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
  a) Define moment and couple. Also state Varignon's Theorem.
  b) Explain the concept of Equilibrium.
  c) Explain the types of beam supports with sketches.
  d) Define the following: i)Friction ii)Angle of friction iii)Angle of repose
  e) State and explain law of conservation of momentum.
  f) What are the characteristics of a force for complete specification?
  g) What is the law of machine?

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
  a) Find the resultant in magnitude and direction for the following concurrent force system:
      i)200N acting 25° North of East
      ii)300 N acting due South
      iii)450 N acting 50° South of West
      iv)550 N acting at South East
  b) Find the magnitude, direction and position of resultant of the system of forces shown in Fig.1.
  c) Determine magnitude, direction and position of resultant of force system shown in Fig.2.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
  a) Using Lami's theorem, find the forces in the members AB, BC and CD. Also find the unknown 'w'. (Refer fig.3.)
  b) A smooth sphere of weight 20N is supported by a chain as shown in fig.4. The length of the chain AB is twice the radius of the sphere. Draw free body diagram and find the tension in the chain and reaction of the wall.
  c) Find the reaction at A and B of the simply supported beam as shown in Fig.5.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
  a) A person weighing 750N is moving in a light weight passenger elevator weighing 6800N. When the elevator moves upwards with constant acceleration, the cable tension force is 8500N. Find the value of the acceleration of the elevator. Also find acceleration, if the tension is 4800N as the elevator accelerates downwards with constant value.
  b) Two masses of 70kg and 105kg are connected by a thin weightless string passing over a light frictionless pulley. Find the tension in the string and acceleration of the system.
  c) A wagon of mass 8 tonnes rolling at 1.4 m/sec collides with another wagon of mass 12 tonnes rolling at 1.8 m/sec in the opposite direction of the same track. After collision the two wagons move together. Find the magnitude of their common velocity.

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

   a) A pull of 60N inclined at 30° to the horizontal plane is required just to move the body placed on a rough horizontal plane. But a push required to move the body is 70N. If the push is inclined at 25° to the horizontal, find the weight of the body and the coefficient of friction.

   b) A ladder 5m in length of weight 320N is placed against a wall making an angle of 60° with the floor. The coefficient of friction between the wall and the ladder is 0.25 and the coefficient of friction between the floor and the ladder is 0.35. The ladder supports a man of weight 720N at its top. Calculate horizontal force 'P' to be applied to the ladder at the bottom to prevent slipping.

   c) Find the centroid of 'I' section shown in fig.6.

   d) Find the centre of gravity of the composite solid wherein a hemisphere of diameter 50mm is placed on the top of cylinder whose diameter is also 50mm. The height of the cylinder is 70mm.

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

   a) In a machine, it was found that an effect had to be moved through a distance of 600mm to move the load by 60mm. Using this machine a load of 12KN was raised by an effort of 1.5KN. Determine: i)Velocity ratio of the machine ii)Mechanical advantage iii)Efficiency

   b) A drum weighing 60N and holding 540N of water is to be raised from a well by means of wheel and axle. The axle is of 90mm diameter and wheel is of 470mm diameter. If a force of 150N has to be applied to the wheel, find mechanical advantage, velocity ratio and efficiency of the machine.

   c) A simple screw jack has a thread of pitch 12mm. Find the load that can be lifted by an effort of 25N applied at the end of handle 450mm long. Take efficiency as 55%.
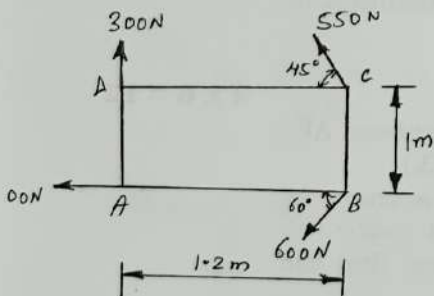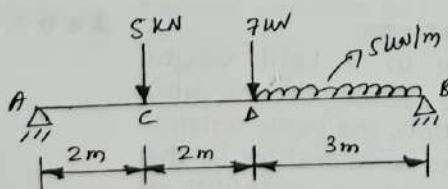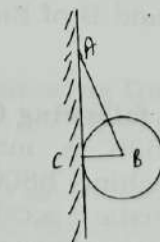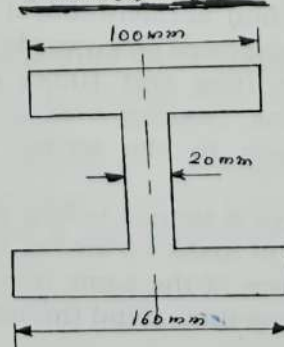

Q.NO.2(b). Fig.1
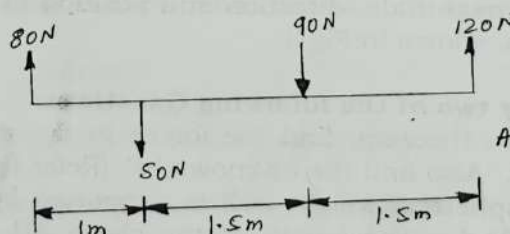
Q.NO.2 (c). Fig.2.
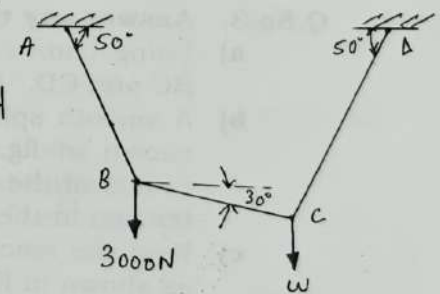
Q.NO.3 (a) Fig.3

Q.NO.3(c). Fig.5

Q.NO.3(b). Fig.4

Q.NO.5 (c) Fig.6

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 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)** State the applications of Chain Drives.
- **b)** List the basic engine components.
- **c)** How are Boilers classified?
- **d)** Define the term: i) C.O.P. ii) Air Conditioning
- **e)** Define the term 'Breakdown Maintenance'.
- **f)** State the working principle of Reciprocating Pump.
- **g)** State the applications of Gear Drives.

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
- **a)** Describe any one type of a Belt Drive with neat sketch and state its application.
- **b)** Draw a neat sketch of Rolling Contact Bearing and state its applications.
- **c)** Explain with a neat sketch Compound Gear Train and write its speed ratio.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
- **a)** Explain the construction and working of 2 stroke petrol engine.
- **b)** Explain the construction and working of 4 stroke diesel engine.
- **c)** Compare a petrol engine with diesel engine.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
- **a)** With a neat sketch explain Babcock and Wilcox Boiler.
- **b)** Compare a Reciprocating Pump with Centrifugal Pump.
- **c)** What is a Boiler Accessory? Explain with a neat sketch Super Heater.

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12
- **a)** Explain the construction and working of Split AC with a sketch.
- **b)** Compare a Fire Tube boiler and Water Tube boiler.
- **c)** With a neat sketch explain the construction and working of Window AC.

Q.No.6. Answer any two of the following Questions: 2 x 6 = 12
- **a)** With the help of neat sketch explain the construction and working of Chain Pulley block.
- **b)** Explain the technical terms used in I.C. Engines:
  i)Stroke volume ii) Compression ratio ii) Brake power
- **c)** What is lubrication? What is the necessity of lubrication? List the methods of lubrication.

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 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) Classify with examples, the commonly welded base metals.
    b) Compare welding with Riveting and Casting.
    c) Explain the need of a anti-flash back device in gas welding.
    d) Explain the Braze welding of cast iron.
    e) Explain the principle of operation of Brazing.
    f) Discuss the method of wave soldering.

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
    a) Discuss with neat sketch the various types of welded joints.
    b) Explain the various types of Edge preparation used in an arc welding process.
    c) What is arc stability? Also list down the factors affecting arc stability.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
    a) Explain the various remedies for an Arc Blow.
    b) Explain the short circuiting type of metal transfer with a neat sketch.
    c) Discuss with a neat sketch the working of a welding transformer.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
    a) Explain with an example the IS system of classification and costing of mild steel electrodes.
    b) What are the various safety measures to be followed while performing an arc welding operation?
    c) Explain with a neat sketch the working of an Acetylene Gas Generator.

