

VSSC TA 2015

Q1. For maximum efficiency in multi-stage compressor

- (a) Air should be cooled to initial temperature between the stages
- (b) Pressure ratio for each stage should be same
- (c) Work done for each stage should be same
- (d) All of the above

Q2. For a two stage reciprocating air compressor, for minimum work required the intercooler pressure is given by

- (a) $P_2 = \sqrt{P_1 \times P_3}$
- (b) $P_2 = P_1 \times P_3$
- (c) $P_2 = 1/\sqrt{P_1 \times P_3}$
- (d) $P_2 = 1/(P_1 \times P_3)$

Q3. Ideal air standard efficiency of a closed cycle gas turbine depends on

- (a) Pressure ratio of the cycle only
- (b) Temperature ratio of the cycle only
- (c) Both the temperature ratio and pressure ratio
- (d) None of the above

Q4. The plant which is smaller in size and lower in weight for the same power, is

- (a) Steam plant
- (b) Gas turbine plant
- (c) I.C. engine plant
- (d) Diesel plant

Q5. At the critical pressure ratio for a convergent nozzle, the velocity at outlet will be

- (a) More than sonic velocity
- (b) Less than sonic velocity
- (c) Equal to sonic velocity
- (d) None of the above

Q6. Ductility of a material can be defined as

- (a) Ability to undergo large permanent deformation in compression
- (b) Ability to recover its original form
- (c) Ability to undergo large permanent deformations in tension
- (d) All of the above

Q7. _____% of carbon in cast iron is

- (a) <0.8%
- (b) <1.3%
- (c) >2%
- (d) <6.3%

Q8. Which is false statement about tempering? Tempering is done to

- (a) Improve machinability
- (b) improve ductility
- (c) Release internal stresses
- (d) Reduce hardness and brittleness

Q9. Brass contains

- (a) 70% copper and 30% zinc
- (b) 70% copper and 30% tin
- (c) 30% copper and 70% tin
- (d) 60% copper and 40% tin

Q10. High speed steel (H.S.S.) belongs to the category of

- (a) Medium-carbon steel
- (b) High-carbon steel
- (c) Alloy steel
- (d) Stainless steel

Q11. The hardness number 1 of Mohr's scale is assigned to

- (a) Quartz
- (b) Talc
- (c) Topaz
- (d) Diamond

Q12. Surveying tapes are made of material having low coefficient of expansion and enough strength, The alloy used is

- (a) Silver steel
- (b) Hastelloy
- (c) Monel metal
- (d) Invar

Q13. A fluid is said to be ideal, is it is

- (a) Incompressible
- (b) Zero viscosity
- (c) Viscous and incompressible
- (d) Low density

Q14. An object having 10 kg mass weighs 5kg on a planet. The value of 'g' at this planet is

- (a) 0.5 m/sec^2
- (b) 4.9 m/sec^2
- (c) 10.2 m/sec^2
- (d) 9.7 m/sec^2

Q15. For a body floating in water, resultant pressure exerted by water acts at

- (a) Bottom surface of body.
- (b) Centroid of portion of body under water.
- (c) All points on the surface of body
- (d) Centroid of body

Q16. If mercury in a barometer is replaced by water, the height of 2cm of mercury will be followingcm of water

- (a) 27.2 cm
- (b) 50 cm
- (c) 52 cm
- (d) 13 cm

Q17. A pressure of 25m of head of water is equal to

- (a) 25 kN/m^2
- (b) 245 kN/m^2
- (c) 2500 kN/m^2
- (d) 2.5 kN/m^2

Q18. An odd shaped body weighing 7.5 kg and occupying 0.1 m^3 volume will be completely submerged in a fluid having specific gravity of

- (a) 1
- (b) 1.2
- (c) 1.7
- (d) 0.75

Q19. Heat flows from one body to other body when they have

- (a) Different heat contents
- (b) Different specific heats
- (c) Different atomic structure
- (d) Different temperatures

Q20. Which of the following has maximum value of thermal conductivity?

