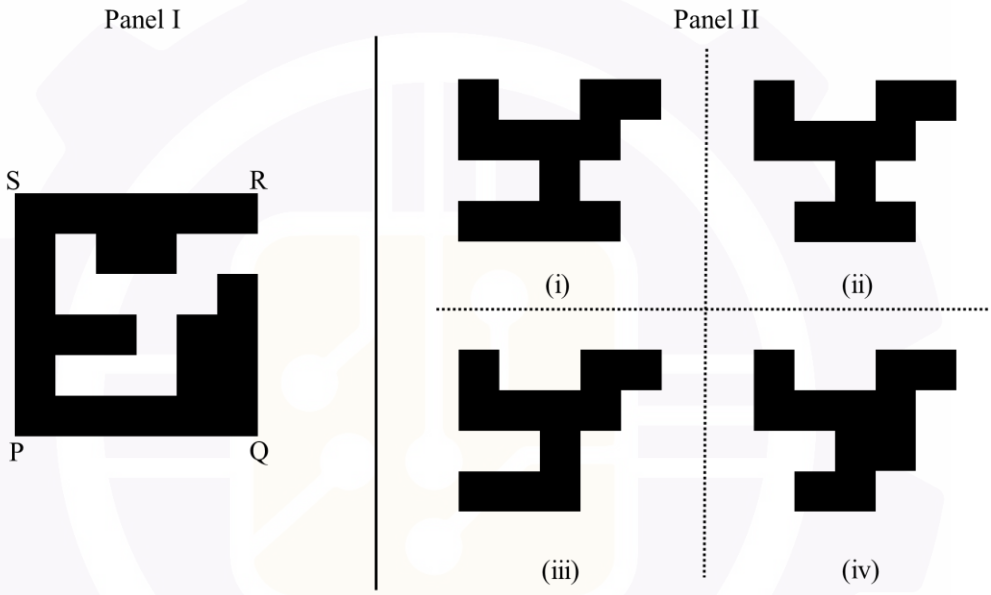
General Aptitude (GA)

Q.1 – Q.5 Carry ONE mark Each

Q.1	Expedite, Hasten, Hurry, _____ Fill the blank by choosing a word with a meaning similar to that of the words given above.
(A)	Accelerate
(B)	Retard
(C)	Provide
(D)	Disable

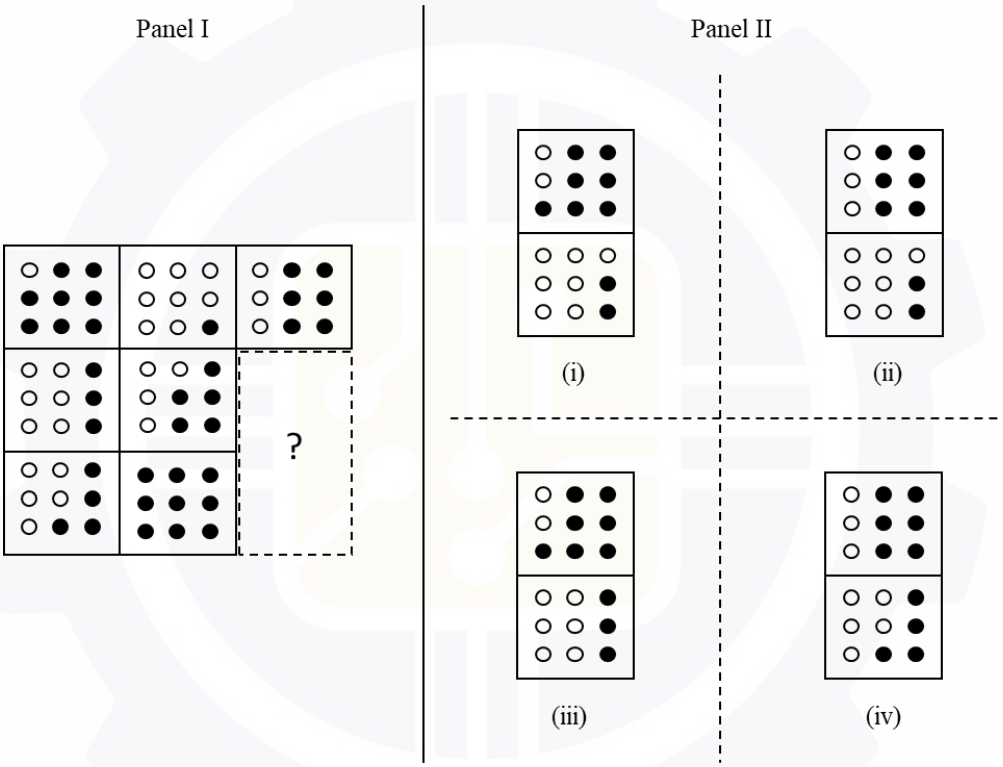
Q.2	A black square PQRS has been cut into two parts. One part of it is shown in Panel I. Which one of the shapes in Panel II is the other part? 
(A)	(i)
(B)	(ii)
(C)	(iii)
(D)	(iv)