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12
    a) With a neat sketch, explain the working of a 2 stage regulator w.r.t gas welding process.
    b) Explain the leftward welding technique used in gas welding process.
    c) Explain with a neat sketch the Air-Acetylene welding process.

Q.No.6. Write short note on any three: 3 x 4 = 12
    a) Weld distortion
    b) Regions of a welding arc
    c) Manufacture of electrodes
    d) Welding of pipes

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2025 Examinations

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

Subject: **Fabrication Drawing (FB302)**

Time Duration: **4 Hrs.**   Max. Marks: **75**

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

a) Using SP6(1), find rivet gauge distances, 'C' in legs of angles mentioned below:
i)Leg size = 80mm ii) Leg size = 100mm ii)Leg size = 150mm

b) Draw to scale the following extruded sections: (any two)
i)ISMB 200 ii) ISA 4545_5 iii) ISLC 75

c) It is found that a structure consists of the following sections with lengths mentioned. Prepare Bill of Material (BOM) for the structure:
i) ISA 4545_5--12 nos. – each 5.5m length
ii) ISMC 100-- 04 nos. – each 2.5m length
iii) ISA 7575_8--05 nos. – each of 4.0m length
iv) ISMB 100-- 04 nos. – each 3m length
Find Gross Cut.

d) Draw sketches of three different types of trusses and name them.

e) For a plate thickness of 16mm, find rivet diameter and hole diameter, using Prof. Unwin's formula.

f) Draw a sketch of a copper corrugated expansion joint.

g) Refer SP6(1) and write the various properties of ISMB 150.

Q.No.2. Answer the following Question:

a) A single line diagram for a riveted truss is shown in fig.1. Use appropriate scale. Draw gusset plate at Apex point 'A'. All dimensions are in 'mm'. All members used to fabricate the truss are ISA 5050_8. Also draw the orthographic front view of the truss.   **(12)**

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

a) Explain the terms:
i)Fabrication Drawing ii)Cleat iii)Edge clearance

b) For a plate thickness of 12mm, draw a 2 row zig-zag, double riveted butt joint. It has additional straps of 10mm thickness each, on both sides of the joining plates.

c) Draw any two types of foundation bolts, using diameter 'D' = 20mm. Draw to scale 1:1.

Q.No.4. Answer the following Questions:

a) Orthographic views of a table, drawn 'not to scale' are shown in fig.2. With respect to origin 'O', draw its isometric view. Also work out the length of typical members, to be used for fabrication purpose, by drawing isometric of each of typical members.   **(8)**

b) Make a Bill Of Material for the table shown in fig.2.   **(4)**

OR

b) Draw and explain the complete welding symbol, as per ISO and AWS.   **(4)**

**Q.No.5.** **Answer any two of the following Questions:**   2 x 6 = 12
  a) Draw and explain the use of six different pipe supports.
  b) From the given orthographic view of a pipeline, (refer fig.3), draw its isometric single line diagram to scale. Origin 'O'.
 c) Draw two different types of column bases.

Q.No.6. **Answer any three of the following Questions:**   3 x 4 = 12
  a) Find weight of 4.75m long ISA 5050_6.
  b) Explain the weld symbols shown in fig.4.
  c) What are the uses of pipe fittings? Draw any four pipe fittings and mention their specific use.
  d) Fig.5 shows riveted joint conventions. Explain the meaning of each.
  e) What are built-up column sections? Illustrate any two of such columns.
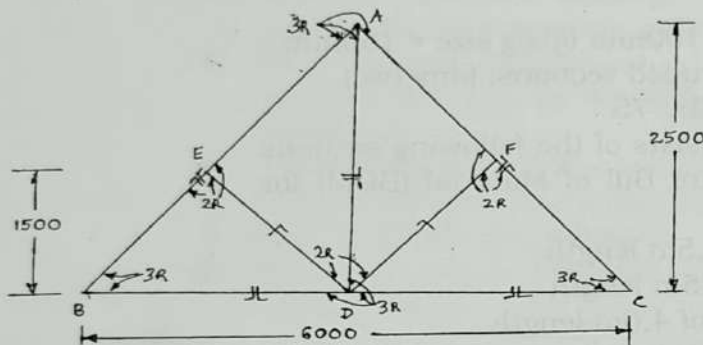
A STEEL TRUSS
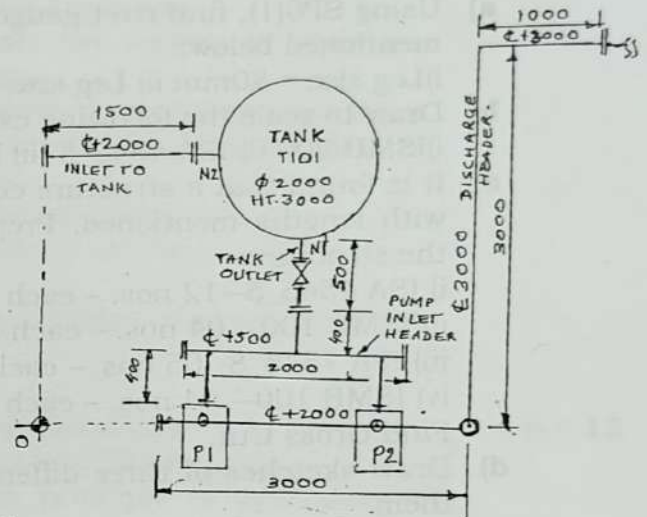FIG.1: Q. no. 2

TOP VIEW
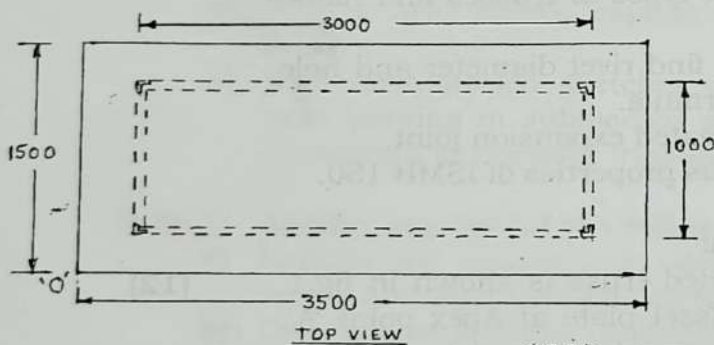
FRONT VIEW
FIG.2: Q. no. 4(a)
NOTE :- ALL DIMENSIONS IN mm
    -FIGURES NOT TO SCALE

FIG-3: Q. no. 5-(b)

NOTE :①ALL DIMENSIONS IN 'mm
②FIGURE NOT TO SCALE
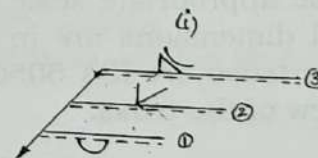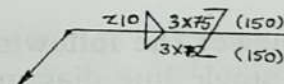③'O' ORIGIN FOR ISOMET
    -R'C

FIG.4. Q. no. 6.(b)

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 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) State the uses of the following in TIG welding: i) A high frequency unit ii) Welding torch iii) Argon gas
b) What is resistance welding? State two factors or variables responsible for resistance welding.
c) What do you understand by weld decay? List any three methods that can be employed to minimize the problem of weld decay.
d) Define weldability. What is carbon equivalent?
e) How are residual stresses produced in welding?
f) What in GTAW spot welding?
g) State two reasons why welded assemblies may be subjected to post heating.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**
a) Differentiate between MIG welding and TIG welding.
b) With a neat sketch explain the principle of operation of FCAW.
c) With neat labeled sketches discuss joint preparation and weld backing in submerged arc welding process. Why it is considered as operator friendly?

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**
a) Explain the construction and working of a foot operated rocker arm spot welding machine with a neat sketch.
b) Differentiate between upset and flash butt welding.
c) State advantages ,limitations and application of Gas Metal Arc welding. (GMAW)

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**
a) Discuss the following in brief in regards to welding:
i)Correction of distortion in a welding joint
ii) Thermal effect of welding on parent metal
b) Explain any two methods to reduce welding stress to minimum.
c) With a neat sketch explain the procedure to rebuild a worn out shaft.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**
a) Discuss any six principles governing design of a good welding jigs and fixtures.
b) Differentiate between arc welding and resistance welding.
c) Compare FCAW with SAW.