- (a) Aluminium
- (b) Steel
- (c) Brass
- (d) Copper

Q21. Flow equation $Q = ka(t_1 - t_2)x$, the term ' $x/(ka)$ ' is known as

- (a) Thermal resistance
- (b) Thermal coefficient
- (c) Thermal conductivity
- (d) Heat transfer coefficient

Q22. A steam pipe is to be insulated by two insulating materials put over each other, for best results

- (a) Better insulation should be put over pipe and inferior one over it.
- (b) Inferior insulation should be put over pipe and better one over it.
- (c) Both may be put in any order.
- (d) whether to put inferior one over pipe or the better one would depend on steam temperature.

Q23. According to plank's law, the wavelength corresponding to the maximum energy is proportional to

- (a) T
- (b) T^2
- (c) T^3
- (d) $1/T$

Q24. In a centrifugal pump, when the impeller speed is doubled, head developed becomes

- (a) 2 times
- (b) 1.414 times
- (c) 4 times
- (d) 1.5 times

Q25. For pump of same speed, discharge is proportional to

- (a) Impeller diameter
- (b) D^2
- (c) D^3
- (d) $1/D^3$

Q26. Francis turbine is best suited for

- (a) Medium head application from 24 to 180m
- (b) Low head installation up to 30m
- (c) High head installation above 180m
- (d) All types of heads

Q27. For small discharge and high heads which pump is preferred

- (a) centrifugal type
- (b) reciprocating type
- (c) axial flow type
- (d) radial flow type

Q28. For a circular cross-section beam subjected to a shearing force F , the maximum shear

- (a) $F/\pi d^2$
- (b) $4F/\pi d^2$
- (c) $2F/\pi d^2$
- (d) $F/4\pi d^2$

Q29. Resilience of a material is important, when it is subjected to

- (a) thermal stresses
- (b) shock loading
- (c) fatigue
- (d) wear and tear

Q30. Three different weights fall from a certain height under vacuum. They will take

- (a) same time to reach earth
- (b) times proportional to weight to reach
- (c) times inversely proportional to weight to reach earth
- (d) unpredictable

Q31. The shearing stress in a helical spring of wire diameter d and having mean diameter D , supporting a compressive load F is given by

- (a) $\frac{2FD}{\pi d^3} \times K$
- (b) $\frac{4FD}{\pi d^3} \times K$
- (c) $\frac{8FD}{\pi d^3} \times K$
- (d) $\frac{16FD}{\pi d^3} \times K$

Q32. A thin spherical shell of internal diameter d is subjected to an internal pressure p . If σ is the tensile stress for the shell material, then thickness of the shell (t) is equal to

- (a) $pd/2\sigma$
- (b) $pd/4\sigma$
- (c) pd/σ
- (d) $4pd/2\sigma$

Q33. In the third angle projection, the object is imagined to be placed

- (a) Below H.P. and behind V.P.
- (b) Above H.P. and in front of V.P.
- (c) Above H.P. and behind V.P.
- (d) Below H.P. and in front of V.P.

Q34. An Oldham coupling connects two shafts, when they are,

- (a) intersecting
- (b) Parallel
- (c) Coaxial
- (d) Perpendicular

Q35.  **symbol in a drawing represents**

- (a) Perspective projection
- (b) Third angle projection
- (c) First angle projection
- (d) Oblique projection

Q36. H7g6 is a

- (a) Close running fit
- (b) Push fit
- (c) Shrink fit
- (d) Press fit

Q37. Conic section obtained by cutting a right circular cone by a section plane inclined to the axis of the cone and cutting all the generators

- (a) Circle
- (b) Ellipse
- (c) Parabola
- (d) Hyperbola

Q38. Curve generated by a fixed point on the circumference of a circle which rolls without slipping along a fixed straight line

- (a) Involute
- (b) Cycloid
- (c) Spiral
- (d) Helix

Q39. Cutting fluid is employed in machining for

- (a) cooling the tool and the job
- (b) lubricate at the rubbing surfaces
- (c) cleaning the machining zone
- (d) all of the above

Q40. Material removal takes place in Abrasive jet Machining due to

- (a) electrochemical action
- (b) mechanical impact
- (c) fatigue failure of the material
- (d) sparking on impact

Q41. Tool life in turning will decrease by maximum extent if we double the

- (a) depth of cut
- (b) feed
- (c) cutting velocity
- (d) tool rake angle

Q42. Cold working process increase

- (a) impact strength
- (b) ductility
- (c) percentage of elongation
- (d) fatigue strength

Q43. The relationship between tool life (T) in minutes and cutting speed (V) in m/min is

- (a) $v^n t = c$
- (b) $vt^n = c$
- (c) $V/T^n = c$
- (d) $V^n/T = c$

Q44. Consumable electrodes are used in which of these welding process?