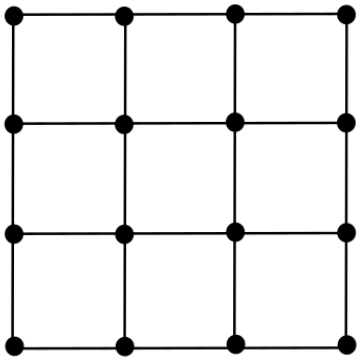
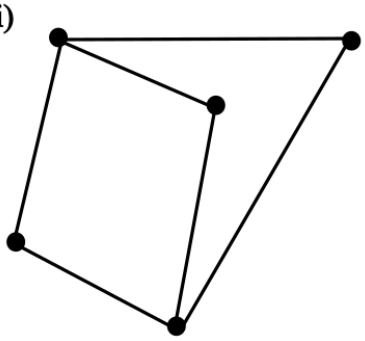
Q.3	A day can only be cloudy or sunny. The probability of a day being cloudy is 0.5, independent of the condition on other days. What is the probability that in any given four days, there will be three cloudy days and one sunny day?
(A)	1/4
(B)	3/4
(C)	2/3
(D)	3/8

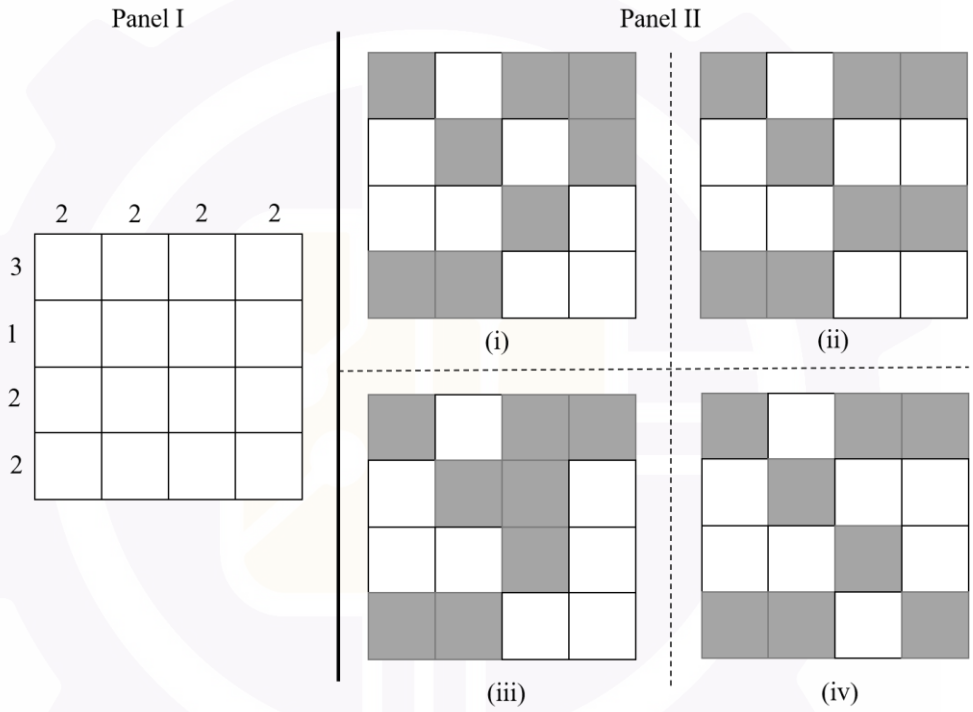
Q. 4	The values of Stock A and Stock B on a particular day are Rs. 50 and Rs. 80, respectively. An investor invests Rs. 100 in Stock A and Rs. 80 in Stock B. He sells all the stocks the next day when the value of Stock A is Rs. 55 and Stock B is Rs. 70. The profit made by the investor is Rs. _____
(A)	0
(B)	5
(C)	10
(D)	20
Q.5	‘When it is raining, peacocks dance.’ Based only on this sentence, which one of the following options is necessarily true?
(A)	Peacocks dance only when it is raining.
(B)	When peacocks dance, it is raining.
(C)	When peacocks are not dancing, it is not raining.
(D)	When it is not raining, peacocks do not dance.