Q.No.6. Write short note an any three: **3 x 4 = 12**
a) Procedure of maintenance welding
b) Prevention of gaseous contamination in welding
c) Corrosion of weld
d) Concept of weld cracking

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2025 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:** 5 x 3 = 15

a) How does automation improve the efficiency, accuracy and repeatability of the Profile cutting, using CNC steel profile cutting machine?

b) When do we prefer to use a planning machine over a shaper?

c) What is the relationship between surface finish tool life with cutting speed, feed and depth of cut?

d) How can flame cutting be used to remove defective welds by gouging?

e) What is meant by rake angle in shearing machine?

f) Enlist the work holding devices for drilling.

g) Give the specifications of a grinding wheel.

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

a) Describe the significance of proper clearance between cutting edges in shearing operations. What could be the consequences of incorrect clearance?

b) Briefly describe the power guillotine machine. What are the key differences between mechanical and hydraulic versions of these machines?

c) Define cropping and notching in the context of metal cutting. Why is notching particularly necessary when dealing with angle sections?

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

a) Explain why straightening is often required for structural members after flame cutting. What issues arise if proper straightening is not done?

b) How does the arrangement of heat strips influence the effectiveness of straightening when dealing with distorted structural members?

c) Explain the process of flame cutting a round bar. What factors must be considered to maintain accuracy and a smooth cut?

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

a) Describe the different drilling machine operations like counter-boring, countersinking and spot facing. How do these operations differ in their applications and tool requirements?

b) Illustrate V-thread profile and explain the terms involved.

c) Differentiate between rough grinding and precision grinding. What are the distinct characteristics and applications of each?

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

a) What are the steps involved in milling keyways, grooves and slots? How does the process differ when milling for gear cutting?

...2/-

b) Explain the working of Whitworth quick return mechanism.

c) Explain the main features of column and knee type milling machine.

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

    a) Jig boring machine

    b) Bevellers used in plate edge preparation

    c) Pipe and bevelling machine

    d) Techniques of cutting away from edge

    e) Punching machines

    f) Shaper operations

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 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 a substitutional solid solution.
- b) Explain the effect of grain size on the mechanical property of steel.
- c) What is the need for hardening? Discuss the three fundamental steps of hardening.
- d) Differentiate between shot blasting and sand blasting.
- e) Explain the chemical process to remove: i)Oil, dirt and grease ii)Oxide deposits
- f) Differentiate between cathodic and anodic protection of steel.

Q.No.2. **Answer any two of the following Questions:**   2 x 6 = 12
- a) With a neat sketch, discuss the manufacturing of pig iron using a blast furnace.
- b) Explain the direct electric arc furnace method of manufacturing steel.
- c) Draw an iron-carbon equilibrium diagram and indicate on it the various phases. Also explain the significance of critical point and eutectoid point w.r.t the diagram.

Q.No.3. **Answer any two of the following Questions:**   2 x 6 = 12
- a) Discuss the effect of the following alloying elements on steel: i)Carbon ii) Silicon iii) Manganese
- b) Explain the effect of temperature and atmosphere on the mechanical properties of steel.
- c) Define Heat Treatment. Why is it required? How does the rate of quenching affect the heat treatment process?

Q.No.4. **Answer any two of the following Questions:**   2 x 6 = 12
- a) Describe the process of Normalizing.
- b) Explain the martempering and austempering process.
- c) Discuss the process of Rotary Blasting.

Q.No.5. **Answer any two of the following Questions:**   2 x 6 = 12
- a) Describe the following processes of cleaning of steel: i)Electrolytic degreasing ii) Acid pickling
- b) Explain the process of Sacrificial Anode Protection.
- c) Explain the following w.r.t steel coating: i)Powder coating ii) Galvanizing

Q.No.6. **Write short notes any three:**   3 x 4 = 12
- a) Full annealing
- b) Recrystallisation and grain growth
- c) Zinc plating
- d) Phosphating

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 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
a) Define a stress, strain and modulus of elasticity.
b) Define: i) Bulk Modulus ii) Poisson's ratio iii) Rigidity Modulus
c) A rod of 10mm diameter under a pull of 5KN expands by 0.65mm in a length of 300mm. Find modulus of elasticity of material.
d) State centroids of: i) Rectangular Section lamina ii) Cylindrical section solid iii) Hemispherical solid section
e) Define a beam and state its classifications with neat sketches.
f) State Bending Equation and terms with units.
g) A thin cylinder of internal diameter of 600mm, thickness as 16mm is under a pressure of $1.6N/mm^2$. Find stress produced.

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
a) A steel rod of 20mm diameter and length 250mm is pulled by a load of 60KN. Take $E= 2 \times 10^5 N/mm^2$. Find: i)Stress ii)Deformation iii)Strain
b) A steel rod of 1200mm long is held between two rigid supports at a temperature of 34°C. Find: i)Free expansion if temperature increased to 70°C. Take $\alpha=12 \times 10^{-6}/°C$. ii)Also find stress induced if free expansion is prevented iii)What is the stress if supports yield by 0.2mm?
c) A copper rod of 20mm and length 400mm is pulled by a load of 70KN. Take $E=1 \times 10^5 Mpa$ and Poisson's ratio $\mu=0.28$. Find: i)Change in diameter ii)Change in length iii)Change in volume

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
a) Find centroid of angle section shown in fig.1.
b) Determine moment of inertia of I section shown in fig.2 about centroidal XX axis.
c) Determine moment of inertia of Tee section of top flange 120x15mm and bottom web 10x150mm about YY axis.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
a) Draw shear force and bending moment diagram for a simply supported beam shown in fig.3.
b) A cantilever beam shown in fig.4, draw shear force and bending moment diagram of beam.
c) Draw shear force and bending moment diagram for simply supported beam shown in fig.5.

**Q.No.5. Answer any two of the following Questions:**   2 x 6 = 12
a) A simply supported beam of 100 x 200mm in cross section carry a load of 1600N at centre of span 3m. Determine maximum bending stress produced.

b) A cantilever beam of hollow circular section has outer diameter of 160mm and inner diameter 120mm. What udl it can carry for full span of 5m if maximum bending stress is 48N/mm².

c) Sketch shear stress distribution for a rectangular beam of 150x200mm in cross section subjected to shear force of 40KN. Also find average and maximum shear stress.

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

a) A thin cylindrical shell of 800mm diameter, thickness 16mm is subjected to pressure of 3N/mm². Determine:
i)Circumferential stress ii)Longitudinal   stress iii)Change in length. Take E= 2 x 10⁵ and µ=0.25

b) A thick cylinder of internal diameter 1.5m and thickness 100mm is subjected to pressure of 8N/mm² internally. Determine the minimum and maximum stress produced.
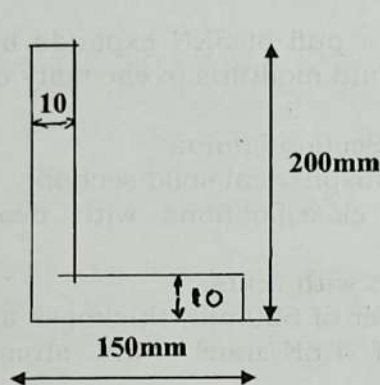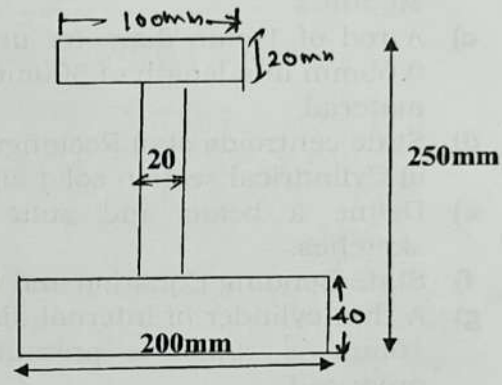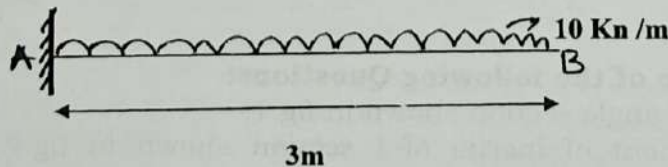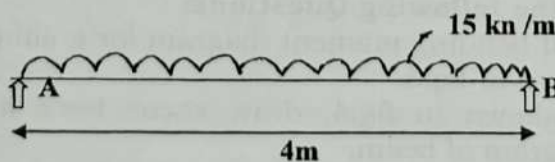

