MARINE ENGINEERING AUTOMATIONCONTROL SYSTEMS-I (UBME302)
QUESTION BANK

B.Sc. NAUTICAL SCIENCE – II YEAR – III SEM

PART-A

UNIT-I

1. Define stress and strain and mention the types of stresses.
2. What are the different types of beams?
3. Define Young's modulus.
4. A copper rod 3 mm in diameter when subjected to a pull of 495 N extends by 0.07 mm. Calculate the Young's modulus for copper.
5. Define HOOK's Law.
6. State few practical examples for Simply Supported Beams.
7. State few practical examples for Cantilever Beams.
8. What is the difference between Cantilever Beam and Simply Supported Beam?
9. Find the maximum and minimum stresses produced in a stepped bar whose upper diameter is 12mm and base diameter is 25mm due to an axially applied load of 12 kN.
10. A wooden tie is 75 mm wide, 150 mm deep and 1.5 meter long. It is subjected to an axial pull of 45000 N. The elongation of the member is found to be 0.6380 mm. Find the Young's modulus for the material.
11. A wooden tie is 60 mm wide, 120 mm deep and 1.5 meters long. It is subjected to an axial pull of 30 kN. The stretch of the member is found to be 0.625 mm. Find the Young's modulus for the tie material.
12. A 20 mm diameter brass rod was subjected to a tensile load of 40 kN. The extension of the rod was found to be 0.4 mm whose length is 200 mm. Find the elastic modulus of brass.
13. A steel rod 25 mm in diameter and 2 m length is subjected to an axial pull of 45 kN. Find (i) the intensity if stress, (ii) the strain, and (iii) elongation. Take E = 2 x 10^5 N/mm^2.
14. What are the various types of loading conditions in Simply Supported Beams?
15. Give the slope and deflection expression for a cantilever lever with a point load at the free end.
16. Give the slope and deflection expression for a cantilever lever with a point load at the middle of the beam.
17. Give the slope and deflection expression for a cantilever lever with a uniformly distributed load of its full length.
18. Give the slope and deflection expression for a cantilever lever with a uniformly distributed load of its half-length.
19. Give the slope and deflection expression for a Simply Supported Beam with a point load at the middle of the beam.
20. Give the slope and deflection expression for a Simply Supported Beam with a uniformly distributed load of its full length.

UNIT-II

21. Define density.
22. Define specific gravity.
23. What do you mean by viscosity?

24. How shall capillary effect be explained?
25. What is surface tension?
26. Define specific weight or weight density.
27. Write Bernoulli's Equation.
28. Give two examples of fluids.
29. List the equipment that works on the basis of Bernoulli's Equation.
30. State Pascal's Law.
31. Define steady and unsteady flow.
32. How to calculate rate of flow of a flowing fluid?
33. Define Compressibility.
34. What is meant by specific volume?
35. What is Newton's law of fluid?
36. Define Reynold's Number.
37. Define rotational flow and irrotational flow.
38. Define uniform and non-uniform flow
39. Define compressible and incompressible flow.
40. State the continuity equation and give its expression.

UNIT-III

41. State the Gas Equation.
42. What is enthalpy?
43. What is Law of conservation of Energy?
44. Define entropy.
45. What is Dryness Fraction?
46. State first law of thermodynamics.
47. Define Joule's law.
48. Write any two properties of steam.
49. List any two examples of steam.
50. In which state steam will be called as superheated steam.
51. What are the properties of steam?
52. What are the laws of perfect gases?
53. Give the characteristic gas equation.
54. What is called as wet steam?
55. How we steam could be converted to dry steam?
56. When can u mention steam as saturated steam?
57. State Boyle's law.
58. Give the statement and expression for Charles' law.
59. State Second law of Thermodynamics.
60. State Zeroth law of Thermodynamics.

UNIT-IV

61. List out the types of ceramic materials.
62. Explain the principle of a Bessemer converter.
63. Give the characteristics of ceramics.
64. Define Hardness.
65. Define organics and polymers.
66. Write down the properties of wrought iron.
67. What is the general classification of materials?
68. What are the properties of cast iron?
69. What is the purpose of heat treatment?
70. What ae the various stages of heat treatment?

71. What are the various classification of heat treatment?
72. Write the general characteristics of metals.
73. What is the general classification of steel?
74. Define Malleability and Ductility.
75. Give the explanations of annealing and quenching.
76. Define ceramics and its uses.
77. Give the contents, applications and uses of any two alloys.
78. What is the purpose of heat treatment? Give two examples of heat treatment.
79. Explain any two heat treatment techniques in detail.
80. Write the properties and applications of Wrought Iron.