Q.6 – Q.10 Carry TWO marks Each

Q.6	Water : P :: Food : Q Choose the P and Q combination from the options below to form a meaningful analogy.
(A)	P = Thirst; Q = Hunger
(B)	P = Drink; Q = Hunger
(C)	P = Thirst; Q = Satiated
(D)	P = Wet; Q = Critic

Q.7	Two tiles are missing in Panel I. Which one of the options in Panel II is the appropriate choice for the missing tiles? 
(A)	(i)
(B)	(ii)
(C)	(iii)
(D)	(iv)

Q.8	Figures (i) and (ii) represent intercity highway systems. The black dots represent cities and the line segments between them represent intercity highways. A salesperson needs to make a trip. She needs to start from a city, visit each of the remaining cities exactly once, and finally return to the same city from which she started. Which one of the following options is then true? (i)  (ii) 
(A)	Such a trip is possible for (i), but not for (ii).
(B)	Such a trip is possible for (ii), but not for (i).
(C)	Such a trip is possible for both (i) and (ii).
(D)	Such a trip is possible neither for (i) nor for (ii).

Q. 9	The figure in Panel I below is a grid of cells with four rows and four columns. The numbers on the top and on the left represent the number of cells that are to be shaded in that column and row, respectively. Which one of the options shown in Panel II below represents the grid shaded correctly? 
(A)	(i)
(B)	(ii)
(C)	(iii)
(D)	(iv)

Q.10	An unbiased six-faced dice whose faces are marked with numbers 1, 2, 3, 4, 5, and 6 is rolled twice in succession and the number on the top face is recorded each time. The probability that the sum of the two recorded numbers is a prime number is _____
(A)	$\frac{3}{36}$
(B)	$\frac{13}{36}$
(C)	$\frac{15}{36}$
(D)	$\frac{19}{36}$

Q.11 – Q.35 Carry ONE mark Each

Q.11	Two identical cubic dice are rolled simultaneously. Which of the following is the probability that at least one of the face values of the two dice is greater than 3?
(A)	$\frac{1}{2}$
(B)	$\frac{3}{4}$
(C)	$\frac{1}{4}$
(D)	$\frac{3}{8}$

Q.12	Which of the following options is **CORRECT** for the eigenvalues (λ) of the given matrix? $\begin{bmatrix} 8 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 7 \end{bmatrix}$
(A)	λ = 1, 1, 1
(B)	λ = 8, 5, 7
(C)	λ = 0, 0, 0
(D)	λ = 40, 1, 35

Q.13	For a given matrix A = $\begin{bmatrix} 4 & 4 \\ 0 & 4 \\ -4 & 4 \end{bmatrix}$, and A^T representing its transpose, which of the following options is the **CORRECT** representation of A^TA ?
(A)	$\begin{bmatrix} 4 & 0 \\ 0 & -4 \end{bmatrix}$
(B)	$\begin{bmatrix} 32 & 0 \\ 0 & 48 \end{bmatrix}$
(C)	$\begin{bmatrix} 32 & 0 \\ 0 & 0 \\ 0 & 48 \end{bmatrix}$
(D)	$\begin{bmatrix} 4 & 0 \\ 0 & 0 \\ 0 & -4 \end{bmatrix}$

Q.14	Given two vectors $\vec{U}$ and $\vec{V}$, which of the following options is **CORRECT** for the expansion of divergence, $\nabla\cdot(\vec{U}+\vec{V})$?
(A)	$\nabla\times\vec{U} + \nabla\times\vec{V}$
(B)	$\nabla\times\vec{U} - \nabla\times\vec{V}$
(C)	$\nabla\cdot\vec{U} + \nabla\cdot\vec{V}$
(D)	$\nabla\cdot\vec{U} - \nabla\cdot\vec{V}$
Q.15	Which of the following is the basic mechanism of hydrocyclones and centrifuges used for solids control in a drilling operation?
(A)	Screening
(B)	Forced settling
(C)	Chemical flocculation
(D)	Dilution