Qno 3a) Fig 1.   Qno 3 b) Fig 2
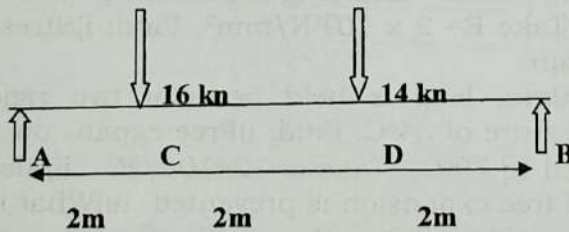
Qno 4a) Fig 3

Qn 4b)   Fig 4

Qn 4c)   Fig 5

BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 Examinations

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

Subject: **Elements of Civil Engineering (FB405)**

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: 5x3=15
a) Write the detailed classification of surveying.
b) State the purpose of compass surveying.
c) Define the following terms: i) Level line ii) Bench mark
d) What is the purpose of foundation?
e) Explain the suitability of pitched roof and flat roof.
f) Explain the significance of water cement ratio.
g) Explain the concept of building drawing.
h) List out various methods of transporting concrete.

Q.No.2. Answer any two of the following Questions: 2x6=12
a) Explain indirect ranging with neat sketch.
b) Explain local attraction. State the reasons and errors caused due to local attraction.
c) The bearings of the sides of a traverse ABCDEA are as follows:

LINE	FB	BB
AB	105⁰ 10'	285⁰ 10'
BC	20⁰ 20'	200⁰ 20'
CD	275⁰ 35'	95⁰ 35'
DE	179⁰ 45'	359⁰ 45'
EA	120⁰ 50'	300⁰ 50'

Compute the interior angles of the traverse.

Q.No.3. Answer any two of the following Questions: 2x6=12
a) The following consecutive readings are taken with level and leveling staff on continuously sloping ground at common intervals of 30m:
0.600, 1.230, 1.860, 2.575, 0.240, 0.910, 1.93, 2.875, 0.60, 1.820, 2.720. The RL of the first point is 150.000m and rule out the page of level field book and enter the above readings and calculate the RLs of all the points. Apply necessary checks.
b) Explain sample leveling and profile leveling with neat sketches.
c) Distinguish between: i) Load bearing structure and framed structure ii) Backsight and foresight

Q.No.4. Answer any two of the following Questions: 2x6=12
a) Explain temporary adjustments of a dumpy level.
b) Explain the procedure for measurement of vertical angle by using theodolite.
c) State methods of curing of concrete and explain any one method in detail.

Q.No.5. Answer any two of the following Questions: 2x6=12
a) Explain fire resisting construction.
b) Briefly explain roof coverings and explain any one in detail.
c) Explain floating piles and end bearing piles.

Q.No.6. Answer following Question: (12)

a) The following are the constructional details of a single room with attached toilet:

Size of room=3.6mx4.2m

Attached toilet=1.5mx2.0m

Height of the roof above floor=3m

Height of the plinth=0.6m

Doors=1.0mx2.2m

Windows=1.3mx1.5m

Ventilators=0.6mx0.6m

Wall thickness=0.3m

Roof-RCC slab=120mm thick

Chajja projection=0.6m from face of the wall

Roof projection all round=0.3m

Draw the plan and section passing through the window opening. Draw to a suitable scale.

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 Examinations

Programme: **Common**

Subject: **Industrial Organisation & Management (CC601)/(CS601)**
                                                                [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
   a) Write down any three points of difference between a joint stock company and a partnership organisation.
   b) Explain briefly the packing and forwarding function in the industry.
   c) Explain briefly any two internal sources of finance.
   d) Explain briefly what is 'arbitration'?
   e) Write down any six objectives of an incentive scheme.
   f) Explain the following terms in network analysis: i) Critical path ii) Slack

Q.No.2.   Answer any two of the following Questions: 2 x 6 = 12
   a) Explain 'function organisation' with the help of a neat sketch.
   b) Write a note on 'Co-operative societies'.
   c) Explain the special features of scientific management.

Q.No.3.   Answer any two of the following Questions: 2 x 6 = 12
   a) Explain briefly the following function of management:
        i)Controlling ii)Forecasting
   b) Explain briefly the following functions in the industry:
        i) Storekeeping (ii) Research and development

   c) Explain 'ABC analysis' with the help of a neat sketch.

Q.No.4.   Answer any two of the following Questions:
   a) i)Write any four objectives of material management.   (02)
        ii)Explain briefly the following terms: i)Reorder point   (04)
        ii)Reserve stock
   b) Write a note on 'GST'. **(only for students of Rationalised   (06)
        scheme)**
   c) What do you understand by a 'financial statement'? Write a   (06)
        short note on 'balance sheet'. **(only for students of Revised
        scheme)**
   d) A machine was purchased for Rs.60,000 and its useful life is   (06)
        estimated to be 10 years. Its scrap value at the end of 10
        years is estimated to be Rs.12,000 using the diminishing
        balance method, calculate the depreciation fund at the end
        of one year.

Q.No.5.   Answer any two of the following Questions:
   a) i)What do you understand by the term 'Industry Relations'?   (02)
        ii)Explain briefly the role of trade unions in industrial   (04)
        relations.
   b) Write a note on 'group incentive plan'?   (06)
   c) Write a note on 'Promotion and transfer'.   (06)

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

a) Write a short note on the Workmen's Compensation Act 1923.

b) Write down any six points of difference between CPM and PERT.

c) The activities of a project and the duration in weeks are given below. Draw the network diagram, determine the critical path and the project duration:

Activity	Duration (in weeks)
1-2	4
2-3	7
2-4	4
3-5	5
4-5	4
5-6	3

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 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**
a) What are assumptions made in the analysis of perfect truss?
b) What is eccentricity? Explain limit of eccentricity with an example.
c) Define indeterminacy. What are the uses of indeterminate structures?
d) Define stiffness and relative stiffness of a member with an example.
e) What is the concept of pure torsion? What are the advantages of hollow circular shafts over solid shafts?
f) Sketch the deflected shape of simply supported beam subjected to point load at centre, stating expressions for slope and deflections.
g) Determine the fixed end moments for the beams of span 'l' carrying point load 'W' at distance 'a' from left support.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**
a) A column section 300mm external diameter and 150mm internal diameter supports an axial load of 2000KN and eccentric load of P=500KN with eccentricity of 350mm. Find the stresses developed at the base of column.
b) A masonry pier 4m x 3m supports a vertical load of 600KN at eccentricity parallel to 4m length of 1.2m and along 3m width at 1m from centre. Find the stresses developed at the corners of the pier.
c) A masonry chimney 18m high is of circular section, the external and internal diameter of the section being 6m and 3m respectively. The chimney is subjected to a horizontal wind pressure of $1500N/m^2$ of projected area. Find the maximum and minimum stress intensities at the base. Take the weight of masonry as $21KN/m^2$.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**
a) A cantilever truss is loaded as shown the fig.1. Find forces in all the members using method of joints.
b) A simply supported truss is loaded as shown in fig.2. Find forces in all the members using method of joints.
c) Find the reactions at the supports and forces in the members at joint G. Refer fig. 3.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**
a) A fixed beam AB of span 6m is subjected to two point loads 100KN at 2m from each support. Find fixed end moments. Draw SFD and BMD.
b) A fixed beam AB of span 8m is subjected to u.d.l. 500KN/m. Find the fixed end moments. Draw SFD and BMD.
c) A continuous beam ABC consist of two span AB=8m and BC=6m. The span AB carries point load of 100KN at mid span of AB. The span BC carries u.d.l. of 50KN/m over entire span of BC. Find the moments and draw BMD.

