Rajasthan Public Service Commission

Factories and Boilers Inspection Department Exam 2025

Inspector of Factories and Boilers – Question Paper

Exam Date:	19-Sep-2026
Exam Time:	10:00AM to 12:30PM
Test Duration:	150 mins
Total Inspector of Factories and Boilers Questions:	150
Maximum Marks – Inspector of Factories and Boilers:	150

Inspector of Factories and Boilers 1	In a Brayton cycle, compression and expansion processes are ideally:
Choice1	Isothermal
Choice2	Constant pressure
Choice3	Constant volume
Choice4	Isentropic
Inspector of Factories and Boilers 2	Calculate the value of Gas constant (R) of an ideal gas having molecular weight of 16.
Choice1	0.52 kJ/kgK
Choice2	0.26 kJ/kgK
Choice3	0.8314 kJ/kgK
Choice4	8.314 kJ/kgK
Inspector of Factories and Boilers 3	The boundary work (or PdV work) for a non-flow process depends on which of the following?
Choice1	Only the initial and final pressures of the system.
Choice2	The path followed during the process as well as the end states.
Choice3	Only the change in internal energy of the system.
Choice4	Only the amount of heat transferred to the system.

Inspector of Factories and Boilers 4	Which of the following is classified under the category of High grade energy?
Choice1	Heat derived from nuclear fission or fusion
Choice2	Heat derived from combustion of fossil fuels
Choice3	Tidal power
Choice4	Heat derived from solar energy
Inspector of Factories and Boilers 5	Which of the following is NOT obeyed by an ideal gas?
Choice1	Boyle’s law
Choice2	Dalton’s law of partial pressures
Choice3	Joule’s law of internal energy
Choice4	The variable value of specific heat
Inspector of Factories and Boilers 6	During steady flow compression process of a gas with mass flow rate of 2 kg/s, increase in specific enthalpy is 18 kJ/kg and decrease in kinetic energy is 3 kJ/kg. If the rate of heat rejection to the environment is 2 KJ/s, the power needed to drive the compressor (in kW) would be (Assuming the entry and exit of the compressor are at the same level)
Choice1	28
Choice2	44
Choice3	32
Choice4	37

Inspector of Factories and Boilers 7	Consider the following statements 1. The zeroth law of thermodynamics serves as a basis for the validity of temperature measurement. 2. The first law of thermodynamics is simply an expression of the conservation of energy principle, and it asserts that energy is a thermodynamic property. 3. The second law of thermodynamics asserts that energy has quality as well as quantity, and actual processes occur in the direction of decreasing quality of energy. 4. Van der Waal's equation is more related to ideal gases than the real gas at higher pressure. Which of the following statement(s) is/are correct?
Choice1	1, 2 and 3
Choice2	1 and 2
Choice3	1, 2 and 4
Choice4	1, 2, 3 and 4
Inspector of Factories and Boilers 8	A wind mill coupled to a generator develops 5kW of electric power as on average. Power produced by the generator charges a battery. Heat transfer from the battery is found to be 0.6kW. Estimate the total amount of energy stored in the battery during 8 hours of operation.
Choice1	1.27×10^4kJ
Choice2	2.54×10^5kJ
Choice3	2.54×10^4kJ
Choice4	1.27×10^5kJ
Inspector of Factories and Boilers 9	Which of the following is incorrect for entropy?
Choice1	Entropy can be defined as a parameter for quantifying the degree of molecular disorderliness in the system
Choice2	Entropy is a measure of driving potential available for a process to occur

Choice3	Entropy is also an indicator of the direction of occurrence of any thermodynamic process
Choice4	Entropy of an isolated system always decreases
Inspector of Factories and Boilers 10	Which of the following is incorrect regarding available and unavailable energy?
Choice1	Available energy is the maximum portion of energy which could be converted into useful work by ideal processes
Choice2	Available energy is not a property
Choice3	A dead state of a system is one which is in equilibrium with the earth and its atmosphere
Choice4	All the forms of energy cannot be converted completely into work even under ideal conditions
Inspector of Factories and Boilers 11	MPFI With regards to internal combustion engines stands for
Choice1	Multi-Port Fuel Injection
Choice2	Multi-Point Fuel Ignition
Choice3	Multi-Point Fuel Injection
Choice4	Multi-Port Fuel Ignition
Inspector of Factories and Boilers 12	In which year Emission Norms 'Bharat Stage III' Emission Norms for 4-wheelers' for entire country whereas 'Bharat Stage-IV (equivalent to Euro IV)' for 11 major cities was made applicable in India?
Choice1	1998
Choice2	2000
Choice3	2005
Choice4	2010
Inspector of Factories and Boilers 13	Velocity of flame propagation in the SI engine is maximum for air-fuel mixture which is _____ stoichiometric

Choice1	10% richer than
Choice2	equal to
Choice3	more than 10% richer than
Choice4	10% leaner than
Inspector of Factories and Boilers 14	The stroke (L) to bore (D) ratio for a condition of $L < D$ is known as:
Choice1	Over square
Choice2	Square
Choice3	Under square
Choice4	Double square
Inspector of Factories and Boilers 15	Which of the following is incorrect for an internal combustion engine?
Choice1	In a 2-stroke engine, the thermodynamic cycle is completed in one revolution of the crankshaft.
Choice2	In a 4-stroke engine, a heavier flywheel is needed as compared to 2-stroke engines.
Choice3	In a 4-stroke engine, a more cooling and lubrication is needed as compared to a 2-stroke engine.
Choice4	In a 4-stroke engine, wear and tear is less than a 2-stroke engine.
Inspector of Factories and Boilers 16	Find the brake specific fuel consumption of a diesel engine whose fuel consumption is 5 grams per second when the power output is 80 kW.
Choice1	0.225 kg/kWh
Choice2	0.45 kg/kWh
Choice3	1.225 kg/kWh
Choice4	2.25 kg/kWh

Inspector of Factories and Boilers 17	Which of the following characteristics is NOT imparted to lubricants by adding oil soluble organic compounds?
Choice1	Pour point depressors
Choice2	Viscosity index improvers
Choice3	Antifoam agent
Choice4	Oxidant agents
Inspector of Factories and Boilers 18	What role does NOx play in the formation of photochemical smog?
Choice1	NOx has no connection to smog formation
Choice2	NOx reacts with sunlight in the atmosphere, initiating reactions that form nitrogen oxide, ozone and other smog components
Choice3	NOx directly condenses to form smog particles without any sunlight involvement
Choice4	NOx only contributes to smog when mixed with carbon monoxide, never on its own
Inspector of Factories and Boilers 19	Which of the following statement is incorrect when using Liquid-Cooling System in engines?
Choice1	Compact design of engines with appreciably smaller frontal area is possible.
Choice2	The fuel consumption of high compression liquid-cooled engines are rather lower than for air-cooled ones.
Choice3	Because of the even cooling of cylinder barrel and head due to jacketing makes it possible to reduce the cylinder head and valve seat temperatures.
Choice4	In case of water-cooled engines, installation is necessarily at the front of the mobile vehicles, aircraft etc.
Inspector of Factories and Boilers 20	Which of the following is incorrect for the factors which affect the velocity of flame propagation in SI engines?
Choice1	Flame speed increases with an increase in intake temperature.
Choice2	Flame speed increases with an increase in intake pressure.

Choice3	Engines having lower compression ratios have higher flame speeds.
Choice4	Increased compression ratio increases the density of the cylinder gases during burning.
Inspector of Factories and Boilers 21	How are fin effectiveness and fin efficiency related to each other?
Choice1	They are always numerically identical
Choice2	Fin effectiveness equals fin efficiency multiplied by the ratio of fin surface area to base area
Choice3	Fin effectiveness equals the reciprocal of fin efficiency
Choice4	They are entirely unrelated quantities
Inspector of Factories and Boilers 22	Which of the following is correct for Nusselt number (Nu) and the Stanton Number (St)? Re is Reynolds number and Pr is Prandtl number
Choice1	Nu = Convective heat transfer/Conduction heat transfer and St = Nu/(Re.Pr)
Choice2	Nu = Conduction heat transfer/Convective heat transfer and St = Nu/(Re.Pr)
Choice3	Nu = Convective heat transfer/Conduction heat transfer and St = Nu.Re.Pr
Choice4	Nu = Convective heat transfer/Conduction heat transfer and St = Nu.Re/Pr
Inspector of Factories and Boilers 23	According to ISO Standard 7730, thermal comfort is defined as:
Choice1	A fixed dry-bulb temperature of 22°C maintained in all indoor spaces
Choice2	That condition of mind which expresses satisfaction with the thermal environment
Choice3	The absence of any air movement inside a conditioned space
Choice4	A relative humidity level held strictly between 40% and 60%
Inspector of Factories and Boilers 24	What does "1 met," the standard unit of metabolic rate, represent?
Choice1	The heat generated by a person doing maximum strenuous exercise

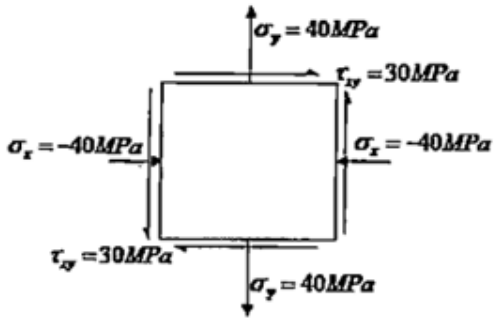
Choice2	The energy produced per unit body surface area by an average sedentary (seated, quiet) person
Choice3	The total heat loss from the human body through radiation alone
Choice4	The heat generated per unit body weight during sleep
Inspector of Factories and Boilers 25	An air-conditioned room has a sensible heat load of 36 kW and a latent heat load of 12 kW. What is the Room Sensible Heat Factor (RSHF) for this room?
Choice1	0.33
Choice2	0.50
Choice3	0.75
Choice4	0.90
Inspector of Factories and Boilers 26	Which of the following is correct for Wein's displacement law? $\lambda_{\max}$ is the wave length corresponding to the maximum value of the monochromatic emissive power, $\lambda_{\min}$is the wave length corresponding to the minimum value of the monochromatic emissive power, and T is the absolute temperature
Choice1	$\lambda_{min} \propto T$
Choice2	$\lambda_{min} \propto 1/T$
Choice3	$\lambda_{max} \propto T$
Choice4	$\lambda_{max} \propto 1/T$
Inspector of Factories and Boilers 27	Which of the following parameters are considered in the energy balance equation which describes the heat exchange between man and his environment? where M is metabolic rate, W is work done by man, Q is rate of convective, radiative, respirative and evaporative heat losses, S is rate of heat storage
Choice1	M, W and Q only
Choice2	M, Q and S only
Choice3	W, Q and S only

Choice4	M, W, Q and S
Inspector of Factories and Boilers 28	Which of the following is the NOT a drawback of simple vapour absorption cycle?
Choice1	Low temperature of the rich solution entering the generator
Choice2	High temperature of the poor solution entering the absorber
Choice3	Presence of absorbent in the vapour leaving the generator
Choice4	Low temperature of the rich solution entering the absorber
Inspector of Factories and Boilers 29	Atmospheric air at a dry bulb temperature of 15°C enters a heating coil whose surface temperature is maintained at 40°C. The air leaves the heating coil at 25°C. The contact factor of the heating coil is:
Choice1	0.375
Choice2	0.4
Choice3	0.6
Choice4	0.67
Inspector of Factories and Boilers 30	The fin effectiveness is low when:
Choice1	The fin is made of high thermal conductivity material
Choice2	The fin has high ratio of thermal conductivity to the heat transfer coefficient
Choice3	The convective heat transfer coefficient is low
Choice4	The fin has low ratio of perimeter to the base area
Inspector of Factories and Boilers 31	A heat pump for domestic heating operates between a cold system at 5°C and a hot system at 77°C. What is the minimum electric power consumption if the heat rejected is 70,000 kJ/hr?
Choice1	2 kW

Choice2	4 kW
Choice3	6 kW
Choice4	8 kW
Inspector of Factories and Boilers 32	In a vapour absorption refrigerator, heat is rejected in:
Choice1	condenser only
Choice2	generator only
Choice3	absorber only
Choice4	condenser and absorber
Inspector of Factories and Boilers 33	The effect of subcooling of a refrigerant before throttling is (under the same set of conditions)
Choice1	Compressor work increases
Choice2	Coefficient of performance increases
Choice3	Condenser capacity decreases
Choice4	Throttling losses increase
Inspector of Factories and Boilers 34	Fins are generally provided to enhance the rate of heat transfer. However, they may sometimes act as insulators. The non-dimensional number that determines whether the fin will increase or decrease heat transfer is:
Choice1	Eckert number
Choice2	Biot number
Choice3	Fourier number
Choice4	Peclet number
Inspector of Factories and Boilers 35	In the standard ASHRAE refrigerant designation R-abc, what does the digit "a" represent?
Choice1	The total number of atoms in the molecule

Choice2	The number of carbon atoms in the molecule minus one
Choice3	The number of chlorine atoms in the molecule
Choice4	The molecular weight of the compound divided by ten
Inspector of Factories and Boilers 36	A cable is insulated by a plastic sheathing (k = 0.4 W/mk). The convective film coefficient between the surface of the plastic sheathing and air is 30 W/ m^2K. Calculate critical radius of insulation
Choice1	13.33 mm
Choice2	75 mm
Choice3	26.66 mm
Choice4	150 mm
Inspector of Factories and Boilers 37	A simply supported beam of length L carries a load varying uniformly from zero at left end to maximum at right end. The maximum bending movement occur at distance of:
Choice1	$\frac{L}{\sqrt{3}}$ from left end
Choice2	$\frac{L}{\sqrt{2}}$ from left end
Choice3	$\frac{L}{\sqrt{3}}$ from right end
Choice4	$\frac{L}{\sqrt{2}}$ from right end
Inspector of Factories and Boilers 38	A 2.0-meter long steel bar has a cross-sectional area of 1000 mm^2. With an elastic limit of 180 MPa and Young's modulus as 180 GPa, its proof of resilience is:
Choice1	205 N.m
Choice2	180 N.m
Choice3	100 N.m
Choice4	1.0 N.m

Inspector of Factories and Boilers 39	The ratio of the shear modulus to module of elasticity is _____, If the poisson's ratio is 0.4
Choice1	$\frac{14}{5}$
Choice2	$\frac{5}{7}$
Choice3	$\frac{7}{5}$
Choice4	$\frac{5}{14}$
Inspector of Factories and Boilers 40	A steel rod 10 mm in diameter and 1m long is heated from 20°C to 120°C, Young's Modulus, E = 200 GPa and Coefficient of Thermal Expansion, α= 12 x 10^{-6}/°C. If the rod is not free to expand, the thermal stress developed in the rod is:
Choice1	120 MPa (tensile)
Choice2	240 MPa (tensile)
Choice3	120 MPa (compressive)
Choice4	240 MPa (compressive)
Inspector of Factories and Boilers 41	The angle of twist of a shaft increases with:
Choice1	Increase in shaft diameter
Choice2	Increase in shaft length
Choice3	Increase in modulus of rigidity
Choice4	Increase in polar moment of inertia

Inspector of Factories and Boilers 42	The state of stress at a point in a loaded member is shown in the figure. The magnitude of maximum shear stress is: 
Choice1	10 MPa
Choice2	30 MPa
Choice3	50 MPa
Choice4	100 MPa
Inspector of Factories and Boilers 43	The value of von-Mises stress is _____, if $\sigma_1 = 100$ MPa, $\sigma_2 = 50$ MPa and $\sigma_3 = 0$:
Choice1	Zero
Choice2	$30\sqrt{3}$ MPa
Choice3	$40\sqrt{3}$ MPa
Choice4	$50\sqrt{3}$ MPa
Inspector of Factories and Boilers 44	A material element is subjected to equal tensile stresses of magnitude σ acting on two mutually perpendicular planes. The corresponding Mohr circle is represented by:
Choice1	A circle of radius σ
Choice2	A circle of radius $\sigma/2$
Choice3	A circle of radius 2σ
Choice4	A point

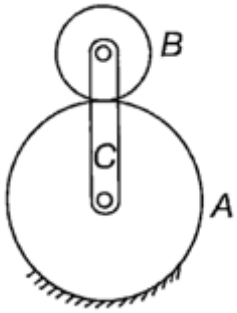
Inspector of Factories and Boilers 45	A pipe of external diameter 3 cm and internal diameter 2 cm and of length 4 m is supported at its ends. It carries a point load of 65 N at its centre. The sectional modulus of the pipe will be:
Choice1	$\frac{65\pi}{64}cm^3$
Choice2	$\frac{65\pi}{32}cm^3$
Choice3	$\frac{65\pi}{96}cm^3$
Choice4	$\frac{65\pi}{128}cm^3$
Inspector of Factories and Boilers 46	The ratio of Euler's buckling load of a column with both ends fixed to the same column with both ends hinged is:
Choice1	2
Choice2	4
Choice3	6
Choice4	8
Inspector of Factories and Boilers 47	A solid circular shaft is subjected to a bending moment $M$and a torque$T$. If the maximum bending stress is equal to the maximum shear stress developed in the shaft, the relationship between $M$and $T$is:
Choice1	$M = T/4$
Choice2	$M = T/2$
Choice3	$M = 2T$
Choice4	$M = 4T$
Inspector of Factories and Boilers 48	Which follower motion is generally preferred for high-speed cams?
Choice1	Uniform velocity
Choice2	Simple harmonic motion
Choice3	Cycloidal motion
Choice4	Constant acceleration

Inspector of Factories and Boilers 49	Two shafts perform the same function under identical static loading: shaft A is ductile steel, shaft B is brittle cast iron. If other factors are similar, how should the factor of safety (FoS) for shaft B compare to that for Shaft A?
Choice1	FoS for shaft B can be taken lower than for shaft A
Choice2	FoS for shaft B can be same as for shaft A
Choice3	FoS for shaft B should generally be higher than for shaft A
Choice4	FoS for shaft B is independent of material behavior
Inspector of Factories and Boilers 50	In a socket and spigot cotter joint subjected to a tensile load P, the spigot end is prone to crushing failure against the cotter. If d is the diameter of the spigot rod, $d_2$is the diameter of the spigot inside the socket, t is the thickness of the cotter, and $\sigma_c$is the allowable crushing stress, the crushing resistance area of the spigot is given by:
Choice1	$d_2 \times t$
Choice2	$(d_2 - d) \times t$
Choice3	$(\pi / 4)\left(d_2^2 - d^2\right)$
Choice4	$2d_2 \times t$
Inspector of Factories and Boilers 51	The primary function of caulking in a riveted joint is:
Choice1	To increase the tensile strength of plate.
Choice2	To enhance the appearance of the joint.
Choice3	To reduce the weight of the joint.
Choice4	To make the joint leak-proof.
Inspector of Factories and Boilers 52	The number of stress cycles for low cycle fatigue is
Choice1	Less than 1000 cycles
Choice2	More than 1000 cycles
Choice3	Less than 10^6 cycles