Q.16	Which of the following is the role of stabilizer subs in the rotary drilling process?
(A)	To prevent the drill-string from falling into the wellbore
(B)	To keep casing equidistant from the wellbore wall
(C)	To assist in keeping the drill collars centralized
(D)	To isolate the wellbore fluid from the subsurface formations
Q.17	For a single-phase dry gas reservoir having a well producing only dry gas, E represents gas expansion factor and B_g represents gas formation volume factor. Which of the following options is **CORRECT**?
(A)	$E \propto \frac{1}{B_g}$
(B)	$E \propto B_g$
(C)	$E \propto B_g{}^2$
(D)	$E \propto B_g{}^3$

Q.18 Choose the correct option by matching the entries in **Group X** with their description in **Group Y**.

Group X	Group Y
(P) Gas hydrate	(I) Gas is mostly present in adsorbed state
(Q) Oil shale	(II) Sedimentary rock contains kerogen
(R) Coal bed methane	(III) Oil recovered from shale
(S) Shale oil	(IV) Gas is present inside the cages formed by water molecules

(A) P – IV; Q – III; R – I; S – II

(B) P – I; Q – II; R – IV; S – III

(C) P – IV; Q – II; R – I; S – III

(D) P – I; Q – III; R – IV; S – II

Q.19	Which of the following statements is **NOT CORRECT** in the context of offshore operational environment?
(A)	The motion of ocean's surface can be due to energy transfer from wind to water.
(B)	Lunar tides are caused by the moon.
(C)	Solar tides are caused by the sun.
(D)	The motion of ocean's surface can be due to energy transfer from water to wind.
Q.20	Which of the following has the most proppant carrying capacity during hydraulic fracturing process?
(A)	Pentane
(B)	Cross-linked gel
(C)	Slickwater
(D)	Untreated formation brine

Q.21	A circular shaped reservoir has external radius of r_e. A well of radius r_w lies in the centre of the reservoir. The part of the reservoir around the wellbore up to a radius of r_s is damaged, where $r_w < r_s < r_e$. Formation damage causes additional pressure drop $\Delta P(r)$ that varies with radial distance r. Which of the following is **TRUE** about the additional pressure drop at the radial location, r_s due to formation damage?
(A)	$\Delta P(r_s) = \Delta P(r_w)$
(B)	$\Delta P(r_s) = 0$
(C)	$\Delta P(r_s) = 2 \times \Delta P(r_w)$
(D)	$\Delta P(r_s) = 4 \times \Delta P(r_w)$

Q.22	In a drawdown test, P_D, t_D, and C_D are dimensionless pressure, dimensionless time, and dimensionless wellbore storage coefficient, respectively. In the early time of a drawdown test, fluid flow results from wellbore unloading. For this period, which of the following is the **CORRECT** representation of the relationship among these parameters?
(A)	$t_D = P_D C_D$
(B)	$C_D = P_D t_D$
(C)	$P_D = t_D C_D$
(D)	$t_D = P_D + C_D$
Q.23	Which of the following is/are conventional Enhanced Oil Recovery method(s)?
(A)	Water flooding
(B)	*In-Situ* combustion
(C)	Surfactant flooding
(D)	Steam flooding

Q.24	Which of the following improve(s) the productivity index of a vertical well in an oil reservoir?
(A)	Hydraulic fracturing
(B)	Increasing the perforation length
(C)	Increasing the skin factor
(D)	Reducing the oil viscosity by steam injection
Q.25	Which of the following methods is/are used to separate water from crude oil-water emulsion?
(A)	Heating
(B)	Centrifugation
(C)	Addition of interfacial tension reducing agents
(D)	Electrostatic coalescence

Q.26	Which of the following statements is/are **CORRECT** about the water injection well platforms?
(A)	These are meant for injection of gas through the injection well.
(B)	Metering devices are not required to determine injection rate of injection wells.
(C)	Metering devices are required to determine injection rate of injection wells.
(D)	Firefighting and life-saving equipment should be present on the platform.
Q.27	Which of the following options is/are representing the rheological behavior of a conventional drilling fluid?
(A)	Dilatant
(B)	Pseudoplastic
(C)	Thixotropic
(D)	Rheopectic

Q.28	Pressure (p) as function of radius (r) and time (t) can be found from the analytical solution of radial diffusivity equation for homogenous and isotropic reservoir following Darcy law. For this solution, if $\frac{\partial p}{\partial t}$ is treated as constant, which of the following correctly describe(s) the state(s) of pressure change?
(A)	Transient
(B)	Pseudo-steady
(C)	Steady
(D)	Unsteady
Q.29	Which of the following statements is/are **CORRECT** about the floating production, storage, and offloading systems (FPSOs)?
(A)	Existing tankers cannot be converted into FPSOs.
(B)	FPSOs can be selected in the absence of any pipeline infrastructure.
(C)	FPSOs cannot process the produced fluids.
(D)	FPSOs can be used for the storage of produced crude oil.