2 x 6 = 12

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

a) A hollow steel shaft of external diameter 150mm and internal diameter 100mm is 1.5m long. Find the maximum torque required to produce a twist of 0.5 degree over the length of the shaft. Take $C=8\times10^4 N/mm^2$.

b) A solid shaft is 100mm in diameter. It transmits 120KW at 200rpm. Find the maximum intensity of shear stress induced and the angle of twist for a length of 6m. Take $C=8\times10^4 N/mm^2$.

c) A steel shaft is subjected to a torque of 20KNm and a bending moment of 10KNm. The diameter of the shaft is 100mm. 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 of length 5m and cross section 50mm x 100mm carries a point load of 10KN at free end. Find the maximum slope and maximum deflection of the cantilever.
Take $E=2\times10^4 N/mm^2$.

b) A simply supported beam of 8m span and cross section 150mm x 300mm carries u.d.l. of 200KN/m over entire span. Find the slope and deflection of the beam.
Take $E=2\times10^4 N/mm^2$.

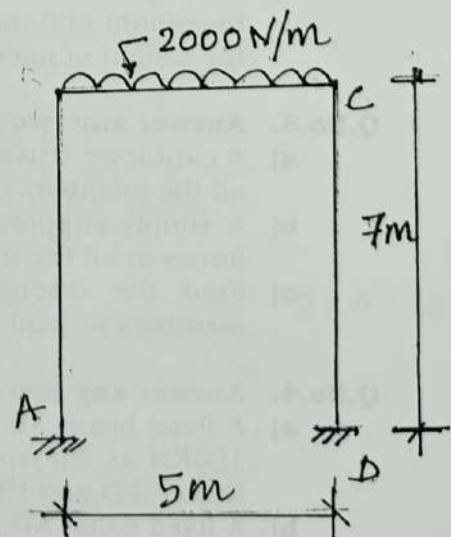**c)** Analyse the portal frame as shown in fig.4 and draw BMD.
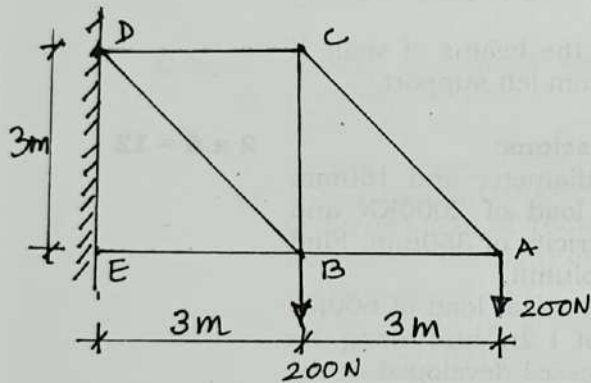
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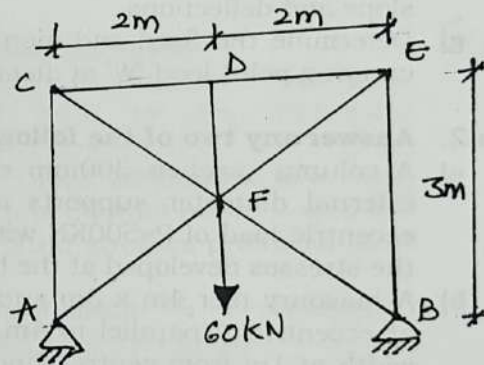
QNO: 3b) fig 2
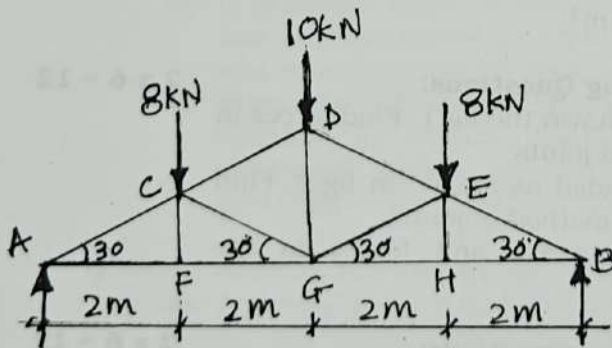
QNO:- 3 c) fig 3

QNO 6 c) figure 4

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

Subject: **Theory of Structures-I (FE601) [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) Define limit of eccentricity and state the expression for same for circular column.
    b) Define principal planes and principal stresses.
    c) Draw influence line diagram for shear force and bending moment in simply supported beam.
    d) Define: i) Perfect frame ii)Imperfect frame
    e) State Torsion equation and units of terms in the equation.
    f) State the expression for stresses in thin cylindrical shell and its nature.
    g) Define Middle Third rule for rectangular column carrying eccentric load.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**
    a) A square column of 250x 250mm carry a load of 70KN on x-axis at 60mm eccentricity from yy-axis. Determine maximum and minimum stresses produced.
    b) A rectangular column of bridge 1400x 2000mm in size carry a vertical load of 1600KN which is 600mm above x-axis and 400mm to the right of yy-axis. Find stresses produced at all corners of column.
    c) Derive limit of eccentricity expression for a rectangular column of BxD in size and define kern of column.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**
    a) A stressed element is subjected to tensile stresses of $80N/mm^2$ on x-axis and $60N/mm^2$ on y-axis planes. Determine resultant stress on 45^0 plane and maximum shear stress on same plane.
    b) A propeller shaft is subjected to bending stress of 80Mpa and a shear stress of 40Mpa. Determine principal stresses and maximum shear stresses in magnitude and direction.
    c) State the expression for normal stresses and tangential stresses in biaxial stress case. Also find normal and tangential stress on 30^0 plane due to axial stress of $60N/mm^2$ on x –axis.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**
    a) A simply supported beam of 4m span came UDL of 40KN/m for full span. Determine reactions and maximum bending moment at centre of beam. Use ILD concept.
    b) A simply supported girder of 10m span, with a wheel load of 50KN moving on it. Determine maximum shear force bending moment at a position of 4m from left end using ILD.
    c) A live load of 40KN/m for 4m length moving on girder of span 16m. Determine bending moment at centre of girder using ILDs concept.

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

a) A solid shaft of 40mm diameter rotates at 250rpm. Determine: i) Torque transmitted ii) Power transmission if shear stress produced is 40N/mm².

b) A solid shaft rotates at 300rpm producing power of 12KW. Determine shear stress produced in shaft. Maximum torque exceeds mean torque by 20%.

c) A hollow circular shaft of internal diameter 120mm and external diameter 150mm subjected to torque of 10x10⁵Nmm. Determine shear stress produced in shaft and also angle of twist in a length of 1.6m. Take Rigidity Modulus as 0.8 x 10⁵ N/mm².

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

a) Determine degree of indeterminacy of following structures: i)Three hinged arch ii) Fixed beam iii) Propped cantilever

b) A thin cylindrical shell of 800mm internal diameter and 16mm thick is subjected to pressure of 3N/mm². Determine hoop and longitudinal stresses. Also find change in length and change in diameter. Take E= 2x10⁵ N/mm², µ= 0.30 and l =3m

c) A thin cylinder of internal diameter 1000mm and thickness 16mm is subjected to internal pressure which produces a maximum stress of 80N/mm² Find the pressure and also longitudinal stress in cylinder.

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 Examinations

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

Subject: **Erection Engineering (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) Write any three advantages of wire rope slings.
   b) Draw a neat sketch of 'choker sling'.
   c) What is the benefit of using spreader bar while handling loads?
   d) How can we protect structures against corrosion?
   e) List any five personal protective equipments used at erection site.
   f) Draw hoist signal for: i) STOP (ii) SLEW BOOM
   g) Write any three features of Manila Ropes.

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
   a) With the help of neat sketch explain:
      i) Crossby clips ii) Wedge sockets
   b) Write a short note on precautions to be taken while handling and storing wire ropes.
   c) Write any three characteristics and three uses of :
      (i) Polypropylene ropes ii) Polyethylene ropes

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
   a) With the help of a neat sketch, explain 'tower crane'.
   b) With the help of a neat sketch, explain 'gin pole'.
   c) With the help of a neat sketch, explain 'differential hoist'.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
   a) With the help of a neat sketch, explain the importance of hook position and centre of gravity while handling loads.
   b) Write three applications of each of the following:
      i) Rollers ii) Jacks iii) Skids
   c) With the help of a neat sketch, explain the use of pads at sharp edges while lifting loads.

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12
   a) With the help of a neat sketch, explain the procedure for erection using mobile crane.
   b) Write a short note on methods of erection, leveling and alignment.
   c) With the help of a neat sketch, explain the method of erection of multi-storey building.