UNIT-V

81. Give the explanations of annealing and quenching.
82. Define ceramics and its uses.
83. Give the contents, applications and uses of any two alloys.
84. What is the purpose of heat treatment? Give two examples of heat treatment.
85. Explain any two heat treatment techniques in detail.
86. Write the properties and applications of Wrought Iron.
87. Give the list of methods of steel production.
88. What is Pig Iron and its composition?
89. Explain the principle of a Blast Furnace.
90. List the properties of high speed steel.
91. What is meant by normalizing?
92. What is the application of Bessemer converter?
93. Name the components of blast furnace.
94. What is kaldo process?
95. Write few words about refining of steel.
96. Write the application of an L-D convertor.
97. What is an alloy?
98. List the composition and uses of low and medium carbon steels.
99. Write in detail about Austenitic Stainless Steel and its uses.
100. Draw the diagram of Bessemer converter.

PART-B

UNIT-I

101. Explain stress and strain and hence give the relation of HOOK's Law
102. Name all types of beams and their deflection and slope expressions.
103. Explain the types of stresses with examples for each.
104. What is the difference between Cantilever Beam and Simply Supported Beam?
105. What are the similarities between Simply Supported Beam and Cantilever Beam?
106. What are the various types of loading conditions in Cantilever Beams?
107. What are the various types of loading conditions in Simply Supported Beams?
108. State few practical examples for Simply Supported Beams.
109. State few practical examples for Cantilever Beams.
110. What is the relation between stress and strain?
111. A cantilever of length 2m carrier a uniformly distributed load of 2500 N/m frère length of 1.25 from the fixed end and a point load of 100 N at free end. If the section is

rectangular with 120mm side & 240mm deep, final the deflection at free end. E=10000N/mm.

112. A stepped post ABC whose upper and lower parts are of diameters 30 mm and 50 mm respectively. A vertical load W_1 = 12 kN is applied on the top. An additional load W_2 is uniformly applied around the shelf at B. Find the normal stress in the upper part of the post. If it is desired that the stresses in the upper and lower parts should be same, find the load at W_2.
113. A 2m long beam supporting a point load of 8.4 KN at mid span. Hangs from the lower ends of two springs as shown. If the young's modulus of the beam in 140 KN /m^2 and the Moment of Inertia of the beam is 2 m^4 and the stiffness of the left and right springs are 300 KN/m and 250 KN/m respectively, find the maximum displacement of load.
114. A compound beam ABCDE fixed at the ends A & E end provided with internal hinges at B & D. The beam carriers point load W at C. Find deflection at C.
115. Simply Supported Beam with a uniformly distributed load of its full length with diagram.

UNIT-II

116. With a simple diagram explain a hydraulic press.
117. Define laminar flow and turbulent flow and hence give its significance with Reynold's Number.
118. With a simple diagram explain a hydraulic accumulator.
119. Explain about the various types of fluid.
120. A plate 0.025 mm away from a fixed plate, moves at 60 cm/s and requires a force of 2 N/m^2 to maintain the speed. Determine the viscosity of the fluid between the plates.
121. Determine the capillarity effect in a glass tube of 4 mm diameter when it is immersed in water and mercury separately. The angle of contact for water is 0^0 and for mercury is 130^0 and the density of water is 1000 kg/m^3 and density of mercury is 13600 kg/m^3. The surface tension of water in contact with air is 0.073575 N/m and for mercury in contact with air is 0.51 N/m.
122. Find the diameter of the droplet of water if the surface tension of water in contact with air is 0.0725 N/m and the pressure inside the droplet of water is 0.02 N/cm^2.
123. Derive Bernoulli's Equation from the result of Euler's Equation.
124. State the practical applications of Bernoulli's Equation.
125. The diameters of a pipe at sections 1 and 2 are 10 cm and 15 cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5 m/s. Also determine the velocity at section 2.
126. A 30 cm diameter pipe conveying water branches into two pipes of diameters 20 cm and 15 cm respectively. If the average velocity in the 30 cm pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in the 15 cm pipe if the averge velocity in the 20 cm pipe is 2 m/s.
127. Describe about pitot tube with neat sketch.
128. Define rate of flow and hence state and derive the result of continuity equation.
129. Describe about orifice meter with neat sketch.
130. Describe about the venurimeter with neat sketch.

UNIT-III

131. Explain the properties of steam.
132. Explain the laws of perfect gases.
133. Mention first law of thermodynamics.
134. Derive characteristic gas equation.
135. Explain wet steam, dry steam, saturated steam, superheated steam.

136. Write both statements of second law of thermodynamics.
137. Write short note on (i) Boyle's law (ii) Charles' law
138. What are the limitations of first law of thermodynamics?
139. What is sensible heat of water and latent heat of evaporation?
140. A vessel of capacity 3 m^3 contains air at 1.5 bar at 25^o C additional air is pumped into the system until the pressure varies to 30 bar and temp to 60^{o}c. Determine the mass of the air pumped in.
141. A gas occupies a volume of 0.1 m^3 at a temperature of 20^o C and a pressure of 1.5 bar. Find the final temperatures if the gas compressed to a pressure of 7.5 bar and occupies a volume of 0.04 m^3? Explain wet steam, dry steam, saturated steam, superheated steam and dryness fraction.
142. Write about the laws of gases.
143. Define specific volume of steam and total heat of steam.
144. What is the quality of wet steam?
145. What is the relationship between boyle's law and charle's law. Derive.

UNIT-IV

146. Define Malleability and Ductility.
147. Give the explanations of annealing and quenching.
148. What is the purpose of heat treatment? Give two examples of heat treatment.
149. Explain about organics & Polymers.
150. Write the properties and applications of Wrought Iron.
151. Discuss about various alloying elements.
152. Give a brief note about ferrous materials.
153. Write short note about cast iron.
154. What is the principle and classification on heat treatment process?
155. Write short notes about the mechanical properties of materials.
156. Write the classification of steel and explain its types.
157. List out the types of ceramic materials.
158. Write the classifications of ferrous materials.
159. Give the characteristics of ceramics.
160. Give notes on annealing, quenching, hardening, normalizing.

UNIT-V

161. List the composition and uses of low and medium carbon steels.
162. Write in detail about Austenitic Stainless Steel and its uses.
163. Draw the diagram of Bessemer converter.
164. Describe the methods of steel making process.
165. Explain the process of refining of steel.
166. Write the classifications of steel.
167. Explain about the KALDO process.
168. Write the applications, advantages, disadvantages of Bessemer converter.
169. What is the classification of Pig Iron?
170. What is the operation of blast furnace?
171. Explain the basic oxygen steel making process.
172. Write about the steel making process in an electric furnace.
173. Explain the principle and operation of L.D converter.
174. Give the contents, applications and uses of any two alloys.
175. Give the list of methods of steel production.

PART-C
UNIT-I

176. The following data refer to a tensile test conducted on a mild steel bar.
    a. Diameter of the steel bar - 30 mm
    b. Gauge length - 200 mm
    c. Extension at a load of 100 kN - 0.139 mm
    d. Load at elastic limit - 230 kN
    e. Maximum load - 360 kN
    f. Total extension - 56 mm
    g. Diameter of the rod at failure - 22.25 mm

    Calculate the following data,
    i. The Young's modulus
    ii. The stress at elastic limit
    iii. Maximum stress
    iv. The percentage elongation
    v. The percentage decrease in area

177. The following data refer to a mild steel specimen tested in a laboratory.
    a. Diameter of the specimen - 25 mm
    b. Length of the specimen - 300 mm
    c. Extension at a load of 15 kN - 0.045 mm
    d. Load at yield point - 127.65 kN
    e. Maximum load - 208.60 kN
    f. Length of the specimen after failure - 375 mm
    g. Neck diameter - 17.75 mm

    Calculate the following data,
    i. Young's modulus
    ii. Stress at Yield point
    iii. Ultimate stress
    iv. Percentage elongation
    v. Percentage decrease in area

178. A cantilever AB of length l carrier a three point loads W each at distance l/3,2l/3 & l from the fixed end A. Determine the slope & deflection free end B

179. A horizontal cantilever of uniform cross section of length l carrier two points loads W at the free end and 2w at a distance of a from the free end. Final the maximum deflection due to this loading. Take $E=2*10^5 N/mm^2$

180. The following data refer to a tensile test conducted on a mild steel bar.
    h. Diameter of the steel bar - 50 mm
    i. Gauge length - 300 mm
    j. Extension at a load of 100 kN - 0.254 mm
    k. Load at elastic limit - 310 kN
    l. Maximum load - 520 kN
    m. Total extension - 70 mm
    n. Diameter of the rod at failure - 35.75 mm

    Calculate the following data,
    i. The Young's modulus
    ii. The stress at elastic limit
    iii. Maximum stress
    iv. The percentage elongation
    v. The percentage decrease in area

181. The following data refer to a mild steel specimen tested in a laboratory.
    a. Diameter of the specimen - 45 mm
    b. Length of the specimen - 400 mm
    c. Extension at a load of 15 kN - 0.061 mm
    d. Load at yield point - 180 kN
    e. Maximum load - 340 kN
    f. Length of the specimen after failure - 480 mm
    g. Neck diameter - 25.25 mm

