امتحان القبول لطلبة الدراسات العليا / الماجستير

جامعة بغداد

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الوقت : ثلاث ساعات

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1) Choose the correct answer

a) Critical point involves equilibrium of solid and vapour phase.

b) Critical point involves equilibrium of solid and liquid phase.

c) Critical point involves equilibrium of solid, liquid and vapour phase.

d) Triple point involves equilibrium of solid, liquid and vapour phase.

2) Heat of the super-heated steam is given by:

a) $h_{sup} = h_f + h_{fg} + C_{ps} log_e \frac{T_{sup}}{T_s}$

b) $h_{sup} = h_f + x h_{fg}$

c) $h_{sup} = h_f + h_{fg}$

d) $h_{sup} = h_f + x\, h_{fg} + C_{ps} log_e \frac{T_{sup}}{T_s}$

3) If a process can be stopped at any stage and reversed so that the system and the surrounding are exactly restored to their initial conditions, it is known as

a) Adiabatic process

b) isothermal process

c) Ideal process

d) frictionless process

e) energyless process.

4) When the gas is heated at a constant pressure, the heat supplied

a) increase the internal energy of the gas

b) increase the temperature of the gas

c) dose some external work during the expansion

d) both (b)and (c)

e) none of the above.

5) The efficiency of the Carnot cycle may be increased by

a) increase the highest temperature b) decrease the highest temperature

c) increase the lowest temperature d) decreasing the lowest temperature

e) keeping the lowest temperature constant.

6) A solid body sinks in the fluid when

a) the specific gravity of the material is greater than unity

b) the buoyancy force does not pass through the metacentre

c) the weight of the fluid displaced is less than the weight of the body

d) the metacentre lies below the centre of gravity

e) the metacentre height is negative

7) uniform flow occurs

a) when the spatial rate of change of velocity is zero

b) when the temporal rate of change of velocity is zero

c) when the velocity changes steadily along the direction of flow

d) only when the velocity vector at any point remains constant

e) when the pressure remains constant in the entire flow field

8) The flow is said to be steady when

a) conditions change steadily with time

b) conditions do not change with time at any point

c) conditions do not change steadily with time at any point

d) the velocity does not change with time at any point

e) only when the velocity vector at any point remain constant with space and time

9) The Euler's equations of motion

a) can be drive from the Navier-Stokes equation

b) is a statement of energy balance

c) is a preliminary step in derive the Bernoull equation

d) cannot be applied to a fluid at rest

10) friction loss through a pipe flow implies

a) loss of energy due to the coefficient of friction between the material of the pipe and the fluid

b) loss due to dynamic coefficient of friction

c) loss of flow rate in pipe due surface roughness

d) loss of energy due to surface roughness

e) loss of momentum due to surface roughnes

11) Thermal conductivity of a material may be defined as the

a) heat conducted in unit time across unit area through unit thickness when a temperature difference of unity is maintained between opposite faces

b) quantity of heat flowing in one second through a slab of the material of area 1 cm2 and thickness 1 cm when its faces differ in temperature by 1° C

c) quantity of heat flowing in one second through one cm of material when opposite faces are maintained at a temperature difference of 1° C

d) all of the above

12) In free convection heat transfer transition from laminar to turbulent flow is governed by the critical value of the

a) Grashoff's number

b) Reynold's number

c) Reynold's number, Grashoff's number

d) Prandtl number, Grashoff's number

13) The amount of radiation mainly depends upon the

a) nature of the body

b) temperature of the body

c) type of surface of the body

d) all of these

14) The thickness of thermal and hydrodynamic boundary layer is equal if Prandtl number is

a) equal to one

b) greater than one

c). less than one

d) equal to Nusselt number

15) Reynolds number is the ratio of

a) kinematic viscosity to thermal diffusivity

b) energy transferred by convection to that by conduction

c) inertia force to viscous force

d) none of the above

16) Geothermal energy reservoirs are

a) Liquid dominated reservoirs

b) Steam dominated reservoirs

c) Hot rocks with no water (d) All of the them

17) Hydrogen can be stored as a

a) Compressed gas

b) Liquid

c) Metal hydride

d) All of the them

18) The tidal energy of a sea wave is the sum of its

a) Mechanical energy & thermal energy

b) Potential energy & hydropower energy

c) Potential energy & kinetic energy

d) Kinetic energy& thermal energy

19) The relationship between power available from wind 'P' and wind velocity 'v' is

a) P ά v

b) P ά v 2

c) P ά v 3

d) P = v

20) What kind of energy does a wind turbine use?

a) Kinetic energy

b) Potential energy

c) Chemical Energy

d) Thermal energy

21) A pyrheliometer is an instrument used to measure the

a) Temperature of solar photovoltaic cell

b) Intensity of direct solar radiation at normal incidence

c) Intensity of indirect solar radiation

d) Efficiency of a solar photovoltaic cell

22) In what form can solar energy be used?

a) Thermal energy

b) Electrical energy

c) Mechanical Energy

d) All of above

23) Solar energy cannot be stored in which of the following mediums?