Q.No.6. Answer any two of the following Questions: 2 x 6 = 12
   a) Write a short note on safety rules to be followed while using cranes.
   b) What are the benefits of accident prevention?
   c) Write a short note on causes of accidents.

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 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
a) What is the role of voluntary agencies in safety?
b) Justify the need for safety committee.
c) Explain the following terms with respect to accident:
i)Unsafe act ii)Unsafe condition
d) Discuss the importance of Insurance.
e) Suggest six different activities to create awareness towards safety in an industry.
f) State and explain common barriers to communication.
g) What is fire detection? How is it done?

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
a) Comment on Factories Act with reference to safety of employees.
b) Discuss the ISO Standards related to safety.
c) What is accident report form? Discuss its importance.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
a) Give a brief account of the costs associated with an accident at workplace.
b) Discuss a case study on accident investigation.
c) Explain three 'E's (Engineering, Education and Enforcement), with reference to accident prevention.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
a) State advantages of good Housekeeping.
b) What are hot-work and cold-work permits? Explain giving suitable examples.
c) Discuss safety precautions to be taken while transporting flammable fluids.

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12
a) Explain the procedure of manual lifting?
b) What precautions would you suggest to prevent falls due to slips and trips?
c) Describe in built safety provisions in cranes and hoists.

Q.No.6. Answer any two of the following Questions: 2 x 6 = 12
a) What do you understand by Noise? State the common effects of noise.
b) How are hazardous chemicals classified?
c) State the different types of chemical emergencies along with the ways to prevent them.

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 Examinations

Programme: **Electronics Engg./EC/FT&EE**

Subject: **Renewable Energy Systems & E.M. (CC503)**

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 three points of comparison between renewable and nonrenewable energy sources.
- **b)** Draw the I-V and P-V characteristics of a solar cell and mark the following: i)Short circuit current ii)Open circuit voltage iii)Maximum power point
- **c)** State three points of comparison between horizontal axis and vertical axis wind mill.
- **d)** Write the equation for power available in the wind. Define the terms in it.
- **e)** What is energy conservation? Explain the necessity of energy conservation.
- **f)** Briefly explain energy scenario in India.

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
- **a)** Explain the concept of following energy sources: i)Wind energy ii)Tidal energy iii)Solar energy
- **b)** Define the following terms with respect to solar radiations: i)Declination angle ii) Incident angle iii)Zenith angle iv) Altitude angle
- **c)** State six points of comparison between concentrating collector and non concentrating collector.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
- **a)** Explain the concept of maximum power point tracking.
- **b)** With a neat diagram explain construction and working of solar distillation.
- **c)** With a neat diagram explain construction and working of box type solar cooker.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
- **a)** Draw a neat block diagram showing components of wind energy conversion system. Explain functions of each components.
- **b)** List the factors to be considered while selecting a site for wind energy conversion system.
- **c)** With a neat diagram explain: i)Pitch control of a wind turbine ii)Yaw control of a wind turbine

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12
- **a)** With a neat diagram explain PV system application for street lighting.
- **b)** Design a solar PV system for a domestic installation consisting of 04 fans of 70W each running for 06 hours a day, 04 lamps of 20W each running for 06 hours a day. Consider battery autonomy of two day. Assume required data.
- **c)** Design a solar PV system for an installation consisting of 02 numbers of motors of 746W each working for 06 hours a day. Consider battery autonomy of 2 days. Assume required data.

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2 x 6 = 12

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

a) Explain ten step procedures for detailed energy audit.

b) i) What is energy management? List at least two advantages of energy management.

   ii)List any three energy efficient technologies relevant to domestic system.

c) With a neat diagram explain PV system application for water pumping.

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 Examinations

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

Subject: **Steel Structures Design (FB701) [Rat.]**

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) IS Code IS800-2007, Steel tables permissible.
                 5) Consider Steel Fe410 with f_y=250MPa.

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

  a) Stating their fields of applications, what are the advantages of steel structures?

  b) While designing steel structures, what are the limit states considered?

  c) Make a comparison between bolted and welded connections.

  d) Draw neat labeled sketch of lacing system.

  e) Draw neat c/s of commonly used compression members.

  f) Explain the phenomenon of Web Crippling.

  g) Explain various load combinations considered while designing roof trusses.

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

  a) Design the fillet weld to connect two plates 200mm x 10mm to mobilize the full tensile strength of plate.

  b) Explain with the aid of neat sketches, various modes of failure of bolted joints.

  c) With the aid of neat sketches explain following types of welds: i) Butt weld ii) Fillet weld

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

  a) With the aid of neat sketch describe the "block shear failure" of tension member.

  b) A tee member ISA 100x75x6 @ 78.5N/m is welded to 10mm thick gusset plate at site. Design the welds to transmit the load equal to design strength of member.

  c) Design a tie member adopting two equal angle sections connected back to back, one on each side of 12mm thick gusset plate with 4mm size fillet weld. The tensile load on the member is 150KN at working condition.

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

  a) Design steel column adopting suitable I-section to carry the axial load of 600KN at service condition. The effective length of column is 5m.

  b) Design the suitable slab base for a column section ISHB300 @ 618N/m. The axial load on column at service condition is 800KN. The column is supported on concrete pedestal of M20 grade concrete. Also design suitable fillet weld between column and slab base.

  c) A compression member 3m long consists of 2 ISA100x100x6 connected on either side of 12mm thick gusset plate by fillet welds. Determine the safe load the member can carry at service condition.

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

  a) i)Design a laterally supported beam of 5m effective span to carry the service load of 25KN/m. Perform necessary checks for shear and deflection.   **(8)**

    ii) Explain how lateral restraints are provided for beams.   **(04)**

b) i)ISMB450@710.2N/m section is used over an effective   **(06)**
simply supported span of 5m. Determine the safe udl the
beam can support at working condition.

    ii)Draw labeled sketch of plate girder showing all   **(06)**
components.

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

  a) Design the principal rafter of a roof truss to carry the
compressive force of 150KN. Centre to centre distance
between intersections of member is 1.65m.

  b) Calculate the imposed load on roof truss at each
intermediate panel points for the following data:
Span of truss: 15m, Rise of truss: 3m, C/C distance between
panel points: 2.02m, Spacing of trusses: 4mC/C

  c) Design an angle purlin for the following data:
i)Spacing of truss: 4.5mC/C
ii)Spacing of purlin: 1.35mC/C
iii)Weight of AC sheets including fasteners: 0.25KN/m²
iv)Live load: 0.6 KN/m²
v)Slope of truss: 26°

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 Examinations

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

Subject: **Design of Steel Structures (FE701) [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 800-1984 and Steel Tables permissible.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**
   a) Explain suitability of steel as structural member.
   b) Draw C/S of various steel sections used as flexural members.
   c) List out merits and demerits of bolted connections.
   d) Draw typical C/S of fillet weld and label all components.
   e) Stating their merits draw sections used as tension members.
   f) What is lacing system? State their design requirements.
   g) What is laterally restrained beam? State different ways to provide lateral restraints.
   h) State merits and demerits of tubular sections.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**
   a) Design the fillet weld to connect two plates 200mm x 10mm and 150mm x 8mm, to carry the design strength of thinner plate. Take σ_{at}= 150Mpa and τ_v=105Mpa
   b) Explain the design procedure for an eccentrically loaded bolted connection, when the load is not lying in the plane of bolts.
   c) Two 16mm thick plates are joined by double cover butt joint using 10mm thick cover plates. Determine the strength and efficiency of joint per pitch of 100mm, when 20mm diameter close tolerance and turned bolts of property class 5.6 are used. Take σ_{at} for plates as 150Mpa.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**
   a) Design a tie member adopting an unequal angle section to carry the tensile force of 75KN. Also design the suitable fillet weld to connect the member to 12mm thick gusset plate. Take σ_{at} = 150Mpa, τ_v= 108Mpa
   b) A tie member ISMC 250 @ 298.2N/m is connected to gusset plate of 12mm thick by fillet weld. Design the weld for the capacity of tie member, if the overlapping length of member is limited to 250mm. Take σ_{at}=150Mpa, τ_v =106Mpa
   c) A tie member consists of 2 ISA90x90x6 connected one on either side of 10mm thick gusset plate. Determine the tensile capacity of the member. Also design the suitable welded connection. Take σ_{at}= 150Mpa and τ_v=106Mpa

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**
   a) Design a single angle strut to carry on axial compressive force of 120KN. The effective length of member is 2.2m. Also design suitable fillet weld to connect the member to 10mm thick gusset plate. Take permissible stress in weld as 105Mpa
   b) A steel column is required to carry an axial load of 500KN. If the length of column is 4.5m having following end conditions:
       i) Major axis- Both ends are fixed
       ii) Minor axis –Bottom fixed, top hinged
       Design the column section using suitable I-section.

c) Design a slab base for a column ISHB300@618N/m to carry an axial load of 600KN. Take permissible bearing pressure concrete as 4N/mm². Also design the suitable welded connection between column and slab base. Take τ_v=105Mpa for welds.

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

a) A simply supported beam 5m span carries an udl of 25KN/m. An additional point load of 90KN acts at middle of span. Design the beam and perform necessary check for shear and deflection.

b) A floor consisting of 125mm thick R.C slab, is to be supported by steel beams provided at 3.5m C/C spacing. Beams are simply supported over an effective span of 5m. The live load on floor slab is 4KN/m². Design the beam and carry out necessary checks for shear and deflection.

c) With the aid of neat labeled sketch, explain functions of various components of plate girder.

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

a) Calculate the DL and LL at each intermediate and end panel points of roof truss, having 15m span and 3m rise. The roof covering consists of AC sheet weighing 140N/m², supported on purlins provided at 2.02m C/C. The C/C distance between trusses in 4m.

b) Details at the support of a roof truss are as mentioned below:
i)Support reaction: 75KN vertically upwards
ii)Angle of inclination of principal rafter: 22° to horizontal
iii)Length of each panel: 2.02m
Design the principal rafter.

c) Stating their suitability, draw line diagrams of various types of roof trusses used.

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 Examinations

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

Subject: **Fabrication Estimation & Costing (FB702)**

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 any three functions of Estimating department.
- **b)** State the units of measurement for the following items of work: i)P.C.C. for foundation ii)Painting iii)Roof sheet coverings iv)Welding v)Sheet metal rain water gutter vi)Aluminum windows
- **c)** State the limits of measurement and degree of accuracy in estimating.
- **d)** With respect to turning operation explain: i)Feed ii)Depth of cut iii)Length of cut
- **e)** State the functions of Estimating Department.
- **f)** Explain different sheet metal operations.
- **g)** Explain the basic costing procedure for gas welding.
- **h)** What are allowances? Explain any two allowances, which are considered while determining machining time.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**
- **a)** For the steel girder used for placing stage lights of size 0.8m x 0.8m and length 6.4m on all four sides as shown in fig.1, prepare a measurement sheet and abstract sheet for structural steel. Assume suitable market rates. Details of structure: Horizontal members: 20mm Ø tubular section @ 4.5Kg/m; Vertical and inclined members: Ø tubular section @ 1.0Kg/m
- **b)** For the steel girder shown in fig.1 having details of structure as in above, prepare the measurement sheet and abstract sheet for painting work. Assume suitable market rates.
- **c)** Write the specifications for: i)Painting ii)Steel doors

Q.No.3. Answer the following Questions:
- **a)** Calculate the time required to machine the job shown in fig.2 of brass from a round stock of 50mm diameter of length 100mm. Assume suitable machining parameters.   **(08)**
- **b)** Explain different sheet metal joints.   **(04)**

OR

- **b)** Explain any two press work operations with a neat sketch.   **(04)**

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**
- **a)** Calculate the cost of welding per meter length and for butt welding 20mm thick structural steel plate by MMAW using 4.0mm diameter electrodes. The electrode cost Rs.15 each and the welder is paid at Rs.1200 per 8 hours shift. The electrical charge is Rs.50 per unit. (Assume suitable additional data)
- **b)** How is estimation of sheet metal operation time done?
- **c)** Explain the procedure of estimating milling time.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**
- **a)** A machine operator is expected to produce 75 parts per day. The standard time to produce one part is 3 minutes. The personal allowance is 5%, the fatigue allowance is 2.5%, the

total changing and grinding allowance is 3%, the start up and shutdown allowance is 2% and the rejection and rework allowance is 1%. Determine the total allowance time for the operator.

b) With reference to welding cost estimation explain the terms:
i)Deposition efficiency ii)Power consumption iii)Weld metal volume

c) Explain in brief any six operations and processes carried out in sheet metal works.

Q.No.6. Write short note on any four: 4 x 3 = 12
a) Purpose of estimating
b) Procedure adopted to do estimation of a fabrication job
c) Welding estimation sheet
d) Estimation and data required to prepare estimate
e) Purpose of estimation

FRONT ELEVATION   SIDE ELEVATION

All Horizontal members are 20mm diameter pipe @ 4.5kg/m
All vertical and Inclined members are 10mm diameter pipe @ 1.0 kg/m
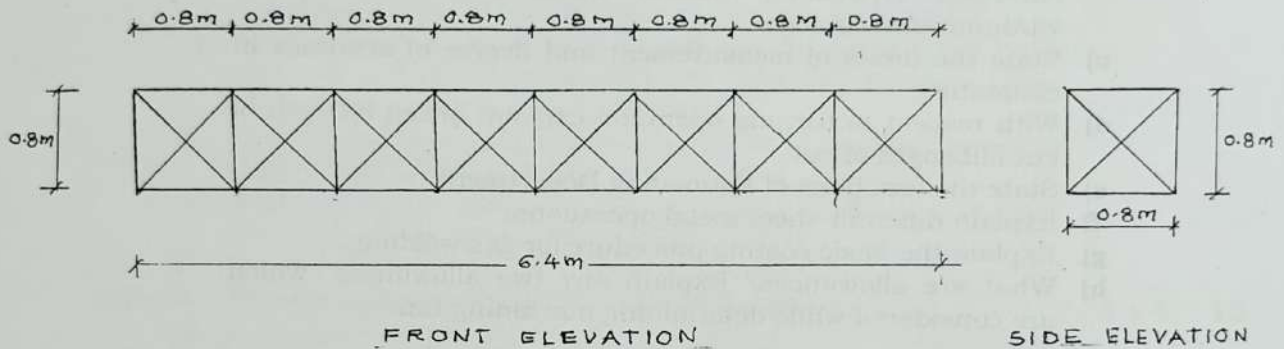
FIGURE 1 , Questions 2(a) and 2(b)
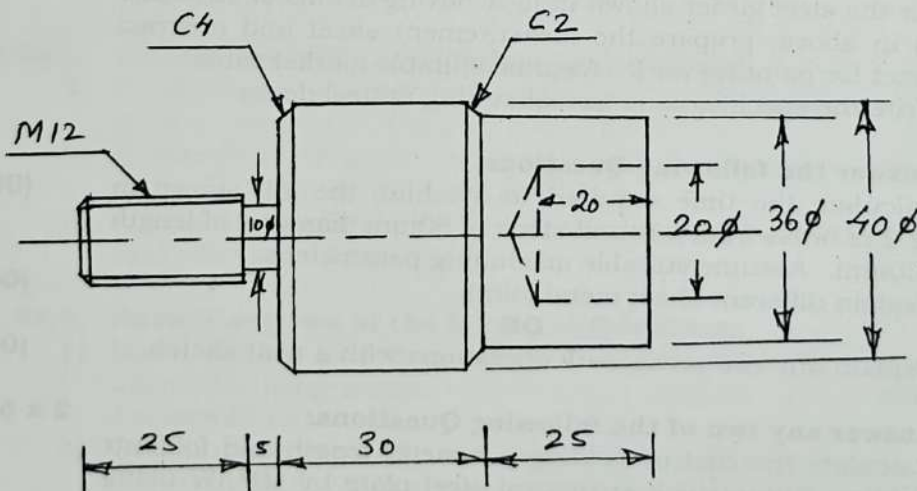
FIG.2, Q.3.a. MACHINED JOB

ALL DIMENSIONS IN mm

× × × × × ×

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
a) Determine slope and deflection of cantilever of span 'l'm subjected to 'W' N/m over entire span.
b) What are long columns and short columns? How does end conditions of the columns affect the Euler's formula?
c) Three hinged arch of span 'l' and rise 'h' carries two point loads 'W' at l/4 and 2W at 3 l/4 from left support. Find the reactions and horizontal thrust.
d) Fixed beam of span 'l' carries u.d.l of 'W' N/m over the entire span. Find SFD and BMD.
e) With the help of example explain relative stiffness and carry over factor in moment distribution method.