Q.30	For a radioactive material, if N is the number of nuclei present at time t, and λ is decay constant, then which of the following is/are **CORRECT** representation(s) of the rate of decay?
(A)	$-\frac{dN}{dt} = \lambda N^2$
(B)	$-\frac{dN}{dt} = \lambda N$
(C)	$-\frac{dN}{dt} = \frac{\lambda}{N^2}$
(D)	$-\frac{dN}{dt} = \frac{\lambda}{N}$
Q.31	Which of the following logging methods is/are **NOT** used for investigation in Cement Bond Logging (CBL)?
(A)	Gamma ray
(B)	Neutron
(C)	Electrical
(D)	Acoustic wave

Q.32	The solution of the given expression is _____. (*Answer in integer*) $$\lim_{x \to \pi/2} \frac{\sin(\cos(x)) - \cos(x)}{\left(\frac{\pi}{2} - x\right)}$$
Q.33	A circular reservoir with a well in the centre is producing oil at constant rate under pseudo steady state. The rate of pressure change measured at the wellbore is 1.0 psi/day. Pressure at the external radius of the reservoir at a certain time was 3500 psi. After 500 days, the pressure (in psi) at the external radius will be _____. (*Answer in integer*)
Q.34	When 92 ml of distilled water (density = 1.0 g/cm^3) is mixed with 23 grams of NaCl salt, the density of the resultant brine solution is 1.15 g/cm^3. The volume of the brine solution (in ml) is _____. (*Rounded off to one decimal place*)
Q.35	An oil has a density of 50 lbm/ft^3 at Standard Temperature and Pressure (STP) conditions. The density of the oil (in ^oAPI) is _____. (*Rounded off to one decimal place*) [Given: water density is 62.4 lbm/ft^3 at STP]

Q.36 – Q.65 Carry TWO marks Each

Q.36	Which of the following is the correct representation of the given expression? $$\frac{(1+i)^8}{(1-i)^6}$$
(A)	$2e^{-i\frac{\pi}{2}}$
(B)	-1
(C)	$2e^{i\frac{\pi}{2}}$
(D)	1

Q.37	The values of a function $f(x)$ at three different x are given as: $f(0.90) = 7.75$ $f(1.00) = 9.00$ $f(1.10) = 10.35$ Using the central difference approximation method, which of the following is the **CORRECT** estimate of first differential, $f'(1.00)$ and second differential, $f''(1.00)$, respectively?
(A)	10.00 and 13.00
(B)	13.00 and 10.00
(C)	10.00 and 10.00
(D)	13.00 and 13.00

Q.38	Consider a random continuous variable x and its distribution function $f(x)$. Which of the following options describes the Probability Density Function (PDF)?
(A)	$\frac{d}{dx}f(x)$
(B)	$\frac{d^2}{dx^2}f(x)$
(C)	$\int f(x)dx$
(D)	$\int \frac{1}{f(x)}dx$

Q.39

Choose the **CORRECT** match of the sedimentary rocks in **GROUP X** with their processes/mechanisms of formation in **GROUP Y.**

GROUP X	GROUP Y
(P) Evaporite	(I) Physical process mainly consisting of lithification or cementation of deposition
(Q) Sandstone	(II) Chemical process and depositions by marine living organisms
(R) Limestone	(III) Anaerobic deposition of organic materials in mud bed
(S) Siltstones	(IV) Evaporation and precipitations of marine water

(A) P - IV; Q - I; R - II; S - III

(B) P - II; Q - IV; R - I; S - III

(C) P - II; Q - III; R - IV; S - I

(D) P - IV; Q - III; R - I; S - II

Q.40	Which of the following “logging methods” in a borehole will provide the highest depth of investigation for a given marine formation?
(A)	Neutron
(B)	Sonic
(C)	Density
(D)	Resistivity

Q.41

Choose the **CORRECT** match of the fire detection systems in **GROUP X** with their corresponding working mechanisms in **GROUP Y**.

GROUP X	GROUP Y
(P) Fusible plug loops	(I) Detects rise in temperature caused by fire and visible/invisible particles of combustion.
(Q) Thermal and smoke detection system	(II) Functions based on drop in pressure that activates fire shutdown.
(R) Gas detection system	(III) Detects flammables.

(A) P-I; Q-II; R-III

(B) P-II; Q-I; R-III

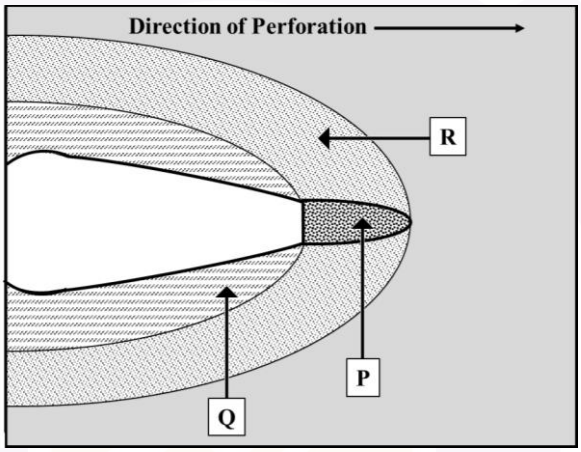
(C) P-III; Q-I; R-II

(D) P-II; Q-III; R-I

Q.42

The sectional view of three different damaged regions (marked as P, Q and R) near the vicinity of a perforation is shown in the figure.

Choose the correct option by matching the entries in **GROUP X** with corresponding terms in **GROUP Y**.



GROUP X	GROUP Y
P	(I) Grain fracturing
Q	(II) Charge and core debris
R	(III) Compacted pulverized zone

(A) P – I; Q – II; R – III

(B) P – II; Q – III; R – I

(C) P – I; Q – III; R – II

(D) P – II; Q – I; R – III

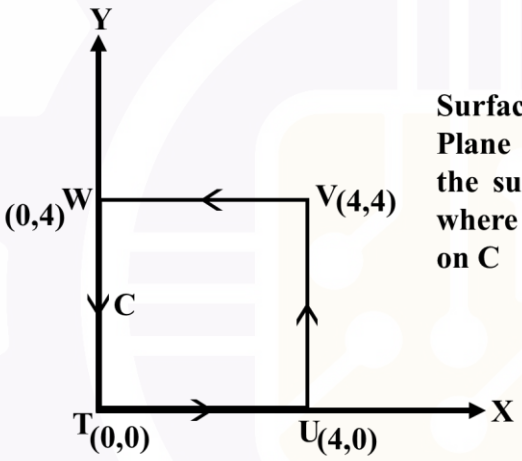
Q.43	Real gas pseudo pressure is used to derive diffusivity equation for highly compressible fluid for which viscosity (μ) and gas compressibility factor (z) are functions of pressure (p). Which of the following represents the partial derivative of the real gas pseudo pressure with respect to time (t)?
(A)	$\frac{2p}{\mu Z}\frac{\partial p}{\partial t}$
(B)	$\frac{p^2}{2\mu Z}\frac{\partial p}{\partial t}$
(C)	$\frac{\mu Z}{2p}\frac{\partial p}{\partial t}$
(D)	$\frac{2\mu Z}{p^2}\frac{\partial p}{\partial t}$

Q.44	Stokes' law is used to calculate the settling rate in the drilling fluid for two batches (P and Q) of barite. The particle (spherical) size of barite from batch P is 75 μm and that for batch Q is 25 μm. The particle settling rate in the drilling fluid for the batch P is _____ times that for the batch Q.
(A)	Four
(B)	Nine
(C)	Two
(D)	One
Q.45	Which of the following approaches is/are used to get the response of Formation Micro Scanner (FMS) log?
(A)	Optical
(B)	Electrical
(C)	Thermal
(D)	Nuclear

Q.46	Which of the following conditions is/are inferred using cross plots of neutron porosity ϕ_N and density porosity ϕ_D?
(A)	Gas zone
(B)	Shale distribution
(C)	Water zone
(D)	Oil zone
Q.47	Which of the following is/are obtained using a core sample?
(A)	Porosity
(B)	Pore size distributions
(C)	Absolute permeability
(D)	Reservoir boundary