a) Water

b) Iron

c) Gas

d) Wood

24) Wind energy conversion devices based on drag force

a) Move faster than wind

b) Move slower than wind

c) Move with equal velocity as wind

d) Do not depend on the velocity of wind

25) Harmful radiation emitted from the sun is

a) Visible radiation

b) Infrared radiation

c) Ultraviolet radiation

d) None of the above

26) The energy released per fission of a U235 nucleus is around

a) 0.02 eV

b) 2 eV

c) 2 MeV

d) 20 MeV

e) 200 MeV

27) From the following, pick out the most suitable energy of neutrons which will produce nuclear fission in a reactor:

a) 0.04 eV

b) 40 eV

c) 400 eV

d) 2 MeV

e) 20 MeV

28) The function of the moderator in a nuclear reactor is:

a) to absorb fast neutrons

b) to adjust the power output to moderate levels

c) to slow down fast neutrons

d) to absorb slow neutrons

e) to cool the reactor core

29) Why are nuclear energy levels more complex than electron energy levels?

a) Nuclear energy levels depend only on attractive forces.

b) Nuclear energy levels depend on attractive and repulsive forces.

c) Nuclear energy levels are an order of one hundred times as great as electron energy levels.

d) Electron energy levels depend on the interaction between neutrons and electrons.

e) Electron energy levels have greater energy than the nuclear energy levels.

30) A 100 g sample of a radioactive element has a half-life of 5days.How many grams of radioactive material will remain after 15 days?

a). 100 g

b). 50 g

c). 25 g

d). 12.5 g

e). 0 g

Q1) When a system is taken from state I to state m, in Fig(1) , along path LQM, 168 kJ of heat flows into the system, and the system dose 64 kJ of work: .

i) How much will be the heat that flow into the system along path LNM if the work done is 21 kJ?

ii) When the system is returned from M to L along the curved path, the work done on the system is 42 kJ. Dose the system absorbs or liberate heat, and how much of the heat is absorbed or liberated?

iii) If $U_L = 0$ and $U_M = 84$ kJ, find the heat absorbed in the processes LN and NM.

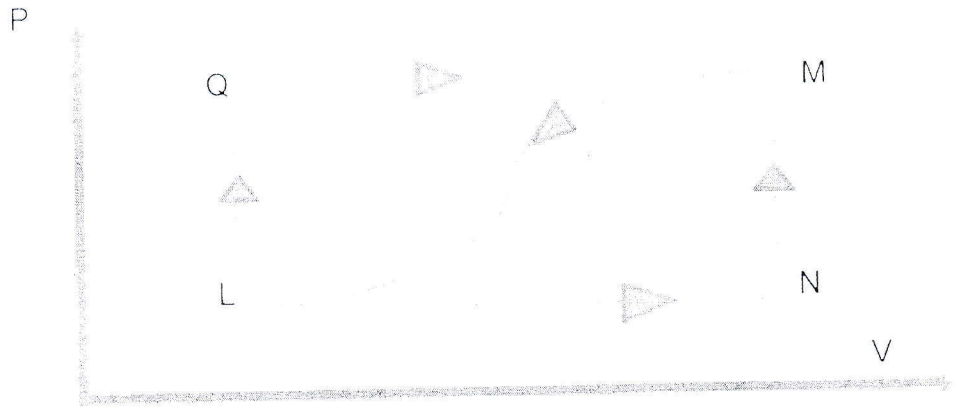

Fig (1)

Q2) an empty cylindrical bucket, 30 cm in diameter and 50 cm long whose wall thickness and weight can be considered as negligible is forced, open end first, into water until its lower edge is 4meters below the surface. What force will be required to maintain this position, assuming the trapped air to remain at constant temperature during the entire operation?

Q3) For a cylindrical container the rate of heat loss is assum proportional to the surface area and to the temperature differenc between inside and outside, with the proportionality constant being denoted *U*. It is sometimes approximated in the form

$$U = 1/(x/\lambda + \mu)$$

where x is the thickness of insulation, λ is the thermal conductivity of the insulating material. Show that the fraction of the stored heat energy lost per unit time is :

$$\frac{P^{loss}}{E^{store}} = \frac{2U(1+R/L)}{R\,c_p^{water}\,\rho^{water}}$$

where R and L are radius and height of the cylinder, Ts is the average temperature of the water in the store, and Ta is the outside ambient air temperature.

Q4)

storage cavern capacity (E_{GEN}/V_s). The electrical output of the turbine (E_{GEN}) is given by

$$E_{GEN} = \eta_M \eta_G \int_0^t \dot{m}_f \, w_{CV,TOT} \, dt$$

where the integral is the mechanical work generated by the expansion of air and fuel in the turbine, $w_{CV,TOT}$ = total mechanical work per unit mass generated in this process, $\dot{m}_f$ = air mass flow rate, t = time required to deplete a full storage reservoir at full output power, η_M = mechanical efficiency of the turbine (which reflects turbine bearing losses), and η_G = electric generator efficiency.

Since all CAES systems to date are based on two expansion stages, the work output can be expressed as the sum of the output from the two stages. The first term reflects the work output from the hp turbine that expands the air from the hp turbine inlet pressure (p_1) to the lp turbine inlet pressure (p_2). Likewise, the second term reflects the expansion work derived from the expansion from p_2 to barometric pressure (p_3).

Prove that EGEN/VS is given by the following equation:

$$\frac{E_{GEN}}{V_s} = \frac{\alpha}{V_s} \int_0^t \dot{m}_A \left[\beta - 1 - \left(\frac{p_2}{p_3} \right)^{\frac{\gamma_2 - 1}{\gamma_2}} \right] dt$$

where

$$\alpha = \eta_M \eta_G \, c_{p,2} T_2 \left(1 - \frac{\dot{m}_f}{\dot{m}_A} \right)$$

and

$$\beta = \frac{c_{p,1} T_1}{c_{p,2} T_2} \left[1 - \left(\frac{p_2}{p_1} \right)^{\frac{\gamma_1 - 1}{\gamma_1}} \right]$$