- (a) TIG
- (b) MIG
- (c) Thermit
- (d) Laser

Q45. Material best weldable with itself is

- (a) Stainless steel
- (b) copper
- (c) aluminium
- (d) mild steel

Q46. Which of the following is a vector quantity?

- (a) mass
- (b) momentum
- (c) angle
- (d) speed

Q47. Two forces each equal to P in magnitude act at right angles, their effect may be neutralized by a third force acting along their bisector in opposite direction whose magnitude is equal to

- (a) $2P$
- (b) $P/2$
- (c) $\sqrt{2}P$
- (d) $P/\sqrt{2}$

Q48. A projectile is fired at an angle θ to the vertical. Its horizontal range will be maximum when θ is

- (a) 30°
- (b) 45°
- (c) 60°
- (d) 90°

Q49. A body moves, from rest with a constant acceleration of 5 m/sec^2 . The distance covered in 5 sec is most nearly

- (a) 38 m
- (b) 62.5 m
- (c) 966 m
- (d) 124 m

Q50. A thief stole a box full of jewellery of $W\text{ kg}$ and while carrying it on his head jumped down from third storey of the building. Before he reached the ground, he experienced a load of

- (a) zero
- (b) infinite
- (c) less than w
- (d) greater than w

Q51. According to which law, all perfect gases change in volume by $1/273$ th of their original volume at 0°C for every 10°C

change in temperature when pressure remains constant

- (a) Joule's law
- (b) Boyle's law
- (c) Gay-Lussac law
- (d) Charles's law

Q52. Which of the following is the property of a system?

- (a) Pressure and temperature
- (b) Internal energy
- (c) Volume and density
- (d) All of the above

Q53. A perfect gas at 27°C is heated at constant pressure till its volume is double. The final temperature is

- (a) 54°C
- (b) 327°C
- (c) 108°C
- (d) 600°C

Q54. In an isothermal process, the internal energy of gas molecules

- (a) Increase
- (b) Decrease
- (c) Remains constant
- (d) May increase/decrease depending on the properties of gas

Q55. 2 kg of substance receives 500 kJ and undergoes a temperature change from 100°C to 200°C . The average specific heat of substance during the process will be

- (a) $5\text{ kJ}/(\text{kg}^\circ\text{K})$
- (b) $2.5\text{ kJ}/(\text{kg}^\circ\text{K})$
- (c) $10\text{ kJ}/(\text{kg}^\circ\text{K})$
- (d) $25\text{ kJ}/(\text{kg}^\circ\text{K})$

Q56. Change in internal energy in a closed system is equal to heat transferred if the reversible process takes place at constant

- (a) Pressure
- (b) Temperature

- (c) Volume
- (d) Internal energy

Q57. If a heat engine attains 100% thermal efficiency, it violates

- (a) Zeroth law of thermodynamics
- (b) First law of thermodynamics
- (c) Second law of thermodynamics
- (d) All of the above laws

Q58. The door of a running refrigerator inside a room was left open. Which of the following statements is correct?

- (a) The room will be cooled to the temperature inside the refrigerator
- (b) The room will be cooled very slightly
- (c) The room will be gradually warmed up
- (d) the temperature of the air in room will remain unaffected

Q59. If hot water and cold water are mixed, then the entropy of the system will

- (a) increase
- (b) decrease
- (c) remains same
- (d) May increase / decrease depending on initial temperature of hot water and cold water

Q60. During a process on the closed system, its internal energy increases by twice the units than heat added to it. It is possible due to

- (a) Radiation of heat from the surroundings
- (b) increasing of temperature
- (c) Performing of shaft work on the system
- (d) Performing of shaft work by the system

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Ans1. d

Solution:

Ans2. a

Solution:

Ans3. a

Solution:

Case 1: If the working fluid is ideal then it depends on the Temperature ratio of the cycle.

$$\eta_{Brayton\ Cycle} = 1 - \sqrt{\frac{T_{min}}{T_{max}}}$$

Case 2: If the working fluid is real then it depends on the Pressure ratio and index.

$$\eta_{Brayton\ Cycle} = 1 - \frac{1}{(r_p)^{\frac{\gamma-1}{\gamma}}}$$

Ans4. b

Solution:

Ans5. a

Solution:

Mach number < 1 → subsonic velocity

Mach number = 1 → sonic velocity

Mach number > 1 → supersonic velocity

If a convergent nozzle is operating under choked condition, the exit Mach number is unity.

Ans6. c

Solution:

Ans7. c

Solution:

Ans8. a

Solution:

The aims of tempering are:

To relieve the internal stresses

To regulate the hardness and toughness

To decrease the brittleness

To restore some ductility

To induce shock resistance to Improving the toughness (strength)

Ans9. a

Solution:

Ans10. c

Solution:

Ans11. b

Solution:

Talc 1

Gypsum 2

Calcite 3

Fluorite 4

Apatite 5

Feldspar 6

Quartz 7

Topaz 8

Corundum 9

Diamond 10

Ans12. d

Solution:

Ans13. b

Solution:

Ideal fluid is **incompressible**, which means the density is constant. Ideal fluid is Ir-rotational, which means the flow is smooth, with no turbulence at all. Ideal fluid is also **non-viscous**, which means there is **no friction**.

Ans14. a

Solution: As mass do not change with place but gravitation due to acceleration may change

$$Mg' = 5$$

$$10 \times g' = 5$$

$$G' = 1/2 = 0.5 \text{ m/s}^2$$

Ans15. b

Solution:

For a body floating in the liquid the normal pressure exerted by the liquid acts at all points on the surface of the body.

Ans16. a

Solution:

$$(\rho gh)_{\text{mercury}} = (\rho gh)_{\text{water}}$$

$$13600 \times 2 = 1000 \times x$$

$$X = 136/5 = 27.2$$

Ans17. b

Solution:

$$P = \rho gh$$

$$= 1000 \times 9.81 \times 25$$

$$= 245.25 \text{ KN/m}^2$$

Ans18. d

Solution:

Given $m = 7.5 \text{ kg}$

$$v = 0.1 \text{ m}^3$$

$$S = ?$$

$$P_{gv} = mg$$

$$Pg = \frac{7.5 \times 10}{0.1} = 750$$

$$S = \frac{750}{1000} = 0.75$$

Ans19. d

Solution:

The heat will flow from the high-temperature region to the low-temperature region until the temperature distribution is the same throughout the body. Or, there may be a temperature gradient across an object. The heat will flow so as to equalize the temperature throughout the object.

Ans20. d

Solution:

Ans21. a

Solution:

Ans22. a

Solution:

Fourier's law of conduction:

It states that the rate of heat transfer by conduction along a given direction is directly proportional to the temp gradient along that direction and is also directly proportional to the area of heat transfer lying perpendicular to the direction of heat transfer.

Ans23. d

Solution:

Ans24. c

Solution:

Affinity law for pump
Head is directly proportional to square of speed
 $H \propto N^2$
 $\frac{H_1}{H_2} = \left(\frac{N_1}{N_2}\right)^2$
If N gets 2N
 $H' = 4H$

Ans25. c

Solution:

Ans26. a

Solution:

High head turbine: In this type of turbines, the net head varies from 150 m to 2000 m or even more, and these turbines require a small quantity of water. Example: Pelton wheel turbine.

Medium head turbine: The net head varies from 30 m to 150 m, and also these turbines require a moderate quantity of water. Example: Francis turbine.

Low head turbine: The net head is less than 30 m and also these turbines require a large quantity of water. Example: Kaplan turbine.

Ans27. b
Solution:

Ans28. b
Solution:

Ans29. b
Solution:

Ans30. b
Solution:

$$S = ut + \frac{1}{2}at^2$$

$$\Rightarrow t^2 = \frac{2S}{g} \quad (\because u = 0 \text{ \& } a = g)$$

$$\Rightarrow t = \sqrt{\frac{2S}{g}}$$

\therefore We can see that the time is independent of mass and thus all three will reach earth at the same time.

