



Question Paper Name: Petroleum Engineering

Duration: 180

Total Marks: 100

Difficulty: Medium



INSTRUCTIONS

The Questions in this model paper is prepared by our team of experts according to the weightage given in the previous gate papers. In some of the questions the engineer is supposed to memorize certain formulae and expressions, in others he/she is supposed to know the concepts, basic assumptions and theories, fundamental methods etc. In some of the questions several answers may appear to be correct but the student has to select the most appropriate answer. In some of the questions, the depth of the working knowledge of the student is tested. Although every care has been taken to ensure accuracy, yet some errors might have crept in and the authors will be grateful if the same could be brought to their notice.

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DICE FREE QUESTION PAPER

- (1) If the transpose of a matrix is equal to its inverse, then the matrix is
(A) Symmetric
(B) Orthogonal
(C) Skew symmetric
(D) singular
- (2) If the following linear system of equations has non-trivial solutions
 $px + y + z = 0$
 $2x + y - 2z = 0$
 $x + 2y - 3z = 0$
the value of p is
(A) 1
(B) 0
(C) -1
(D) -7
- (3) The value $\int_0^{\frac{\pi}{2}} \log(\cos x) dx$ is
(A) $-\frac{\pi}{2} \log 2$
(B) $-\frac{\pi}{4} \log 2$
(C) $\frac{\pi}{2} \log 2$
(D) $\frac{\pi}{4} \log 2$
- (4) if $3 \leq X \leq 5$ and $8 \leq Y \leq 11$ then which of the following options is **True**?
(A) $\frac{3}{5} \leq \frac{X}{Y} \leq \frac{8}{5}$
(B) $\frac{3}{11} \leq \frac{X}{Y} \leq \frac{5}{8}$
(C) $\frac{3}{11} \leq \frac{X}{Y} \leq \frac{8}{5}$
(D) $\frac{3}{5} \leq \frac{X}{Y} \leq \frac{8}{11}$
- (5) The Headmaster _____ to speak to you.
Which of the following options is incorrect to complete the above sentence?
(A) Is wanting
(B) Wants
(C) Want
(D) Was wanting
- (6) Mahatma Gandhi was known for his humility as
(A) He played an important role in humiliating exit of British from India.
(B) He worked for humanitarian causes.
(C) He displayed modesty in his interactions.
(D) He was a fine human being.



(7) All engineering students should learn mechanics, mathematics and how to do computation.

I

II

III

IV

Which of the above underlined parts of the sentence is not appropriate?

- (A) I
- (B) II
- (C) III
- (D) IV

(8) Select the pair that best expresses a relationship similar to that expressed in the pair:

water: pipe::

- (A) cart: road
- (B) electricity: wire
- (C) sea: beach
- (D) music: instrument

(9) Given the following differential equation

$$\frac{d^2y}{dx^2} + 7\frac{dy}{dx} + 12y = 0$$

the general solution is

- (A) $y = Ae^{4x} + Be^{-3x}$
- (B) $y = Ae^{-4x} + Be^{-3x}$
- (C) $y = Ae^{3x} + Be^{-4x}$
- (D) $y = Ae^{4x} + Be^{3x}$

(10) Velocity of an object fired directly in upward direction is given by $V = 80 - 32t$, where t (time) is in seconds. When will the velocity be between 32 m/sec and 64 m/sec?

- (A) $(1, 3/2)$
- (B) $(1/2, 1)$
- (C) $(1/2, 3/2)$
- (D) $(1, 3)$

(11) In a factor, two machines M1 and M2 manufacture 60% and 40% of the autocomponents respectively. Out of the total production, 2% of M1 and 3% of M2 are found to be defective.

If a

randomly drawn autocomponent from the combined lot is found defective, what is the probability

that it was manufactured by M2?

- (A) 0.35
- (B) 0.45
- (C) 0.5
- (D) 0.4



(12) Following table gives data on tourists from different countries visiting India in the year 2011.

Country	Number of Tourists
USA	2000
England	3500
Germany	1200
Italy	1100
Japan	2400
Australia	2300
France	1000

Which two countries contributed to the one third of the total number of tourists who visited India in 2011?

- (A) USA and Japan
- (B) USA and Australia
- (C) England and France
- (D) Japan and Australia

(13) If $|-2X + 9| = 3$ then the possible value of $|-X| - X^2$ would be:

- (A) 30
- (B) -30
- (C) -42
- (D) 42

(14) All professors are researchers

Some scientists are professors

Which of the given conclusions is logically valid and is inferred from the above arguments:

- (A) All scientists are researchers
- (B) All professors are scientists
- (C) Some researchers are scientists
- (D) No conclusion follows

(15) The number of ways in which the letters in the word MINING can be arranged is

- (A) 90
- (B) 180
- (C) 360
- (D) 720

(16) Events A and B are independent but NOT mutually exclusive. If the probabilities P(A) and P(B) are

0.5 and 0.4 respectively, then $P(A \cup B)$ is

- (A) 0.6
- (B) 0.7
- (C) 0.8
- (D) 0.9



- (17) Identify the correct statement for a 'normal distribution'
- (A) Mean is greater than mode but less than median
 - (B) Mean is less than mode but greater than median
 - (C) Mean is greater than mode and median
 - (D) Mean, median and mode are equal
- (18) John Thomas an _____ writer, passed away in 2018
- (A) Imminent
 - (B) Prominent
 - (C) Eminent
 - (D) dominant
- (19) M and N had Four children P,Q,R and S of them,only P and R were married.They had children X and Y respectively. if Y is a legitimate child of W,which one of the following statements is necessarily False ?
- (A) M is the grandmother of Y
 - (B) R is the father of Y
 - (C) W is the wife of R
 - (D) W is the wife of P
- (20) Find the correct relationship in the following?
- (A) $(WOR)_{\text{surface}} = \frac{B_0}{B_w} (WOR)_{\text{reservoir}}$
 - (B) $(WOR)_{\text{reservoir}} = \frac{B_0}{B_w} (WOR)_{\text{surface}}$
 - (C) $B_w(WOR)_{\text{surface}} + B_0 (WOR)_{\text{reservoir}} = 1$
 - (D) none of these
- (21) What is the property that does not change from reservoir to laboratory?
- (A) Porosity
 - (B) J function
 - (C) Contact angle
 - (D) Such property does not exist
- (22) A helium porosimetry experiment was carried out on a 5 in. long and 1.5 in. Diameter core sample. The initial pressures in the reference chamber and the Sample chamber (both of equal volumes of 300 cc) were 300 and 14.7 psia, Respectively. After maintaining isothermal conditions, the valve connecting the Two chambers was opened and pressures were allowed to equilibrate, which was Found to be 185 psia. What is the porosity of the core sample in percentage?
- (23) Calculate the bubble point pressure and the composition of the vapour for a solution containing 100lb of propane and 90lb of n-pentane at 100F.assume ideal behaviour. Vapour pressure of propane and n pentane are 38.20 and 54 psia respectively.
- (24) A 10lb block of dry ice is placed in a 50 cuft tank that contains air at atmospheric pressure 14.7 psia and 75F.what will be the final pressure in psia of the sealed tank when all the dry ice has evaporated and cooled the gas to 45F? note:- (consider the volume of ice very small when compared to the container)



- (25) a volumetric oil reservoir whose PVT properties are given below. when the reservoir pressure is dropped from an initial pressure of 2500psi to an average pressure of 1600psia, a total of 26 MMSTB of oil had been produced. the cumulative GOR at 1600psia was 954 SCF/STB, and the current GOR was 2250SCF/STB. the average porosity for the field is 0.18 and average connate water saturation is 0.18. now water was produced and standard conditions were 14.7psia and 60F. calculate the average gas saturation in the reservoir at 1600psi?

	2500psi	2000psi	1600psi
Bo bbl/stb	1.29	1.272	1.21
Rs SCF/STB	575	510	385
Z	0.87	0.82	0.82

- (26) during the gravel pack operation the 6in I.D. liner became filled with gravel, and a layer of mill scale and dirt accumulated to a thickness of 1in on top of the gravel within the pipe. if the permeability of the accumulation is 1000md, what additional pressure drop in psi is placed on the system when pumping a 1cp of fluid at the rate of 100bbl/hr?

- (27) During a period of production from a certain reservoir, the average reservoir pressure remained constant at 3200psia. during the stabilized pressure, the oil and water producing rates were 30,000STB/day and 5000STB/day, respectively. calculate the incremental water influx for a later period when the pressure drops from 3000psia to 2800psia. assume the following relationship for pressure and time holds

$$\frac{dp}{dt} = -0.003p, \text{psia/month}$$

Other data are the following:

$P_i = 3500\text{psia}$, $R_{si} = 750\text{SCF/STB}$

At 3200psia

$B_t = 1.45\text{bbl/STB}$, $B_g = 0.002\text{bbl/STB}$, $R_p = 800\text{SCF/STB}$, $B_w = 1.04\text{bbl/STB}$

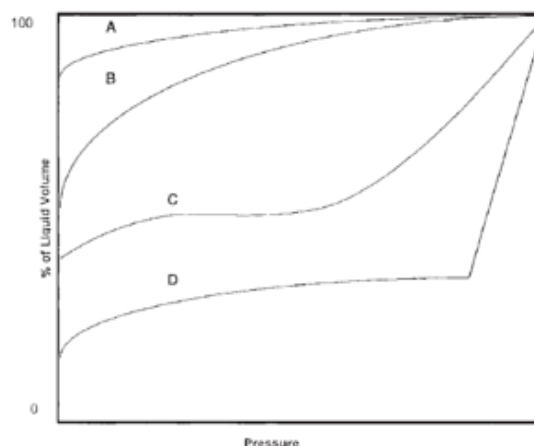
Note:- use Schilthius steady state model 1 month = 30 days

$$\frac{dW_e}{dt} = C(p_i - p)$$

C = constant

- (28) choose the correct option?

- 1- Ordinary black oil
- 2- