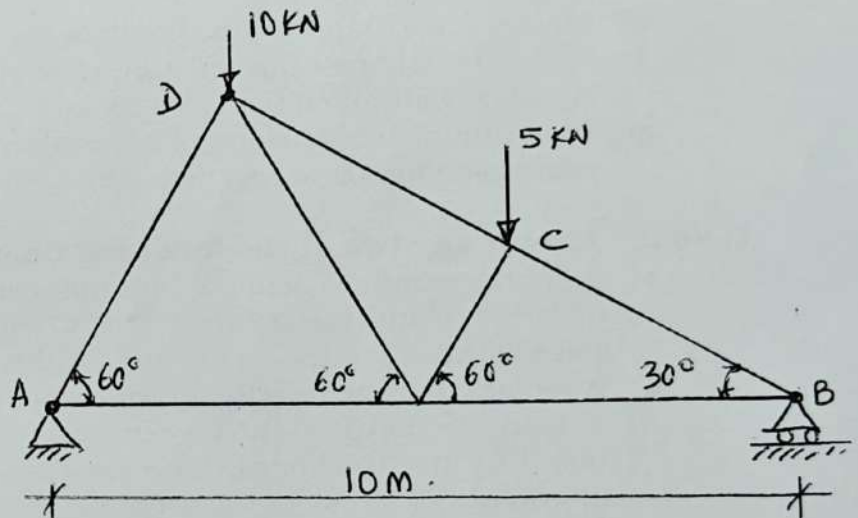
Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

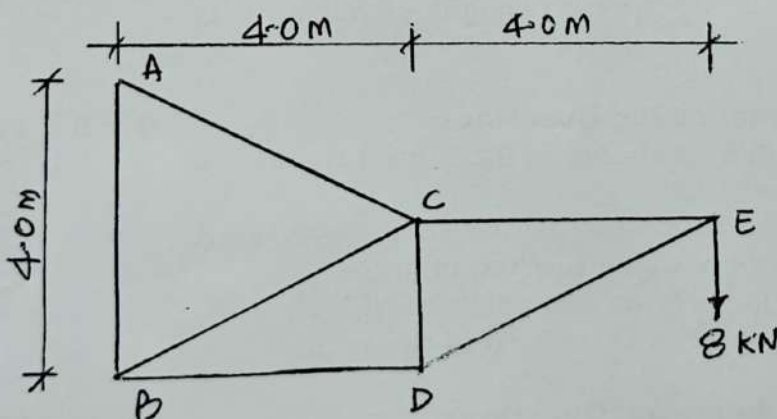
- a) A cantilever beam 250mm long of rectangular section 40mm wide and 30mm deep carries a uniformly distributed load. Calculate the value of 'w' if the maximum deflection of the cantilever is not to exceed 0.5mm. Take $E = 70 \times 10^3 \text{ N/mm}^2$
- b) A simply supported beam of length 700mm and cross section of 200x250mm carries a u.d.l. of 210KN/m over entire span. Find slope and deflection of the beam. Take $E = 2 \times 10^4 \text{ N/mm}^2$.
- c) Analyze the portal frame as shown in fig.4. and draw BMD.



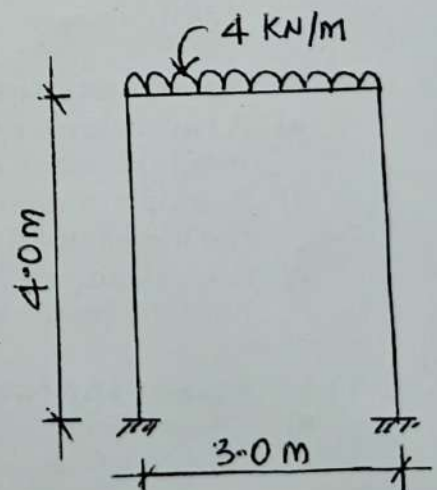
Q.N° 3a Fig(1)



Q.N° 3b. Fig(2)



Q.N° 3c. Fig(3)



Q.N° 5c Fig(4)

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Erection Engg.(FB603)**

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 the precautions in handling and storing synthetic fiber ropes.
 - b) Briefly specify the characteristics of Sisal rope.
 - c) What is the purpose of bull pin as connecting tool in cranes?
 - d) How inspection of hoisting chain is carried out?
 - e) State the use of spreader bar.
 - f) How to protect a structure against corrosion at erection site?
 - g) Draw hoist signals for back trolley and slew boom for crane operations.
- Q.No.2. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Describe plain laid or house laid construction.
 - b) What is kinking? State the causes, effects and methods of removal of kinking.
 - c) Write the characteristics and uses of polypropylene rope.
- Q.No.3. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Explain the construction and working of mechanical crawler crane.
 - b) Describe manila rope sling and state its merits and demerits.
 - c) Explain the operation of differential hoist and list its uses.
- Q.No.4. Answer any two of the following Questions:** **2 x 6 = 12**
- a) What are skids? Enlist applications of skids in handling of loads.
 - b) Explain estimation of centre of gravity for handling loads.
 - c) State the precautions to be followed while handling loads on slings.
- Q.No.5. Answer any two of the following Questions:** **2 x 6 = 12**
- a) With a neat sketch explain erection of multi storey building at site.
 - b) Write short note on erection by raising of guy derrick.
 - c) Discuss inspection and rectification of erection work at site.
- Q.No.6. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Briefly explain the various causes of accident.
 - b) List the benefits of accident prevention.
 - c) What is PPE? Discuss use of protective equipment.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Quality Control & Inspection (FB604)**

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 is quality control?
- b) List the benefits of T&M.
- c) What are the aims of inspection?
- d) How all weld test specimen is prepared for tensile test?
- e) Explain the procedure for conducting nick break test.
- f) State the principle of ultrasonic inspection.
- g) What is leak? What do you understand by leak testing?

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain various abilities as parameters of fitness for use.
- b) What is quality value and quality cost? How balance between quality cost and quantity value can be achieved?
- c) Discuss Kaizen as a tool for quality assurance.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- a) How inspection is classified based on work location? Explain.
- b) Explain the duties of inspector of quality control department.
- c) State the advantages and disadvantages of magnetic particle testing.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- a) With neat sketch explain free bend test.
- b) Discuss test procedure of Vickers hardness test.
- c) What is Etch test? Compare macro etch with micro etch examination.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain the procedure to conduct fluorescent penetrant inspection.
- b) With neat sketch explain eddy current testing.
- c) Compare X-ray radiography with gamma ray radiography.

Q.No.6. Write short note on any three:

3 x 4 = 12

- a) Quality of design
- b) ISO 9000
- c) Inspection records
- d) Visual inspection

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Piping Fabrication & Installation (FB713)/(FE611) [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 five of the following Questions:

5 x 3 = 15

- What are the different schedules of pipe?
- How does temperatures rise affect the yield stress of material of steel pipes?
- How does the change in pipe size affect the velocity of flow?
- Explain the purpose of pipe insulation.
- Why is corrosion allowance considered in design of pipelines?
- Why are double line diagram used in piping?
- List the activities involved in the fabrication of pipelines.

Q.No.2. Answer the following Question:

(12)

- Steam flows through a pipeline at a flow rate of 500Kg/hr. The design temperature is 200°C and design pressure is 8 bar(800KPa). The pipe material is ASTM A106 grade B having length of 100m. If number of fitting is 15 (elbows, valves, etc) and corrosion allowance is 2mm, select the appropriate pipe size (NPS) and schedule. (thickness) (refer data sheet)

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Draw orthographic views (F.V, T.V, L.H.S.V) from the given isometric view of a pipeline shown in fig.1.
- Prepare bill of material for the pipeline shown,fig.1.
- Draw symbols for the following piping components:
i) NRV ii) Butterfly valve iii) Y-branch iv) Reducer v) A flanged connection vi) Elbow -90°

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Explain the 'stove pipe' technique for cross country pipeline construction.
- Describe the process of cold bending pipes using the 3-point bend method.
- Explain the importance of proper edge preparation for pipe welding.

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Q.No.5. Answer any two of the following Questions:

- How is expansion taken care in process pipelines? Explain any one method.
- Explain the procedure for carrying out a hydrotest on a pipeline.
- Discuss the importance of inspection during pipeline installation.

3 x 4 = 12

Q.No.6. Write short note on any three:

- Use of steam traps in pipelines
- Pipe support types
- Manufacture of seamless pipes
- P& IDs
- Special design consideration for various fluids to be transmitted
- Dimension of fabricated pipe bends

Data Tables:

Given Tables:

Table 1: Steam Properties at 200°C, 800 kPa

Property	Value
Density (ρ)	4.17 kg/m ³
Dynamic Viscosity (μ)	1.6×10^{-5} Pa-s
Specific Volume	0.2395 m ³ /kg

Table 2: Design Factors for ASTM A106 Grade B

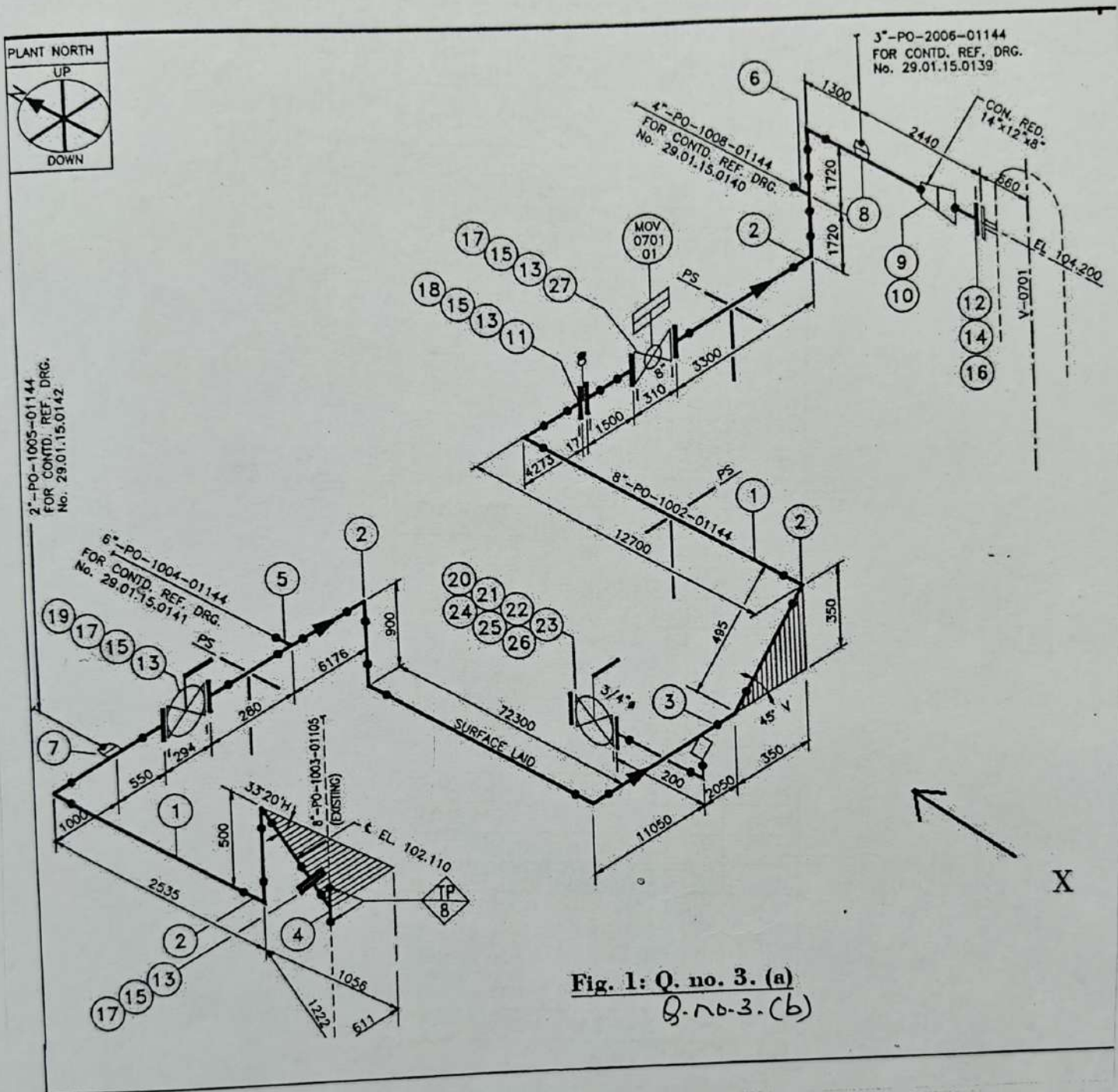
Factor	Value
Allowable Stress at 200°C	108 MPa
Weld Joint Efficiency (E)	1.0
Design Factor (Y)	0.4

Table 3: Standard Pipe Sizes

NPS	Schedule	OD (mm)	Wall Thickness (mm)	ID (mm)
2	40	60.3	3.91	52.48
2.5	40	73.0	5.16	62.68
3	40	88.9	5.49	77.92
4	40	114.3	6.02	102.26
2	80	60.3	5.54	49.22
2.5	80	73.0	7.01	58.98
3	80	88.9	7.62	73.66

Table 4: Equivalent Length for Fittings

Fitting Type	Equivalent Length/Diameter (L/D)
90° Elbow	30
Gate Valve	13
Globe Valve	340
Check Valve	100



ITEM No.	QTY	UNIT	DESCRIPTION
1	130	M T R	8" LINE PIPE SCH.40 CS,SMLS
2	10	P C	8" ELBOW 90° LR SCH.40 A234 WPB
3	1	P C	8" ELBOW 45° SCH.40 A234 WPB
4	1	P C	8" EQ. TEE SCH.40 A234 WPB
5	1	P C	8"x6" RED. TEE SCH.40x80 A234 WPB
6	1	P C	8"x4" RED. TEE SCH.40x80 A234 WPB
7	1	P C	2" WELDOLET SCH.80
8	1	P C	3" WELDOLET SCH.80
9	1	P C	14"x12" CON. RED. SCH.40 A234 WPB
10	1	P C	12"x8" CON. RED. SCH.40 A234 WPB
11	1	P C	8" 150# SPECTACLE BLIND
12	1	P C	14" 150# WN RF FLG. SCH.40 A105
13	8	P C	8" 150# WN RF FLG. SCH.40 A105
14	1	P C	14" 150# GASKET CAF
15	7	P C	8" 150# GASKET CAF
16	12	P C	1"x130 LG. STUD BOLTS A193B7/A194 2H
17	40	P C	3/4"x110 LG. STUD BOLTS A193B7/A194 2H
18	8	P C	3/4"x130 LG. STUD BOLTS A193B7/A194 2H
19	1	P C	8"-150# BALL (R.B) VALVE BODY/BONNET : ASTM A126-WCC or WCB BALL : AISI 316 SYSTEM : MONEL K500 SEATS : PTFE
20	1	P C	3/4" ELBOW 90° LR SCH.80 A234 WPB
21	1	P C	3/4" NIPPOLET SCH.160 A105
22	1	P C	3/4" 150# WN RF FLG. SCH.80 A105
23	1	P C	3/4" 150# BLIND FLG.
24	8	P C	1/2"x65 LG. STUD BOLTS A193B7/A194 2H
25	1	P C	3/4"-150# BALL (R.B) VALVE BODY/BONNET : ASTM A126-WCC or WCB BALL : ASTM A105 SYSTEM : MONEL K500 SEATS : PTFE
26	2	P C	3/4" 150# GASKET CAF
27	1		8" 150# MOV

Note:

- Front View Direction "X"
- All dimensions in "mm"

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Mechanical Engg./FT&EE**

Subject: **Safety Engineering (MC626)**

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

- Give three reasons why safety is needed in industries.
- List any three unsafe acts that may cause accidents.
- List three direct costs of accidents.
- State the purpose of communication in safety.
- What is manual handling?
- Name two types of Personal Protective Equipment. (PPE)

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Explain the role of management, supervisors and workmen in safety.
- Describe the objectives, types and functions of a safety organisation.
- Classify accidents based on nature of injury, cause and location with examples.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Briefly discuss the accident report form.
- Compare Life Insurance and General Insurance.
- Explain how a job safety analysis is carried out.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Explain the importance of safety education and training.
- Explain the objectives and types of work permit systems.
- Explain types of fires and relevant extinguishers.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Define fall, list its common causes, and explain prevention.
- Discuss in built safety features in crane hoists.
- What are the types of machine hazards? Explain the common safeguarding methods and devices.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- Describe electrical hazards and their prevention.
- Discuss the effects of noise and remedial measures.
- Discuss hazards in the chemical industry with classification and properties of flammable chemicals.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Steel Structures Design (FB701)**

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 three of the following Questions:

3 x 5 = 15

- Briefly explain limit state design in steel structures design.
- Briefly explain analysis of eccentric welded joint with moment in the plane of welds.
- Briefly explain design procedure of tension members.
- Write short note on: i) Lacing ii) Batten plates
- Briefly explain different lateral stability of beams with neat sketches.
- State design procedure of angle purlin in roof truss.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Design a fillet weld to connect two plates 175x10mm and 150x8mm for the full strength of thinner plate. Use Fe₄₁₀ grade steel and shop weld.
- Design a fillet weld for ISA90x60x8mm connected to gusset plate of 10mm for a factored load of 220KN. Use shop weld and Fe₄₁₀ steel.
- Define: i) Throat thickness ii) Effective length iii) Overlap length of fillet welded joint

Q.No.3. Answer the following Questions:

- A tie member used is ISA100x100x10mm connected to gusset plate of 12mm thick by longitudinal welds at top 225mm, bottom 110mm and to side 100mm transverse weld. Determine design strength of members in tension. Use shop welds and Fe₄₁₀ grade steel.

(09)

OR

- Design a tie member using unequal angle section to carry a factored load of 300KN. Also design fillet welds. Use site weld and Fe₄₁₀ grade steel.
- State the different failure state of tension members as per codal provisions.

(09)

(03)

Q.No.4. Answer the following Questions:

- Determine design strength of I section column ISHB400@ 82.2Kg/m with length of column 6m. One end of column fixed, other hinged. Use Fe₄₁₀ grade steel.

(09)

OR

- Design a slab base for a column ISHB350@72.4Kg/m carrying a factored load of 1400KN. Use M₂₀ concrete and Fe₄₁₅ steel. Also design welds. Use site welds.
- Define effective length and state the same for different support conditions of column.

(09)

(03)

Q.No.5. Answer the following Questions:

- With a neat sketch write short notes on plate girder.
- Design an I section beam simply supported for an effective span of 6m to carry working load of 32KN/m for full span. Check the beam for: i) Bending ii) Shear iii) Deflection

(03)

(09)

OR

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-2-

- c) I Section beam used is ISMB400@61.6Kg/m for effective span of 5m. Determine safe udl the beam can carry for full span if used as: i)Simply supported beam ii)Cantilever beam (09)

Q.No.6. Answer the following Questions:

- a) Design an angle purlin for a roof truss with following data: (09)
i)Spacing of trusses= 4m C/C ii)Spacing of purlins=1.4m C/C iii)Slope of truss= 26° iv)Wind pressure= 1000N/m^2
v)Weight of sheets= 160N/m^2