Ans31. c
Solution:

Ans32. b
Solution:

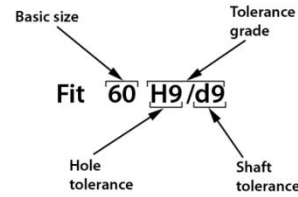
Ans33. a
Solution:

The Third Angle Projection schema imagines the object in the third quadrant. One can place an object on the bottom of the horizontal plane and behind the vertical planes.

Ans34. b
Solution:

Ans35. c
Solution:

Ans36. a
Solution:



Type of Fit	Description	Hole Basis	Shaft Basis
Clearance Fits	Loose Running	H11/c11	C11/h11
	Free Running	H9/d9	D9/h9
	Close Running	H8/f8	F8/h8
	Sliding	H7/g6	G7/h6
	Locational Clearance	H7/h6	-
Transition Fits	Similar	H7/k6	K7/h6
	Fixed	H7/n6	N7/h6
Interference Fits	Press	H7/p6	P7/h6
	Driving	H7/s6	S7/h6
	Forced	H7/u6	U7/h6

Ans37. b
Solution:

Ans38. b
Solution:

Ans39. d
Solution:

Ans40. b
Solution:

Ans41. c
Solution:

Tool life of any tool for any work material is governed by machining parameters mainly cutting velocity (V), feed, and depth of cut (t).

Cutting velocity affects the maximum and depth of cut minimum.

Most widely used tool life equation and expressed in equation form

Ans42. d
Solution:

In cold working process

1. No heating required.
 2. The better surface finish obtained.
- Superior dimension control.

3. Better reproducibility and interchangeability of parts.
4. Improved strength properties like fatigue strength and tensile strength.

Ans43. b

Solution:

Ans44. b

Solution:

Ans45. d

Solution:

Ans46. b

Solution:

Ans47. c

Solution:

$$A = B = P \quad \theta = 90^\circ$$

Applying parallelogram law

$$R = \sqrt{P^2 + P^2}$$

$$R = P\sqrt{2}$$

Ans48. b

Solution:

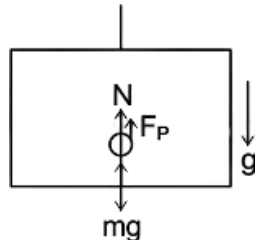
Ans49. b

Solution:

$$\begin{aligned} S &= ut + \frac{1}{2}at^2 \\ &= 0 + \frac{1}{2} \times 5 \times 5^2 \\ &= 125/2 = 62.5 \end{aligned}$$

Ans50. a

Solution:



Considering a pseudo force which is an apparent force that acts on all masses whose

motion is described using a non-inertial frame of reference, such as a rotating reference frame.

According to the problem

$$W - N = F_p$$

$$\Rightarrow mg - N = mg$$

$$\Rightarrow N = 0 \quad \therefore \text{No load is experienced by the man.}$$

Ans51. d

Solution:

Ans52. d

Solution:

Ans53. b

Solution:

$$\begin{aligned} \frac{V_1}{T_1} &= \frac{V_2}{T_2} \\ \frac{V}{300} &= \frac{2V}{T_2} \\ T_2 &= 600 - 273 = 327^\circ\text{C} \end{aligned}$$

Ans54. c

Solution:

Ans55. b

Solution:

$$\begin{aligned} \text{Given : } m &= 2 \text{ kg} \\ Q &= 500 \text{ KJ} \\ \Delta T &= 100^\circ\text{K} \\ Q &= mc\Delta T \\ 500 &= 2 \times C \times 100 \\ C &= 2.5 \text{ kJ}/(\text{kg}^\circ\text{K}) \end{aligned}$$

Ans56. c

Solution:

Ans57. c

Solution:

Ans58. c

Solution:

Ans59. a

Solution:

$$\rho = \frac{P}{RT}$$

Density and Temperature are inversely related at constant Pressure.

Initially, hot water has a lower density and cold water has a higher density. Due to the density differences, hot water floats above cold water. Due to temperature differences heat transfer takes place within the mixture from hot water to cold water. Molecules of hot water start moving downwards and molecules of cold water start moving upwards as they lose and gain heat respectively. Thus, the mixture comes in motion as a result of buoyancy force originated from variation in fluid density. \therefore This motion increases the molecule's randomness and thus increases the entropy of the mixture.

Ans60. c
Solution:

