Department of Mechanical Engineering

ME 8693 HEAT AND MASS TRANSFER

Unit III - MCQ Bank

III UNIT- PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGER- MCQ Bank

1. Boiling refers to a change from the

    A. Solid to a liquid phase

    B. Vapor to a liquid phase

    C. Liquid to a solid phase

    D. Liquid to a vapor phase

Answer: (D)

2. Which type of boiling occurs in steam boilers employing natural convection?

    A. Forced convection

    B. Pool

    C. Local

    D. Saturated

Answer: (B)

3. In which type of boiling the fluid motion is induced by external means?

    A. Pool

    B. Local

    C. Forced convection

    D. Subcooled

Answer: (C)

4. In which type of boiling the temperature of the liquid exceeds the saturation temperature?

    A. Forced

    B. Saturated

    C. Pool

    D. Saturated

    Answer: (D)

5. The phenomenon of stable film boiling is referred to as

    A. Nucleate effect

    B. Boiling regimes

    C. Leiden frost effect

    D. Von karma effect

    Answer: ©

6. For water evaporating at atmospheric pressure, the burnout occurs at temperature excess slightly

    above

    A. 25 K

    B. 55 K

    C. 75 K

    D. 105 K

    Answer: (B)

7. The boiling phenomenon is known to occur in how many forms?

    A. 1

    B. 2

    C. 3

    D. 4

    Answer: (D)

8. Which of the following parameters affect burnout heat flux in the nucleate boiling region

    (i) Heat of evaporation

    (ii) Temperature difference

    (iii) Density of vapor

    (iv) Density of liquid

(v) Surface tension at the vapor-liquid interface

Mark the correct answer from the codes indicated below

A. I, ii, iii and v

B. I, iii, iv and v

C. I, ii, iii and iv

D. I, iii and v

Answer: (B)

9. All the following statements are correct, except

A. Nucleate boiling gets promoted on a smooth surface

B. In subcooled heating, the temperature of the heating surface is more than the boiling point of the liquid

C. Film boiling region is usually avoided in commercial equipment

D. There occurs transition from nucleate to film boiling burn-out point on the boiling curve

Answer: (A)

10. In nucleate pool boiling, the heat flux depends on

A. Liquid properties, material and condition of the surface

B. Material of the surface only

C. Material and roughness of the surface

D. Liquid properties and material of the surface

Answer: (A)

11. Condensation refers to a change from the

A. Solid to a liquid phase

B. Vapor to a liquid phase

C. Liquid to a solid phase

D. Liquid to a vapor phase

Answer: (B)

12. . Condensation process is very common in

(i) Boilers

(ii) Condensers

(iii) Evaporators

Identify the correct statements

A. i and ii

B. ii and iii

C. i, ii and iii

D. i and iii

Answer: (C)

13. The convective coefficients for condensation usually lie in the range

A. 30-300 W/m^2 K

B. 60-3000 W/m^2 K

C. 300-10000 W/m^2 K

D. 2500-10000 W/m^2 K

Answer: (D)

14. Drop wise condensation usually occurs on

A. Oily surface

B. Glazed surface

C. Smooth surface

D. Coated surface

Answer: (A)

15. Consider the following statements

(i) If a condensing liquid does not wet a surface, then drop wise condensation will not take place on it

(ii) Drop wise condensation gives a higher transfer rate than film wise condensation

(iii) Reynolds number of condensing liquid is based on its mass flow rate

(iv) Suitable coating or vapor additive is used to promote film wise condensation

Identify the correct statement

A. i and ii

B. ii, iii and iv

C. iv only

D. i, ii and iii

Answer: (D)

16. Depending upon the behavior of condensate up on the cooled surface, the condensation process are classified into how many distinct modes?

   A. 1

   B. 2

   C. 3

   D. 4

   Answer: (2)

17. For film wise condensation on a vertical plane, the film thickness δ and heat transfer coefficient h vary with distance x from the leading edge as

   A. δ decreases, h increases

   B. Both δ and h increases

   C. δ increases, h decreases

   D. Both δ and h decreases

   Answer: (C)

18. How many fluids remain at a constant temperature during the process of boiling and condensation?

   A. 1

   B. 2

   C. 3

   d. 4

   Answer: (A)

19. Identify the correct expression for effectiveness

    A. 4 – exponential (- NTU)

    B. 3 – exponential (- NTU)

    C. 2 – exponential (- NTU)

    D. 1 – exponential (- NTU)

    Answer: (D)

20. What is the maximum efficiency for parallel flow heat exchanger?

    A. 5%

    B. 10%

    C. 20%

    D. 50%

    Answer: (A)

21. The curve of effectiveness versus NTU parameters indicates the relationship between

    (i) Effectiveness

    (ii) NTU $_{MAX}$

    (iii) C $_{MIN}$/C $_{MAX}$

    Identify the correct statements

    A. i and ii

    B. i, ii and iii

    C. ii only

    D. iii only

    Answer: (B)

22. For laminar film condensation on a vertical plate, the film thickness is given by

    A. $[4 \, k \, \delta \, (t_{sat} - t_s) \, x/p^2 \, g \, h_{fg}]^{0.25}$

    B. $[4 \, k \, \delta \, (t_{sat} - t_s) \, x/p^2 \, g \, h_{fg}]^{0.5}$

    C. $[4 \, k \, \delta \, (t_{sat} - t_s) \, x/p^2 \, g \, h_{fg}]$

    D. $[4 \, k \, \delta \, (t_{sat} - t_s) \, x/p^2 \, g \, h_{fg}]^{1.5}$

    Answer: (A)

23. For laminar film condensation on a vertical plate, the gravitational acceleration g is replaced by

   A. 4 g sin α

   B. 3 g sin α

   C. 2 g sin α

   D. g sin α

   Answer: (D)

24. The critical Reynolds number for transition from laminar to turbulent film condensation is

   A. 2000

   B. 1900

   C. 1800

   D. 1700

   Answer: (C)

25. Consider the following phenomena

   (i) Boiling

   (ii) Free convection in air

   (iii) Forced convection in air

   (iv) Conduction in air

   Identify the correct sequence (heat transfer coefficient)

   A. iii – iv – i – ii

   B. iv – i – iii – ii

   C. iv – iii – ii – i

   D. iv – ii – iii – i

   Answer: (D)

26. The bubble diameter at the time of detachment from the surface can be worked out from the relation proposed by Fritz and is given by

   A. $C_d \beta [2 \sigma/g (p_t - p_v)]$.

   B. $C_d \beta [2 \sigma/g (p_t - p_v)]^{3/2}$

   C. $C_d \beta [2 \sigma/g (p_t - p_v)]^{1/2}$

   D. $C_d \beta [2 \sigma/g (p_t - p_v)]^{5/2}$

   Answer: (C)

27. In spite of large heat transfer coefficient in boiling liquids, fins are used advantageously when the entire surface is exposed to

A. Film boiling

B. Transition boiling

C. Nucleate boiling

D. All modes of boiling

Answer: (C)

28. With increase in excess temperature, the heat flux in boiling

A. Increases continuously

B. Decreases and then increases

C. Decreases, then increases and again decreases

D. Increases, then decreases and again increases

Answer: (D)

29. Heat flux increases with temperature excess beyond the Leiden-frost point due to

A. Radiation effect becomes predominant

B. Occurrence of subcooled boiling

C. Vapor space become large

D. Promotion of nucleate boiling

Answer: (A)