Q.48	Pressure change and derivative type curves (Bourdet type curves) are used in the well test analysis. Which of the following statements is/are **CORRECT** about these type curves?
(A)	These curves are on Log-Log plot.
(B)	Horizontal axis is for dimensionless time t_D.
(C)	All derivative type curves merge in the middle time region.
(D)	Vertical axis is for dimensionless pressure P_D only.
Q.49	Which of the following is/are objective(s) of a safety system in offshore production platforms?
(A)	To prevent leak or overflow of hydrocarbons.
(B)	To prevent ignition of hydrocarbons released on the platform.
(C)	To prevent water coning in the reservoir.
(D)	To prevent gas coning in the reservoir.

Q.50	A wellbore has true vertical depth (TVD) of 10000 ft. The pore pressure of the formation fluid in the permeable stratum at the bottom of the wellbore is 6500 psig. Which of the following is/are the acceptable average static mud density value(s) (in lbm/gal) to prevent the flow of the formation fluid from the permeable stratum to the wellbore? [Given: 1 lbm/gal mud is equivalent to 0.052 psi/ft]
(A)	13.8
(B)	11.3
(C)	11.8
(D)	13.2
Q.51	Which of the following statements is/are **CORRECT** about the skin factor?
(A)	Successful hydraulic fracturing increases the skin factor.
(B)	Successful hydraulic fracturing decreases the skin factor.
(C)	Formation damage near wellbore increases the skin factor.
(D)	Formation damage near wellbore decreases the skin factor.

Q.52	Consider a vector function $\vec{F} = (y - z + 2)\hat{i} + (yz + 8)\hat{j} - xz\hat{k}$, on the surface (S) in the XY plane at $z = 0$ (as shown in the figure). Considering Stokes' theorem for space, the **ABSOLUTE** value of surface integral $\iint_S (\nabla \times \vec{F}).\hat{n}dS$ is _____. (*Answer in integer*)  **Surface (S) projection of cube in the XY Plane (Z = 0) with the boundary (C) of the surface S, along the path TUVWT, where $\hat{n}$ is the unit vector at any point on C** (Consider $\hat{i}, \hat{j}, \hat{k}$, and $\hat{n}$ as unit vectors)
Q.53	For a given reservoir of porosity, $\phi = 0.1$, the water saturation is equal to the irreducible water saturation. The BVI (Bulk Volume Irreducible) water saturation was estimated as 0.04 using NMR (Nuclear Magnetic Resonance) log. The permeability, k in mD is estimated using the relation: $k = 10^4\phi^4\left(\frac{FFI}{\phi - FFI}\right)^2$, where FFI is the Free Fluid Index. Based on this information, the permeability (in mD) is _____. (*Rounded off to two decimal places*)

Q.54	The Inflow Performance Relationship (IPR) for a vertical well in a single-phase oil reservoir was found to be linear. The flowing bottomhole pressures are 4000 psi and 1000 psi at oil flow rates of 200 STB/day and 600 STB/day, respectively. At the flowing bottomhole pressure of 2875 psi, the value of flow rate (in STB/day) is _____. (*Answer in integer*) [STB: Stock Tank Barrel]
Q.55	A matrix acidizing job is planned on a sandstone pay zone at a depth of 7000 ft without formation breakdown by keeping a safety margin of 250 psi with the help of a coil tubing unit. Consider the fracture gradient of 0.7 psi/ft, average specific gravity of the injection fluid as 1.065, and frictional pressure drop of 200 psi. The maximum surface injection pressure (in psi) is _____. (*Rounded off to one decimal place*) [Given: Hydrostatic gradient (psi/ft) = 0.433 × Specific Gravity]
Q.56	A drawdown test data is analyzed to find out the permeability and skin factor of the reservoir using a semi-log plot. Flowing bottomhole pressure (in psi) is plotted on the linear scale against time (in hours). Flow rate is 1500 STB/day, oil formation volume factor is 1.2 RB/STB, oil viscosity is 1 cP, and thickness of the bed is 10 ft. After plotting, it is found that the slope of the straight line fitting the data in the middle time region is –60 psi/log cycle. The permeability of the reservoir (in mD) is _____. (*Rounded off to one decimal place*) [RB: Reservoir Barrel; STB: Stock Tank Barrel]
Q.57	A conventional Sucker Rod Pumping (SRP) unit is being used for lifting 25 °API oil from a depth of 5000 ft. The maximum and minimum values of polished rod loads are 14300 lbf and 5200 lbf, respectively. The ideal counter balance load (in lbf) is _____. (*Answer in integer*)