Choice4	More than 10^6 cycles
Inspector of Factories and Boilers 53	Which coupling is used to connect parallel shafts with a small amount of misalignment?
Choice1	Muff coupling
Choice2	Rigid Flange coupling
Choice3	Oldham coupling
Choice4	Sleeve bearing
Inspector of Factories and Boilers 54	Which statement is CORRECT about woodruff key
Choice1	The key does not permit axial movement between shaft and the hub
Choice2	The extra depth of key in the shaft reduces stress concentration
Choice3	The key cannot be used on tapered shaft
Choice4	The woodruff key is of rectangular section inserted half in the shaft and half in the hub
Inspector of Factories and Boilers 55	Two solid circular shafts, A and B, are made of the same material and are identical in all respects except for their diameters, $d_A$and d_B. Assuming both shafts operate at the same rotational speed, the ratio of the maximum power that can be transmitted by shaft A to that transmitted by shaft B is:
Choice1	$\frac{d_A}{d_B}$
Choice2	$\left(\frac{d_A}{d_B}\right)^2$
Choice3	$\left(\frac{d_A}{d_B}\right)^3$
Choice4	$\left(\frac{d_A}{d_B}\right)^{\frac{1}{3}}$
Inspector of Factories and Boilers 56	The gear backlash is defined as:

Choice1	The hardness of the gear material
Choice2	The thickness of a single gear tooth
Choice3	The clearance between meshing gear teeth
Choice4	The lubrication of gear tooth
Inspector of Factories and Boilers 57	A journal bearing has a diameter of 0.05 m and a length of 0.05 m and rotates at a speed of 20 rev/s while supporting a load of 2000 N. The lubricant has a dynamic viscosity of 2.0×10^{-2}Pa.s, and the radial clearance between the journal and the bearing is $5.0 \times 10^{-5} m$. The Sommerfeld number for the bearing is
Choice1	0.0625
Choice2	0.125
Choice3	0.200
Choice4	0.400
Inspector of Factories and Boilers 58	In a thin cylindrical pressure vessel with closed ends subjected to internal pressure, the ratio of the circumferential stress to the longitudinal stress is:
Choice1	0.50
Choice2	1.00
Choice3	2.00
Choice4	4.00
Inspector of Factories and Boilers 59	Considering only internal pressure p_i, the maximum value of radial stress in a thick cylindrical wall equals
Choice1	$p_i$and compressive
Choice2	$p_i$and tensile
Choice3	$\frac{p_i}{2}$ and compressive
Choice4	$\frac{p_i}{2}$and tensile

Inspector of Factories and Boilers 60	In a thick cylindrical pressure vessel, the variation of the hoop stress is:
Choice1	uniform
Choice2	parabolic
Choice3	linear
Choice4	cubic
Inspector of Factories and Boilers 61	A cast iron pipe of 750 mm diameter is used to carry water under a head of 60 m. The thickness of the pipe is ___, if permissible stress is 20 MPa. $(\rho g)_{water}$= 10^4 ($\frac{\text{kg}}{m^3} \cdot \frac{m}{\text{sec}^2}$)
Choice1	$\left(\frac{15}{4}\right)$mm
Choice2	$\left(\frac{25}{4}\right)$mm
Choice3	$\left(\frac{40}{3}\right)$mm
Choice4	$\left(\frac{45}{4}\right)$mm
Inspector of Factories and Boilers 62	A slow and progressive deformation of the material with time under constant stress at high temperature is called as:
Choice1	Deformation
Choice2	Fracture
Choice3	Creep
Choice4	Fatigue
Inspector of Factories and Boilers 63	Which formula is commonly used to calculate the degree of freedom of a planar mechanism:
Choice1	Euler's Formula
Choice2	Gruebler's Equation
Choice3	Bernoulli's Equation
Choice4	Kennedy Theorem

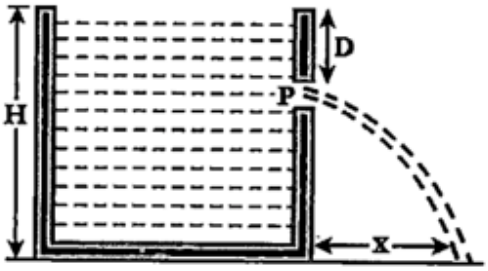
Inspector of Factories and Boilers 64	A circular shaft revolving inside a bearing is an example of:
Choice1	Rolling pair
Choice2	Screw pair
Choice3	Spherical pair
Choice4	Turning pair
Inspector of Factories and Boilers 65	Consider the epicyclic gear train shown in Figure below. Gear A is fixed and has 100 teeth, while gear B has 20 teeth. If the arm (carrier) C rotates through 3 revolutions, determine the number of revolutions made by gear B. 
Choice1	18
Choice2	15
Choice3	12
Choice4	24
Inspector of Factories and Boilers 66	In case of involute gear teeth, the pressure angle is:
Choice1	Zero at the pitch point.
Choice2	Maximum at the engagement of teeth.
Choice3	Minimum at the engagement of teeth.
Choice4	Same at all points of contact.

Inspector of Factories and Boilers 67	A rope drive transmits 120 kW of power from a pulley of 2 m effective diameter rotating at 60 rpm. The maximum allowable tension in each rope is 2000 N. The tension ratio is $\frac{T_1}{T_2} = 5$. Neglecting centrifugal tension and taking $\pi = 3$, the number of ropes required will be
Choice1	10
Choice2	11
Choice3	12
Choice4	13
Inspector of Factories and Boilers 68	If the number of teeth on sprocket is 6 and PCD of the sprocket is 200 mm what is the pitch of chain?
Choice1	50 mm
Choice2	75 mm
Choice3	100 mm
Choice4	125 mm
Inspector of Factories and Boilers 69	In the case of multi-plate clutch, if n is the total number of plates on the driving and the driven members, the number of active surfaces will be:
Choice1	n
Choice2	n-1
Choice3	2(n-1)
Choice4	3(n-1)
Inspector of Factories and Boilers 70	A Hartnell governor is a/an____ governor.
Choice1	dead weight
Choice2	pendulum type
Choice3	spring-loaded
Choice4	inertia

Inspector of Factories and Boilers 71	The flywheel of a steam engine has a radius of gyration, angular acceleration and mass are 1.0 meter, 1.0 rad/s^2 and 2500 kg, respectively. Determine the kinetic energy of flywheel after 10 seconds from the start.
Choice1	100 kN-m
Choice2	110 kN-m
Choice3	125 kN-m
Choice4	130 kN-m
Inspector of Factories and Boilers 72	Why is balancing of rotating parts necessary in machines?
Choice1	To increase machine weight
Choice2	To reduce shaft diameter only
Choice3	To increase friction
Choice4	To reduce vibration and unbalanced forces
Inspector of Factories and Boilers 73	What is the peak value of the primary unbalanced force for a single cylinder machine with a piston of mass 0.5 kg with crank radius of 50 mm when the speed of rotation is 2100 r.p.m. (Take $\pi = \frac{22}{7}$)
Choice1	1110 N
Choice2	1210 N
Choice3	1300 N
Choice4	7500 N
Inspector of Factories and Boilers 74	An aeroplane makes a complete half circle of 50 meters radius, towards left, when flying at 50 m/s. The rotary engine and the propeller of the plane have a mass of 400 kg and a radius of gyration of 0.3 m. The engine rotates with angular velocity of 220 rad/s clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft.
Choice1	9720 N-m
Choice2	7920 N-m

Choice3	2790 N-m
Choice4	7790 N-m
Inspector of Factories and Boilers 75	In free vibrations, the acceleration vector leads the displacement vector by:
Choice1	$\frac{3\pi}{2}$ radian
Choice2	π radian
Choice3	$\frac{\pi}{3}$ radian
Choice4	$\frac{\pi}{2}$ radian
Inspector of Factories and Boilers 76	In the context of forced vibration of a spring-mass system, the magnification factor is defined as the ratio of:
Choice1	Natural frequency to forcing frequency
Choice2	Steady-state amplitude or Dynamic amplitude to static deflection
Choice3	Velocity to displacement
Choice4	Displacement to velocity
Inspector of Factories and Boilers 77	At a certain point in castor oil, the shear stress is 0.022 kgf/m^2 and the velocity gradient is 0.22 per second. The dynamic viscosity of castor oil in poises is numerically equal to:
Choice1	0.1 g
Choice2	1 g
Choice3	10 g
Choice4	100 g
Inspector of Factories and Boilers 78	Vacuum pressure is defined as:
Choice1	Pressure above the atmospheric pressure.
Choice2	Atmospheric pressure + gauge pressure.

Choice3	Atmospheric pressure – Absolute pressure.
Choice4	Atmospheric pressure + Absolute pressure.
Inspector of Factories and Boilers 79	An open tank contains a liquid and is made to slide down an inclined plane with uniform velocity. The free surface of the liquid will be
Choice1	parallel to the plane of inclined plane
Choice2	inclined to the horizontal at an angle tan α = 1/g
Choice3	inclined to the horizontal at an angle which depends upon the shape of the inclined plane
Choice4	horizontal
Inspector of Factories and Boilers 80	A floating body is in stable equilibrium when:
Choice1	Centre of gravity is above metacentre
Choice2	Metacentre lies above centre of gravity
Choice3	Centre of buoyancy coincides with centre of gravity
Choice4	Metacentre is below centre of buoyancy
Inspector of Factories and Boilers 81	A horizontal circular pipe carries an incompressible fluid under laminar flow conditions. Initially, the head loss due to friction is h_1 . If the average flow velocity is doubled while the pipe diameter is reduced to one-half of its original value, with the pipe length and fluid properties remaining unchanged, the ratio of the new head loss (h_2) to the initial head loss (h_1) is
Choice1	2
Choice2	4
Choice3	8
Choice4	16

Inspector of Factories and Boilers 82	For a given centrifugal pump,
Choice1	head varies inversely as square of speed
Choice2	discharge varies directly as speed
Choice3	discharge varies directly as square of speed
Choice4	power varies directly as fifth power of speed
Inspector of Factories and Boilers 83	Water is stored in a tank up to a height H. A small orifice is provided on one of the vertical walls at a depth D below the free surface, allowing water to discharge horizontally into the atmosphere, as shown in the figure. Neglecting all losses, determine the horizontal distance$x$travelled by the water jet before it strikes the ground. 
Choice1	$x = \sqrt{D(H-D)}$
Choice2	$x = \frac{\sqrt{D(H-D)}}{2}$
Choice3	$x = 2\sqrt{D(H-D)}$
Choice4	$x = 4\sqrt{D(H-D)}$
Inspector of Factories and Boilers 84	A large water tank is fitted with two identical sharp-edged orifices located at depths of 16 cm and 25 cm below the free surface. Assuming the coefficient of discharge is the same for both orifices, what is the ratio of the discharge through the upper orifice to that through the lower orifice?
Choice1	2:3

Choice2	3:4
Choice3	4:5
Choice4	1:2
Inspector of Factories and Boilers 85	A venturimeter is installed in a horizontal pipeline carrying an incompressible fluid. If the throat diameter is one-third of the pipe diameter and the fluid velocity in the pipe is 2 m/s, determine the velocity at the throat, assuming ideal flow.
Choice1	6 m/s
Choice2	9 m/s
Choice3	18 m/s
Choice4	24 m/s
Inspector of Factories and Boilers 86	Match the following efficiencies of turbines:

Hydraulic efficiency	$\frac{Power\ at\ the\ shaft\ of\ turbine}{Power\ supplied\ by\ water\ at\ inlet}$
Mechanical Efficiency	$\frac{Volume\ of\ water\ actually\ striking\ runner}{Volume\ of\ water\ supplied\ to\ turbine}$
Volumetric efficiency	$\frac{Power\ at\ the\ shaft\ of\ turbine}{Power\ delivered\ by\ water\ to\ runner}$
Overall efficiency	$\frac{Power\ delivered\ by\ water\ to\ runner}{Power\ supplied\ by\ water\ at\ inlet}$

Choice1	A-III, B-I, C-II, D-IV
Choice2	A-I, B-III, C-II, D-IV
Choice3	A-IV, B-III, C-II, D-I
Choice4	A-IV, B-I, C-II, D-III
Inspector of Factories and Boilers 87	Negative slip in a reciprocating pump is most likely to occur under which of the following operating conditions?
Choice1	A long delivery pipe with a short suction pipe and operating at low speed.