    Calculate the following data,

    i. Young's modulus
    ii. Stress at Yield point
    iii. Ultimate stress
    iv. Percentage elongation
    v. Percentage decrease in area

UNIT-II

182. Two large plane surfaces are 2.4cm apart. The space between the surfaces is filled with glycerin. What force is required to drag a thin plate of $0.5m^2$ surfaces area between the two large plane surfaces at a speed of 0.6m/s if (i) the plate is at the middle of two plane surfaces?
183. Water is flowing through a pipe having diameter.300mm and 200mm at the bottom & upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and pressure at the upper end is 9.81N/cm^2. Find the difference in potential head if the rate of flow through pipe is 40 litres/sec.
184. Briefly explain about the types of fluid flow.
185. Derive Bernoulli's equation of motion.
186. The water is flowing through a pipe having diameters 20 cm and 10 cm at sections 1 and 2 respectively. The rate of flow through the pipe is 35 litres/sec. The section 1 is 6 m above datum line and section is 4 m above datum line. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure at section 2.
187. Water flows through a pipe AB of 1.2 m diameter at 3 m/s and then passes through a pipe BC of 1.5 m diameter. At C the pipe branches in which branch CD is 0.8 m and carries one-third the flow of AB. The velocity of the water in branch CE is 2.5 m/s. Find the rate of flow of AB, the velocity of the water in BC, the rate of flow in CD, the velocity in CD and the diameter of the pipe CE.

UNIT-III

188. A reversible engine is supplied with heat from two consent temperature sources at 900 K and 600 K and rejects heat to a consent temperature sink at 300 K. The engine developer work equal to 90 KJ/s and rejects heat at 56 KJ/s. Find the heat supplied by each sources and thermal efficiency of the engine.
189. A reversible engine operates between two reversible at temperature of 600^o C and 40^o C the engine drives a reversible refrigerator which operates between reservoirs at temperatures of 40^o C and 20^o C. The heat transfer to the engine is 2 MJ and network output of the combined engine and refrigerator is 360 KJ. Find heat transfer to the refrigerator and the net heat transfer to the reservoir also find the above values if the efficiency and is decreased by 40%.
190. Determine the quantity of heat required to produce 1kg of steam at a pressure of 6 bar at 25^oc under the following conditions.(i) when the steam is wet with dryness fraction of

0.9. (ii) When the steam is dry saturated. (iii) When the steam is superheated at consent pressure at 250^{o}c assuming the mean specific is 2.3kj/kgK?

For 6 bar pressure, Take h_f = 6704 kj/kgK, h_{fg} = 2085 kj/kgK, t = 158.8^{0} C

191. Steam enters an engine at a pressure of 12 bar with 67^{o}c of super heat it is exhausted at a pressure of 0.15 bar and 0.95 dryness. Find the drop in enthalpy if the mean specific heat 2kj / kgk?

For P_1 = 12 bar pressure, take h_f = 798.4 kj/kgK, h_{fg} = 1984.3 kj/kgK.

For P_2 = 0.13 bar pressure, take h_f = 226 kj/kgK, h_{fg} = 2373.2 kj/kgK.

192. A Steam engine obtains steam from a boiler at a pressure of 15 bar and 0.98 dryness it was observed that the steam losses 21kj/kg of heat as it flows through the pipe with the pressure remaining constant. Calculate the dryness fraction of the stream at the engine end of the pipeline?

For $P_1 = P_2$ = 15 bar pressure, take h_f = 844.6 kj/kgK, h_{fg} = 1945.3 kj/kgK.

193. A reversible engine is supplied with heat from two consent temperature sources at 700 K and 500 K and rejects heat to a consent temperature sink at 100 K. The engine developer work equal to 70 KJ/s and rejects heat at 46 KJ/s. Find the heat supplied by each sources and thermal efficiency of the engine.

UNIT-IV

194. Explain about common engineering materials.
195. Explain the basics of metals and its classification.
196. Give the basics & classification of ceramics & its uses.
197. Discuss about classification of ferrous & non-ferrous materials.
198. Give the properties, uses & application of wrought iron and cast iron.
199. Describe about the characteristics, alloy, and uses of aluminum, zinc and copper.

UNIT-V

200. Explain the process of production of iron from one with a flow chart.
201. Write short note about pig iron and its classification. Discuss about the elements of blast furnace construction and hence explain its principle and operation.
202. Explain working of Bessemer convertor and give its application, advantages and disadvantages.
203. Explain in detail about the phase diagram.
204. What are the salient features of iron-carbide diagram? Explain with neat sketch.
205. Give the variation of low carbon, medium carbon and high carbon steels. Explain about them in detail.