OR

- b) Select suitable truss for a span of 12m industrial shed and determine dead load and live load at panel points of truss. Use AC sheet roofing weighing 170N/m^2 . Assume suitable data. (09)
- c) State the different loads considered for roof truss design and their load combinations. (03)

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Theory of Structures- II (FE702)[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

- Explain how to determine slope and deflection for a simply supported beam of 'l' m span subjected to wN/m over the entire span.
- Define the term slenderness ratio. What are the limitations of Euler's formula?
- Three hinged parabolic arch of span 'l' and rise 'h' carries u.d.l of wN/m over whole span. Find the reactions and horizontal thrust.
- Fixed beam of span 'l' carries point load '2W' at midspan. Draw SFD and BMD.
- What are distribution factors for a member in moment distribution method? How do the carry over factors differ for simple supports and fixed supports?

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- A simply supported beam 5m span carries two point loads 40KN and 60KN at 1m and 3m from left support. Find the deflection under each load. $E=2 \times 10^5 N/mm^2$ and $I=90 \times 10^6 mm^4$
- A cantilever beam of span 8m carries a u.d.l of 100N/m. Find the slope and deflection at the free end.
- A propped cantilever of span 6m is propped at free end. It carries 25KN/m over entire span. Draw bending moment diagram.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- A fixed beam of 6m span is subjected to two point loads as shown in fig.1. Draw SFD and BMD of the beam.
- A fixed beam of 6m span is subjected to u.d.l and point loads as shown in fig.2. Draw SFD and BMD.
- A fixed beam of 8m span is subjected to partial u.d.l 200N/m as shown in fig.3. Draw SFD and BMD.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- A continuous beam ABC is simply supported as shown in fig.4. It is subjected to loading as shown. Draw bending moment diagram using moment distribution method taking EI constant.
- A beam ABC is fixed at A and simply supported at B and C and loaded as shown in fig.5. Draw BMD using moment distribution method. Take EI as constant.
- A portal frame ABCD carries point load 500N on span BC as shown in fig.6. Draw BMD. Use moment distribution method taking EI constant.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- A hollow cylindrical column of 150mm external diameter and 15mm thickness, 3m long and is hinged at one end fixed at the other. Find the Euler critical load of $E=8 \times 10^4 N/mm^2$

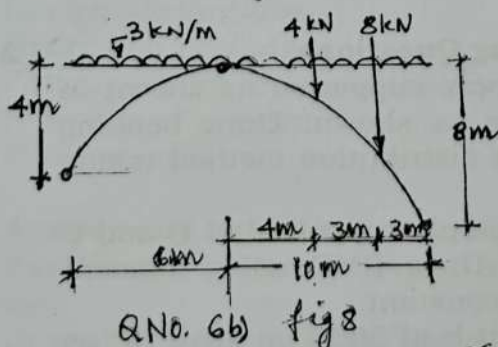
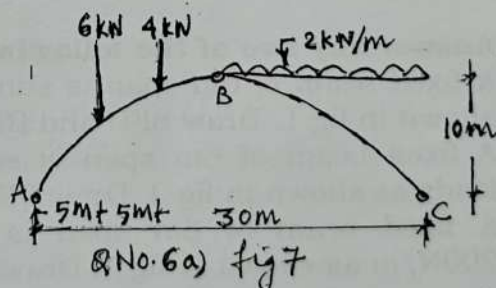
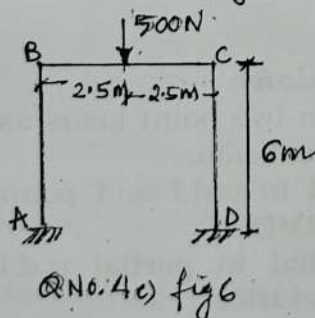
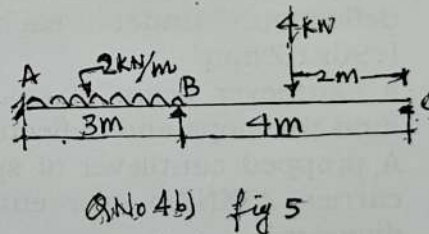
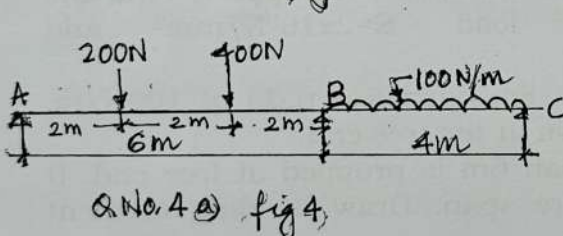
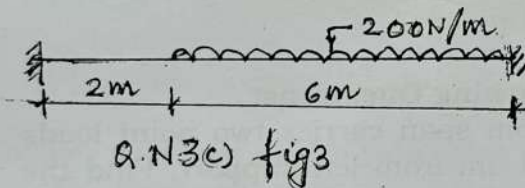
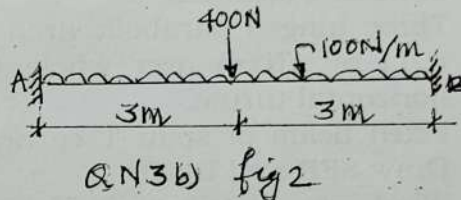
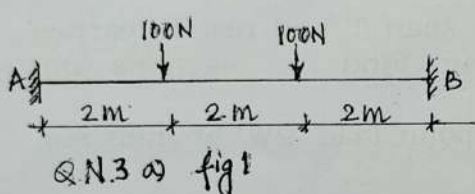
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- b) A column of section $100\text{mm} \times 150\text{mm}$ is 6m long both ends being fixed. Find the safe load for the column. Use Euler's formula and allow a factor of safety of 3. Take $E=17500\text{N/m}^2$.
- c) A hollow circular column 2m long has one of its ends fixed and the other end free and has to support axial load 'P'. The internal diameter is 200mm and external diameter 240mm . Allowing a factor of safety of 4, Calculate the axial load. Using Rankine's formula. Take $f_c=330\text{N/mm}^2$ and $\alpha = \frac{1}{7500}$

Q.No.6. Answer the following Questions:

2 x 6 = 12

- a) A three hinged arch has a span of 30m and rise of 10m . The arch is loaded as shown in fig.7. Determine the horizontal thrust.
- b) A three hinged arch of span 16m has its abutments at different levels as shown in fig.8. The loading is as shown in figure. Find the vertical reactions and horizontal thrust.



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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Fabrication Technology & Erection Engg.**

Subject: **Fabrication of Boilers & Pressure Vessels(FE703)[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 five of the following Questions:

5 x 3 = 15

- a) What are bolting materials?
- b) Explain safety in roll bending.
- c) Write a note on hand forming tools for metal spinning.
- d) How is strengthening at stress concentration areas done?
- e) Explain the stresses in spherical shells.
- f) How are welding radiographs interpreted?
- g) Explain the basic principle of stiffening.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain the following press operations:
i) Blanking ii) Flanging iii) Re-striking
- b) Explain any two press braking tools with neat sketch.
- c) Write short note on the following:
i) Straight side presses ii) Limitations of press braking

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain pyramid type roll bending machine along with a sketch.
- b) Write short notes of following:
i) Lubrication for spinning ii) Selection of steel for hydrogen service
- c) Explain the process of bending thin wall tubes.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain localized heating for compression bend with a neat sketch.
- b) Write short note on the following:
i) Use of applied stiffeners ii) Mechanism of bending
- c) Describe the stresses in bi-metallic joints with a neat sketch.

Q.No.5. Write short note on any three:

3 x 4 = 12

- a) Design precautions
- b) Hydro test procedure
- c) Fatigue failure of pressure vessel
- d) Selection of construction material for non-corrosive service
- e) Production of structure sections

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain the following: i) Piping loads ii) Combination of design load
- b) Describe discontinuity stresses in vessels with a neat sketch.
- c) Describe stresses in cylindrical shells with a neat sketch.