Choice2	A long delivery pipe with a short suction pipe and operating at high speed.
Choice3	A short delivery pipe with a long suction pipe and operating at low speed.
Choice4	A short delivery pipe with a long suction pipe and operating at high speed.
Inspector of Factories and Boilers 88	The specific speeds of two hydraulic turbines are identical, and both turbines operate under the same effective head. If turbine 1 rotates at twice the speed of turbine 2, then the ratio of their power outputs, $\left(\frac{P_2}{P_1}\right)$ is
Choice1	4
Choice2	16
Choice3	8
Choice4	2
Inspector of Factories and Boilers 89	A smooth two-dimensional flat plate is exposed to wind velocity of 100 m/s (kinematic viscosity 0.15 stokes). If the transition Reynolds number is 2 x 10^5, the maximum distance from the leading edge upto which laminar boundary layer exists is
Choice1	3 mm
Choice2	3 cm
Choice3	30 cm
Choice4	3 m
Inspector of Factories and Boilers 90	For reaction radial flow turbine, if u: tangential velocity of wheel at inlet v_{f1}: Velocity of flow at inlet H: head on the turbine, the flow ratio is expressed as
Choice1	$\frac{u}{\sqrt{2gH}}$
Choice2	$\frac{u}{\sqrt{gH}}$

Choice3	$\frac{v_{f1}}{\sqrt{gH}}$
Choice4	$\frac{v_{f1}}{\sqrt{2gH}}$
Inspector of Factories and Boilers 91	Which of the following welding creates a joint by heating the joint without any filler metal?
Choice1	Oxy - acetylene welding
Choice2	Electric arc welding
Choice3	Electric resistance welding
Choice4	Thermit welding
Inspector of Factories and Boilers 92	The most desirable flame used in ideal condition of oxy-acetylene welding is -
Choice1	Neutral flame
Choice2	Carburizing flame
Choice3	Oxidizing flame
Choice4	Combination of oxidizing and carburizing flame
Inspector of Factories and Boilers 93	There is no sure way of quantifying ____ allowance, since it is highly dependent on the foundry personnel and practices involved.
Choice1	Shake
Choice2	Shrinkage
Choice3	Machining
Choice4	Draft
Inspector of Factories and Boilers 94	The principal breakdown pass sequences in rolling are:
Choice1	Box-pass series, Diamond-square series, Oval-square series.
Choice2	Diamond-square series, Box-pass series, Oval-square series.

Choice3	Box-pass series, Oval-square series, Diamond-square series.
Choice4	Oval-square series, Diamond-square series, Box-pass series.
Inspector of Factories and Boilers 95	Irregular depressions on the surface of the forging is called as -
Choice1	Flakes
Choice2	Cold shut
Choice3	Die shift
Choice4	Scale pits
Inspector of Factories and Boilers 96	The following is always a cold working operation:
Choice1	Rolling
Choice2	Wire drawing
Choice3	Forging
Choice4	Extrusion
Inspector of Factories and Boilers 97	Taylor's tool life equation is - where, $T$is the tool life in minutes, V is the cutting speed in m/min, and c and n are constants.
Choice1	$VT^n = c$
Choice2	$V^nT = c$
Choice3	$VT^{n+1} = c$
Choice4	$VT^{n-1} = c$
Inspector of Factories and Boilers 98	In _____ operation in lathe, the work held in the spindle is rotated while the tool is fed past the workpiece in a direction parallel to the axis of rotation.
Choice1	Turning
Choice2	Facing

Choice3	Boring
Choice4	Drilling
Inspector of Factories and Boilers 99	18-4-1 high speed steel contains following elements in the ratio of 18:4:1.
Choice1	Tungsten, Chromium, Vanadium
Choice2	Chromium, Vanadium, Tungsten
Choice3	Tungsten, Manganese, Chromium
Choice4	Tungsten, Vanadium, Chromium
Inspector of Factories and Boilers 100	Which of the following operation is identical to the squeezing of toothpaste out of a toothpaste tube:
Choice1	Rolling
Choice2	Forging
Choice3	Extrusion
Choice4	Stamping
Inspector of Factories and Boilers 101	KANBAN is related to -
Choice1	Quality Control
Choice2	Just-in-time
Choice3	Project Management
Choice4	Labour acts
Inspector of Factories and Boilers 102	PERT is:
Choice1	Programme evaluation and review technique
Choice2	Project evaluation and review technique.
Choice3	Programme evaluation and rewind technique

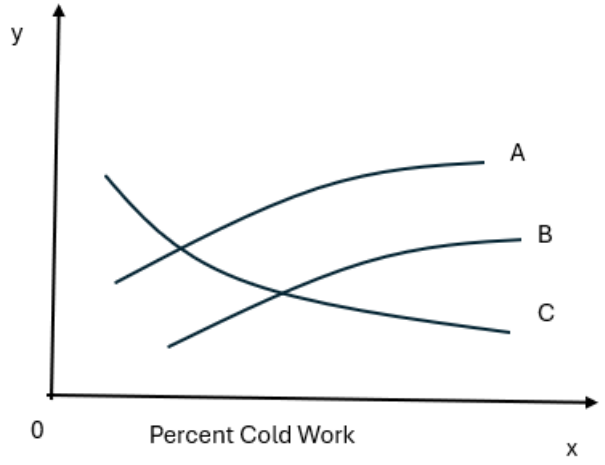
Choice4	People evaluation and rewind technique
Inspector of Factories and Boilers 103	The following Supply chain strategy is associated with zero Inventory and Lean operation systems:
Choice1	Push-based
Choice2	Pull-based
Choice3	Push-Pull
Choice4	Push-Push
Inspector of Factories and Boilers 104	According to Maslow's Hierarchy of Needs Theory, which need must be satisfied first?
Choice1	Social needs
Choice2	Esteem needs
Choice3	Self-actualization needs
Choice4	Physiological needs
Inspector of Factories and Boilers 105	Risk pooling is most effective when demand variations across different locations are:
Choice1	Opposite in nature
Choice2	Similar in nature
Choice3	Unrelated to each other
Choice4	No variation in demand exists
Inspector of Factories and Boilers 106	Which control chart is not associated with attributes?
Choice1	P Chart
Choice2	$\bar{X}$ Chart
Choice3	nP Chart