Q.58	Matthews-Brons-Hazebroek (MBH) plots are used to calculate the Dietz shape factor (C_A) for reservoirs of various shapes. The MBH plot for a right-angled triangle reservoir with a well in the centre shows a reading of dimensionless pressure $P_{D(MBH)} = 3.0$, at the modified dimensionless time $t_{DA} = 1.0$. The Dietz shape factor of this right-angled triangle reservoir is _____. (*Rounded off to one decimal place*)
Q.59	A drilling fluid following power law model is being circulated in a wellbore at the rate of 600 gal/min. The internal diameter (D_i) of the drill-pipe is 4.276 inches. The power law parameter (n) for the drilling fluid in the applicable flow regime is 0.67. The wall shear-rate $(\dot{\gamma}_w)$ inside the drill-pipe is given by the following equation. $$\dot{\gamma}_w = \left(\frac{3n+1}{4n}\right) \times \frac{8V}{D_i}$$ where V is the average drilling fluid velocity inside the drill-pipe. The value of wall shear-rate inside the drill-pipe $(\text{in } s^{-1})$ is _____. (*Rounded off to one decimal place*) [Given: 1 gallon = 3785.4 cm^3; 1 inch = 2.54 cm]
Q.60	The upper limit of the scale of the dial reading for a given rotational oilfield viscometer is 300°. At the rotational rate of 100 RPM, the highest possible effective (apparent) viscosity measurable (in cP) is _____. (*Rounded off to one decimal place*) [Given: 1° dial reading is equivalent to 5.11 $dynes/cm^2$ or 0.511 Pa; 1 RPM = 1.703 s^{-1}]

Q.61	Three wells are at the corners of an equilateral triangle inside an infinite acting reservoir. The reservoir is horizontal, homogenous and isotropic and has uniform thickness. Initial reservoir pressure is 3000 psi. If only one of the wells had been producing in the transient state, the pressure at the centre of equilateral triangle would have dropped by 100 psi after 60 days. If all the three wells started producing simultaneously in transient state at the same rate, then after 60 days since the start of production, the pressure at the centre of the equilateral triangle (in psi) is _____. (*Answer in integer*)
Q.62	Oil is being produced from an undersaturated oil reservoir (with no initial gas cap). The reservoir rock compressibility and water saturation are negligible. There is no water influx, and there is no water production from the well. The initial oil formation volume factor was 1.24 RB/STB. After production of oil for a short period of time, the reservoir pressure is still above the bubble-point pressure, and the oil formation volume factor has changed to 1.25 RB/STB. The calculated oil recovery factor (in fraction) is _____. (*Rounded off to three decimal places*) [RB: Reservoir Barrel; STB: Stock Tank Barrel]
Q.63	Consider one-dimensional oil flow in a horizontal porous media having length of 2000 ft, constant cross-sectional area of 6000 ft^2 and absolute permeability of 50 mD. Oil of viscosity 2 cP is flowing along the length (perpendicular to the cross section) such that the pressure at the inlet and outlet are 2500 psig and 2200 psig, respectively. Using the Darcy's equation for single phase flow, the flow rate of the oil through this porous media (in bbl/day) is _____. (*Rounded off to one decimal place*) [1 bbl = 5.61 ft^3]

Q.64	A gas reservoir has bulk volume of 10000 ft^3, connate water saturation of 0.2 and porosity of 0.2. There is no oil present in the reservoir. The gas formation volume factor, B_g is 0.005 RCF/SCF. The volume of gas in-place for this reservoir (in SCF) is _____$\times 10^4$. (*Answer in integer*) [RCF: Reservoir Cubic Feet; SCF: Standard Cubic Feet]
Q.65	A drill-string placed in a wellbore is composed of 6000 ft of drill-pipe having internal diameter of 4.67 inches. The drilling fluid is being pumped at the rate of 80 cycles/minute and the pump factor is 0.21 bbl/cycle. Assume the amount of drilling fluid in the drill-collar and drill-bit to be negligible. The time required to circulate the drilling fluid from the surface to the drill-bit (in minutes) is _____. (*Rounded off to two decimal places*) [Given: 1 bbl = 5.61 ft^3]