Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: A Primer on Stainless Steels **Semester: VII**
Programme: B. Tech (MSNT+PIE+Mech) **Time: 03 hrs.**
Course Code: MHEG 461 **Max. Marks: 100**
Instructions:

SECTION A

All the questions shall be compulsory (5 questions X 4 marks each = 20 marks)

S. No.		Marks	CO
Q 1	What are the 5 major types of Stainless Steel grades? How are they designated numerically?	**4**	
Q 2	What are the 5 major alloying elements in Stainless Steel (other than Carbon and Iron)? Give 1 major function of each of the alloying elements	**4**	
Q 3	Mention 3 most commonly used stainless steel grades for each of the following types of SS: a. Austenitic SS b. Semi-austenitic SS c. Ferritic SS d. Duplex SS	**4**	
Q 4	What is the difference between 304 and 304L grades of Stainless Steel? Why would you prefer to have 304L grade of SS?	**4**	
Q 5	Mention 2 major advantages of using 200 series of Stainless Steel	**4**	

SECTION B

Questions 6, 7 & 8 are compulsory. Questions 9 & 10 have an internal choice (5 questions X 8 marks each = 40 marks)

Q 6	What is Stress Corrosion Cracking (SCC)? What are the necessary conditions for SCC to occur? Which grades of Stainless Steel would you specify to overcome SCC? Explain with reasons	**8**	
Q 7	What is AOD process? What are the 3 major functions of AOD process? Explain with suitable reactions. What are the major differences of AOD process vis-à-vis VOD process?	**8**	
Q 8	Explain what is meant by the following finishes of Stainless Steel? a. 2B	**8**	

	b. 2D c. 2R d. 2J Amongst all the aforesaid finishes, which one exhibits the highest corrosion resistance and why?		
Q 9	(a) What process is used to impart colour to stainless steel sheets? Explain its fundamental mechanism **OR** (b) What is the type of rolling mill used for cold rolling of stainless steel? How many rolls are there in this type of mill? Why is this type of mill used for cold rolling of stainless steel?	**8**	
Q 10	(a) Which grades of stainless steel should be specified for the following and why? 1. Construction of bridge in marine environment 2. Fabrication of Bus Bodies in coastal regions **OR** (b) What are the various factors which are taken into consideration while fabricating transportation vehicles, like buses, railways, etc? Enumerate the various reasons why Stainless Steel is considered the most suitable material for construction of vehicular bodies?	**8**	
SECTION-C **Question 11 is compulsory and question 12 has an internal choice (2 questions X 20 marks each = 40 marks)**			
Q 11	What are the 5 major types of corrosion observed on Stainless Steel? What is PREN? How do you calculate PREN? What is the significance of PREN values in Stainless Steel? What are the major factors influencing pitting corrosion? Explain their effect on pitting corrosion	**20**	
Q 12	(a) What is galvanic corrosion in stainless steel? Show the positions of the following metals in galvanic series based on their activities in flowing sea water? 1. Zinc 2. Aluminium alloysMild steel and cast iron 3. Stainless steel grade – 409M 4. Stainless steel grade – 430	**20**	

	5. Stainless Steel grade – 304 6. Stainless steel grade – 316 7. While fastening 2 sheets of stainless steel, should we use fasteners made of aluminium, mild steel or stainless steel? Explain with reasons **OR** (b) What is intergranular corrosion in Stainless Steel? When does intergranular corrosion take place? How can we avoid intergranular corrosion? For water having high chloride content, should we use 304L, 316L or 316-Ti grades of SS? Explain with reason		