AE 2354 / HIGH TEMPERATURE MATERIALS

1. Explain the various stages of creep curves and laws representing them. (AU M/J 2009)

2. Discuss the effect of stress, temperature and strain rate in various stages of creep. (AU M/J 2009)

3. It is well known that at high temperature materials are subjected to creep, corrosion, and microstructural changes. Analyse each of these things in limiting functional life of components. .(AU N/D 2007)

4. Write technical note on various creep mechanisms. .(AU N/D 2007)

5. It is well known that the functional life time of a material put into service at high temperature are subjected to three dimensional damages by way of creep, corrosion and microstructural changes. For each type write on the various damage mechanisms and the method to combat them. (AU M/J 2007)

6. It is well known that to predict long term properties accelerated short term tests are to be carried out and extrapolating procedure by parametric approach is to be followed. Analyse how various parameters are evolved based on materials behavior. (AU M/J 2007)

7. Explain the various methods adopted in representing rupture life of creep. (AU M/J 2009)

8. Analyse time hardening strain hardening pictorially and mathematically and prove that at constant stress the strain hardening reduces to time hardening. (AU N/D 2007)

9. Based on steady state creep rate derive expressions for creep ductile and brittle fracture. (AU N/D 2007)

10. It is obvious that as the material creeps it proceeds from primary stage into a stedy state and accelerates into the tertiary state with a end result of fracture.

For creep ductile fracture or rupture the area of cross section that supports load reduces to zero. Analyse how to compute time to rupture based on initial conditions.

For creep brittle fracture void nucleate and grow from the onset of steady state and in tertiary state voids coalesce into cracks which propagates to produce fracture. This can be modeled by defining a damage parameter w which changes from zero at the virgin state to unity at rupture. Based on this model compute time for brittle fracture. (AU M/J 2007)

11. What are the characteristic features of brittle and ductile fracture? (AU M/J 2009)
12. Elaborate the mechanism of fracture, which varies with temperature with use of fracture maps of any alloy system. (AU M/J 2009)
13. What is the significance of ductile to brittle transition temperature? (AU M/J 2009)
14. Discuss the triple point cracking and grain boundary cavitation creep mechanisms of fracture. (AU M/J 2009)
15. Analyse technically the following fractures.

Transgranular ductile fracture
Intergranular creep fracture
Pure diffusional fracture

Rupture(AU N/D 2007)

16. Draw fracture maps for pure Ni Nichrome a solid solution and a precipitation hardened Nickel base super alloy and explain how does the boundaries shift due to alloying and precipitation. (AU N/D 2007)

17. Draw fracture maps for a bcc material or an oxide and explain various regimes.(AU N/D 2007)

18. Explain the defect structure of oxide scale. (AU M/J 2009)

19. How are the corrosions due to different hot gas combated? Discuss. (AU M/J 2009)

20. Brief on the basis for selection of alloying element to combat hot corrosion. (AU M/J 2009)

21. What are the various types of high temperature corrosions? (AU M/J 2009)

22. Analyse the mechanisms of hot corrosion by basic fluxing and acidic fluxing. Also, analyse the various stages of hot corrosion.(AU N/D 2007)

23. Analyse how doping of a n-type and a p-type semiconductor oxides influence corrosion kinetics..(AU N/D 2007)

24. Analyse the various kinetic laws of oxidation..(AU N/D 2007)

25. Discuss the general strengthening mechanism of various tupes of super alloys.(AU M/J2009)

26. Name a few examples for intermetallics and ceramics applicable for high temperature. How do these materials sustain strength at higher temperature? Explain. (AU M/J2009)

27. In developing a super alloy for high temperature application how alloy chemistry san be judiciously employed to produce resistance for creep, corrosion and microstructural instability.(AU N/D 2007)

28. It is also possible to produce resistance to the above three dimensional damage by different processing routes. Analyse please.(AU M/J2009)

29. Analyse the various strengthening mechanisms occurring in a nickel base super alloy. (AU M/J 2007)

30. Write a technical note on how processing influences the structure and properties of super alloys.(AU M/J2009)

31. Write a short notes on:

a) Titanium Aluminides

b) High Temperature Ceramics.

32. Explain the high temperature hot corrosion or type I hot corrosion?

33. How intermetallics contribute to the high temperature strength and oxidation resistance?

34. State the different kinetic laws of oxidation.

35. Draw the fracture maps for a typical bcc and fcc materials.
36. Derive Orowon and Griffith theory of cleavage I failure.
37 .Write a technical note on various high temperature materials.
38. Describe the various methods adopted in representing rupture life of creep?
39. Discuss the various alloy chemistry and process parameters strength of super alloys?
40. Discuss about various types of fracture?