Choice4	C Chart
Inspector of Factories and Boilers 107	Which of the following best describes Acceptance Sampling in Statistical Quality Control?
Choice1	It monitors the production process to reduce process variation.
Choice2	It involves inspecting incoming raw materials and finished goods to decide whether to accept or reject a lot.
Choice3	It measures the average production time of a manufacturing process.
Choice4	It controls scheduling of work on machines.
Inspector of Factories and Boilers 108	Identify the incorrect statement:
Choice1	Reliability is a condition related to chance or probability.
Choice2	Reliability depends upon the operating conditions.
Choice3	Reliability depends upon the interval for which the system operates.
Choice4	Probability that a failed item will be restored to operational effectiveness is Reliability.
Inspector of Factories and Boilers 109	ISO 9000 mainly deals with:
Choice1	Occupational Health and Safety management
Choice2	Quality management system
Choice3	Information Security management system
Choice4	Business Continuity management system
Inspector of Factories and Boilers 110	ISO 14000 specifies requirements for:
Choice1	Food Safety management system
Choice2	Environment management System
Choice3	Health care management system

Choice4	Product design standards
Inspector of Factories and Boilers 111	EOQ in Inventory control is: where: $D \rightarrow$Annual demand $C_o \rightarrow$ordering cost $C_h \rightarrow$carrying cost / holding cost
Choice1	$\sqrt{\frac{2DC_0}{C_h}}$
Choice2	$\frac{\sqrt{2DC_0}}{C_h}$
Choice3	$2\sqrt{\frac{DC_0}{C_h}}$
Choice4	$\sqrt{2D}\frac{C_0}{C_h}$
Inspector of Factories and Boilers 112	SDE analysis of inventory deals with: Where S is Scarce, D is difficult, E is easy
Choice1	Utility of the materials
Choice2	Cost of the materials
Choice3	Availability of the material
Choice4	Quality of the material
Inspector of Factories and Boilers 113	Nickel in steel primarily improves:
Choice1	Brittleness
Choice2	Toughness
Choice3	Hot Shortness

Choice4	Thermal Conductivity
Inspector of Factories and Boilers 114	Pearlite, in Iron-Carbon phase diagram, is an intimate mixture of ferrite and___
Choice1	Cementite
Choice2	Austenite
Choice3	Ledeburite
Choice4	Martensite
Inspector of Factories and Boilers 115	Medium-Carbon Steel Contains:
Choice1	0.05 - 0.30% Carbon
Choice2	0.30 - 0.60% Carbon
Choice3	0.60 - 1.50% Carbon
Choice4	2.11 - 4.3% Carbon
Inspector of Factories and Boilers 116	_____ is the temperature, in the Iron-Carbon phase diagram, during heating at which pearlite changes to Austenite.
Choice1	Upper critical temperature
Choice2	Lower critical temperature
Choice3	Curie temperature
Choice4	Room temperature
Inspector of Factories and Boilers 117	Which of the following is unwanted impurity present in plain carbon steels:
Choice1	Sulphur
Choice2	Manganese
Choice3	Carbon
Choice4	Silicon

Inspector of Factories and Boilers 118	Which of the following alloying elements is predominantly added to steel to improve its corrosion resistance?
Choice1	Manganese
Choice2	Chromium
Choice3	Silicon
Choice4	Phosphorus
Inspector of Factories and Boilers 119	Which of the following is NOT a heat treatment process?
Choice1	Annealing
Choice2	Case Hardening
Choice3	Tempering
Choice4	Galvanizing
Inspector of Factories and Boilers 120	Ferrite (α - Iron) has which crystal structure?
Choice1	BCC
Choice2	FCC
Choice3	BCT
Choice4	HCP
Inspector of Factories and Boilers 121	Calorising is a surface treatment process in which the surface of steel is enriched with:
Choice1	Chromium
Choice2	Zinc
Choice3	Aluminium
Choice4	Nickel

Inspector of Factories and Boilers 122	Graph shows the variation of mechanical properties with the amount of mechanical work. 
Choice1	A - Strength B - Ductility C - Hardness
Choice2	A - Strength B - Hardness C - Ductility
Choice3	A - Ductility B - Strength C - Hardness
Choice4	A - Hardness B - Ductility C - Strength
Inspector of Factories and Boilers 123	When a variation in hardness on the surface of a hardened steel is obtained, the defect in heat treatment is called as:
Choice1	Warping
Choice2	Distortion
Choice3	Soft spots
Choice4	Decarburization
Inspector of Factories and Boilers 124	The relation between the case-depth and the time of carburizing is given by: where K= a constant t= time of carburizing in hours.
Choice1	Case-depth =$\sqrt{Kt}$
Choice2	Case-depth = $K\sqrt{t}$

Choice3	Case depth = $t\sqrt{K}$
Choice4	Case depth = Kt
Inspector of Factories and Boilers 125	The Brinell hardness number is given by: where P= Load applied, kg D= Indenter ball diameter, mm
Choice1	$B.H.N. = \frac{P}{\pi D \times depth\ of\ indentation}$
Choice2	$B.H.N. = \frac{\pi D}{P \times depth\ of\ indentation}$
Choice3	$B.H.N. = \frac{depth\ of\ indentation}{P \times \pi D}$
Choice4	$B.H.N. = \frac{P \times \pi D}{depth\ of\ indentation}$
Inspector of Factories and Boilers 126	Which of the following materials cannot be tested using Magnetic Particle Testing?
Choice1	Mild Steel
Choice2	Cast Iron
Choice3	Aluminium
Choice4	Carbon Steel
Inspector of Factories and Boilers 127	For brittle materials, like cast iron, the modulus of toughness is: where $\sigma_u$is ultimate tensile strength e_f is strain at fracture.
Choice1	$\frac{1}{3}\sigma_u \times e_f$
Choice2	$\frac{2}{3}\sigma_u \times e_f$

Choice3	$\sigma_u \times e_f$
Choice4	$2\sigma_u \times e_f$
Inspector of Factories and Boilers 128	Liquid Penetrant Testing (LPT) is primarily used to detect:
Choice1	Strength
Choice2	Surface cracks
Choice3	Grain size
Choice4	Chemical composition
Inspector of Factories and Boilers 129	The correct sequence of creep deformation in a creep curve, in order of their elongation is:
Choice1	steady state, transient, accelerated
Choice2	transient, steady state, accelerated
Choice3	transient, accelerated, steady state
Choice4	accelerated, steady state, transient
Inspector of Factories and Boilers 130	The basic principle of Ultrasonic Testing (UT) is based on the propagation and reflection of:
Choice1	X-rays
Choice2	Magnetic flux
Choice3	High-frequency sound waves
Choice4	Visible light
Inspector of Factories and Boilers 131	Which of the following is not a Non-Destructive Testing Method?
Choice1	Ultrasonic Testing
Choice2	Radiographic Testing

Choice3	Tensile Testing on UTM
Choice4	Liquid Penetrant Testing
Inspector of Factories and Boilers 132	The power requirements of electromagnets in Magnetic Particle Testing is:
Choice1	High amperage and low voltage
Choice2	High amperage and high voltage
Choice3	Low amperage and low voltage
Choice4	Low amperage and high voltage
Inspector of Factories and Boilers 133	Radiographic Testing (RT) is primarily used to detect which type of weld discontinuity?
Choice1	Surface scratches only
Choice2	Internal porosity and slag inclusions
Choice3	Surface corrosion only
Choice4	Surface hardness variations
Inspector of Factories and Boilers 134	The Scleroscope is an instrument for determining the _____ of metals.
Choice1	Resilience
Choice2	Toughness
Choice3	Creep
Choice4	Rebound Hardness
Inspector of Factories and Boilers 135	The primary purpose of the Charpy impact test is to determine a material's:
Choice1	Hardness
Choice2	Anti-corrosion property
Choice3	Ability to absorb energy during sudden fracture

Choice4	Wear resistance
Inspector of Factories and Boilers 136	Which of the following is NOT an axial flow turbine?
Choice1	Kaplan turbine
Choice2	Jonval turbine
Choice3	Girard turbine
Choice4	Fourneyron turbine
Inspector of Factories and Boilers 137	Which of the following power plant cycle is NOT classified under Vapour power cycle?
Choice1	Otto cycle
Choice2	Rankine cycle
Choice3	Regenerative cycle
Choice4	Reheat cycle
Inspector of Factories and Boilers 138	The fusible metal used in a fusible plug melts when:
Choice1	Boiler pressure increases
Choice2	Water level falls below the safe limit
Choice3	Steam temperature decreases
Choice4	Feed water pressure increases
Inspector of Factories and Boilers 139	The primary function of a moderator in a nuclear reactor is to:
Choice1	Absorb neutrons
Choice2	Slow down fast neutrons
Choice3	Increase reactor temperature
Choice4	Shield radiation

Inspector of Factories and Boilers 140	Which of the following is NOT a requirement of a good boiler?
Choice1	The initial cost, installation cost and the maintenance cost should be as low as possible
Choice2	The boiler should be light in weight, and should occupy small floor area.
Choice3	The boiler must be able to meet the fluctuating demands without pressure fluctuations.
Choice4	The boiler should have a maximum of joints to avoid leaks which may occur due to expansion and contraction
Inspector of Factories and Boilers 141	A pendant superheater receives heat mainly by:
Choice1	Radiation only
Choice2	Convection only
Choice3	Conduction only
Choice4	Partly by convection and partly by radiation
Inspector of Factories and Boilers 142	Feed water with specific volume 0.001 m^3/kg is pumped from a condenser pressure of 0.1 bar to a boiler pressure of 70 bar. What is the approximate pump work per kg of water?
Choice1	0.7 kJ/kg
Choice2	6.99 kJ/kg
Choice3	69.9 kJ/kg
Choice4	699 kJ/kg
Inspector of Factories and Boilers 143	In a single-heater regenerative cycle, bled steam enters the feed water heater with enthalpy 2800 kJ/kg. The saturated liquid leaving the heater has enthalpy 720 kJ/kg, and the condensate entering the heater has enthalpy 200 kJ/kg. Using the heater energy balance, find the mass fraction of bled steam per kg of throttle flow.
Choice1	0.10 kg
Choice2	0.20 kg

Choice3	0.30 kg
Choice4	0.40 kg
Inspector of Factories and Boilers 144	For maximum efficiency, the ratio of blade velocity to the absolute velocity at exit of nozzle.
Choice1	Double
Choice2	Half
Choice3	One-Third
Choice4	Two-Third
Inspector of Factories and Boilers 145	Which of the following sentence is correct?
Choice1	Conversion ratio for Breeder reactor is more than 1
Choice2	If the fissionable material produced is more than the consumed, the reactor is called Breeder reactor
Choice3	If the fissionable material produced is equal to or less than the consumed, the reactor is called Converter reactor
Choice4	Conversion ratio is defined as the ratio of the number of consumed primary fuel atoms to the number of secondary fuel atoms
Inspector of Factories and Boilers 146	A diesel engine delivers 2000 BHP and uses 400 HP to overcome friction. Find the IHP and Mechanical efficiency of the engine.
Choice1	1600 HP and 80%
Choice2	2400 HP and 83%
Choice3	2000 HP and 100%
Choice4	2400 HP and 90%
Inspector of Factories and Boilers 147	A steam turbine which has blade efficiency as 90% and nozzle efficiency as 91%. Calculate stage efficiency for an impulse stage of the steam turbine.
Choice1	10%

Choice2	9%
Choice3	98.9%
Choice4	81.9%
Inspector of Factories and Boilers 148	Which of the following is incorrect for surface condensers?
Choice1	The condensate can be used as boiler feed water
Choice2	Cooling water of poorer quality can be used
Choice3	High vacuum can be obtained in the surface condenser
Choice4	High vacuum decreases the thermal efficiency of the plant
Inspector of Factories and Boilers 149	In a reheat cycle, steam enters the turbine with enthalpy 3300 kJ/kg, expands to enthalpy 3000 kJ/kg before reheat. It is then reheated to enthalpy 3500 kJ/kg, and then expands to a final enthalpy of 2500 kJ/kg. What is the total work done by the turbine per kg of steam?
Choice1	800 kJ/kg
Choice2	1000 kJ/kg
Choice3	1300 kJ/kg
Choice4	1800 kJ/kg
Inspector of Factories and Boilers 150	In low speed ball and tube mill pulverization occurs mainly because of:
Choice1	Centrifugal force only
Choice2	Attrition and impact
Choice3	Crushing and attrition
Choice4	Cutting action only