Q.No.2. **Answer any two of the following Questions:**   2 x 6 = 12
a) A simply supported beam of 6m span is subjected to 20KN/m over entire span, and it carries 10KN point load at 2m from left support. Find maximum deflection if the beam section 150mmx200mm. Take E= 0.2×10^5 N/mm².
b) A cantilever beam of span 10m carries u.d.l of 200N/m. Find the slope and deflection at the free end.
c) A propped cantilever of span 8m is propped at free end. It carries point load of 1000N at midspan. Find the maximum deflection and its position.
E= 2×10^5 N/mm² and I= 100×10^4 mm⁴.

Q.No.3. **Answer any two of the following Questions:**   2 x 6 = 12
a) A fixed beam of span 6m is subjected to two point loads as shown in the fig.1. Draw SFD and BMD
b) A fixed beam of span 5m is subjected to part udl as shown in the fig.2. Draw SFD and BMD.
c) A fixed beam of span 8m is subjected to loading as shown in fig.3. Draw SFD and BMD.

Q.No.4. **Answer any two of the following Questions:**   2 x 6 = 12
a) Beam ABC is loaded as shown in fig.4. Find the support moments using moment distribution method. Draw BMD. Assume EI to be constant throughout.
b) Continuous beam ABC is simply supported at supports as shown in fig.5. It is subjected to point loads 4KN and 8KN as shown in figure. Using distribution method, find the support moments and draw BMD. Take EI as constant.
c) A portal frame as shown in fig.6 in subjected to udl 300N/m. Draw BMD using moment distribution method. Take EI constant for all members.

Q.No.5. **Answer any two of the following Questions:**   2 x 6 = 12
a) A hollow cylindrical column is 4m long, both ends being fixed. The column carries an axial load of 250KN. Assume the internal diameter to be 0.80 times that of external diameter. Take fc=550N/mm² and α=1/1600. Find the diameters.

...2/-

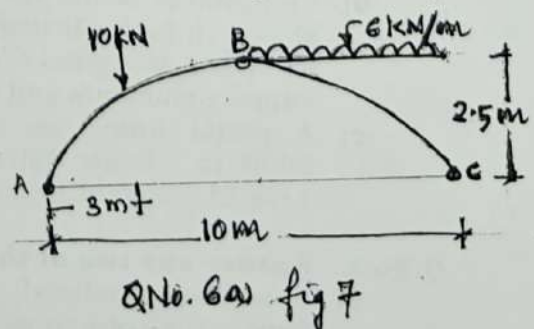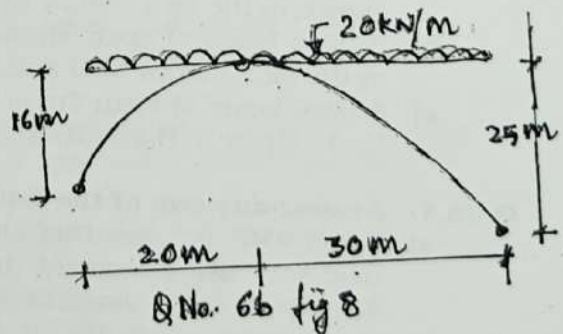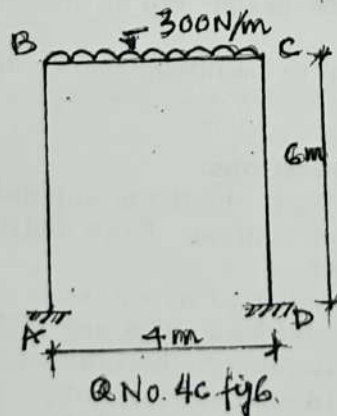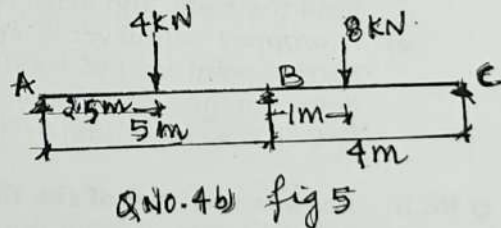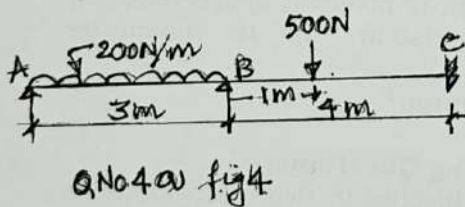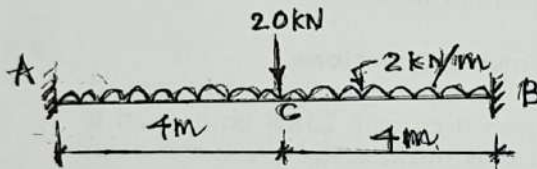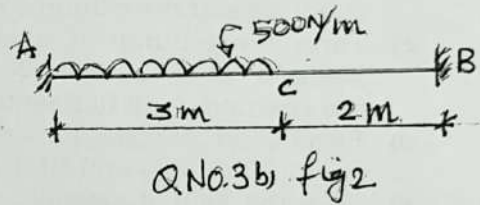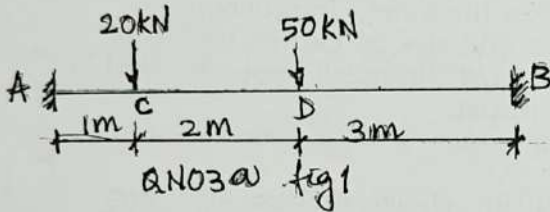b) A column 3m long is 60mm in diameter. One end of the column is fixed while its other end is hinged. Allowing a factor of safety of 3, find the safe compressive load. Use Euler's formula. Take $E=2\times10^5$ N/mm².

c) Find the maximum length of a solid mild steel rod having diameter 60mm used as a column with both ends fixed to carry a load of 30KN. Allow factor of safety as 3.

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

a) A three hinged arch 10m in span and rise 2.5m carries point loads 10KN at 2.5m from left end and uniformly distributed load of 6KN per meter on the right half of span. Determine the horizontal thrust. (Refer fig.7)

b) A three hinged parabolic arch has span of 50m. Its abutment are at depths 16m and 25m below the crown C. It is loaded as shown in fig.8. Find the vertical reaction and horizontal reaction at supports.

QNO3a) fig1

QNo.3b) fig2

QN3 c) fig 3

QNo4a) fig4

QNo.4b) fig5

QNo. 4c fig6

QNo. 6b fig 8

QNo. 6a) fig 7

x x x x x x x

BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
April, 2025 Examinations

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

Subject: **Offshore Structures (FB714)**

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) What are polymetallic nodules?
b) State and explain the different tide levels.
c) Enlist the forces to be considered in the design of offshore structures.
d) Explain what a pipeline "pig" is and its use.
e) State Archimedes principle.
f) What is pre-stressed concrete?
g) What is the different non-destructive tests for welds?

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
a) Explain the variation of currents with depth.
b) Draw a neat sketch of Jack up rig and explain its use.
c) Draw a neat sketch of a compliant structure and explain its use.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
a) Explain the use of drill ships.
b) Explain the lay barge method of laying submarine pipelines.
c) Explain the Tow method of pipeline installation.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
a) Explain the conditions of equilibrium of floating bodies.
b) A uniform rectangular body 2.0m long and 1.50m wide and 0.90m deep floats in water. The depth of immersion being 0.60m. What is the weight of the body? Find also the position of the meta-centre.
c) Explain the terms buoyancy, centre of buoyancy, and centre of gravity.

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12
a) What are the different methods of non-destructive tests for welds?
b) What are the different protective measures for corrosion of steel.
c) Write a short note on pumped concrete.

Q.No.6. Answer any two of the following Questions: 2 x 6 = 12
a) Draw a neat sketch of a launch barge and explain its use.
b) What is Tremie concrete?
c) Write a short note on hyperbaric welding.

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