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Code No. : 22868

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD**

Accredited by NAAC with A++ Grade

**M.E. (Mech. Engg.) II-Semester Main Examinations, August-2023****Metallurgy of Casting and Welding**

(Advanced Design &amp; Manufacturing)

Time: 3 hours

Max. Marks: 60

*Note: Answer all questions from Part-A and any FIVE from Part-B***Part-A (10 × 2 = 20 Marks)**

Q. No.	Stem of the question	M	L	CO	PO
1.	Sketch the cooling curve of an alloy of eutectic system with 40%A and 60%B assuming an eutectic composition of 60%B.	2	3	1	1
2.	Calculate the amounts of phases in 0.4% Carbon steel.	2	4	1	2
3.	Differentiate between Brass and Bronze.	2	1	2	1
4.	List the various types of foundry refractories.	2	1	2	1
5.	Analyse the property and phase changes in hardening of steel with water as quenching medium.	2	4	3	2
6.	Sketch the heating range of Normalizing of steels.	2	3	3	2
7.	List any four methods of relieving residual stresses.	2	1	4	1
8.	Differentiate the various types of Pearlite with their interlamellar distance.	2	2	4	1
9.	Express the formula of Carbon equivalents.	2	2	5	1
10.	Classify the Low alloy steels.	2	1	5	1
<b>Part-B (5 × 8 = 40 Marks)</b>					
11. a)	Explain the microstructure, composition and applications of Malleable and Chilled cast irons.	4	2	1	1
b)	What are the different gases in cast metals? How to degasify them?	4	1	1	1
12. a)	Explain in detail about the composition, properties and applications of Nickel Chromium high temperature alloys.	4	2	2	1
b)	Compare the solidification times of cubical and spherical castings made of same material of equal surface areas.	4	4	2	2
13. a)	Explain Weld metal zone, Fusion boundary zone, Heat Affected zone and unaffected zone of steel weldment as superimposed on Iron-Iron Carbide equilibrium diagram.	4	2	3	1
b)	Analyse the process and purpose of Spheroidising with appropriate microstructures.	4	4	3	1

Contd... 2

14. a)	Discuss the importance of Schaeffler diagram with appropriate sketch.	4	3	4	1																								
b)	An AISI stainless steel 304L is to be welded using filler alloy AISI347. The compositions of base metal and filler alloy are as follows.	4	4	4	2																								
<table border="1"> <thead> <tr> <th>Material Type</th> <th>%C</th> <th>%Mn</th> <th>%Si</th> <th>%Cr</th> <th>% Ni</th> <th>% Ta</th> <th>%Cb</th> </tr> </thead> <tbody> <tr> <td>AISI 304L</td> <td>0.03</td> <td>2.0</td> <td>1.0</td> <td>20.0</td> <td>8.0</td> <td>-</td> <td>-</td> </tr> <tr> <td>AISI 347</td> <td>0.08</td> <td>2.0</td> <td>1.0</td> <td>17.0</td> <td>12.0</td> <td>0.5</td> <td>0.5</td> </tr> </tbody> </table>		Material Type	%C	%Mn	%Si	%Cr	% Ni	% Ta	%Cb	AISI 304L	0.03	2.0	1.0	20.0	8.0	-	-	AISI 347	0.08	2.0	1.0	17.0	12.0	0.5	0.5				
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AISI 347	0.08	2.0	1.0	17.0	12.0	0.5	0.5																						
Calculate the Chromium and Nickel equivalents of the base metal, filler alloy and midway composition of the weld metal.																													
15. a)	List the problems associated with welding of Austenitic Stainless steels and explain their remedies.	4	1	5	1																								
b)	Explain the factors responsible for Hydrogen induced cracking.	4	2	5	1																								
16. a)	Explain the solidification of various alloys of the phase diagram of the eutectic system.	4	2	1	1																								
b)	With appropriate microstructures how the age hardening of castings is done?	4	4	2	1																								
17.	Answer any <i>two</i> of the following:																												
a)	Calculate the approximate annealing temperature of 0.2%C steel.	4	4	3	2																								
b)	Explain the causes and factors responsible for development of residual stresses.	4	2	4	1																								
c)	Explain the different types of microstructural products of weldments.	4	2	5	1																								

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level - 1	20%
ii)	Blooms Taxonomy Level - 2	40%
iii)	Blooms Taxonomy Level - 3 & 4	40%

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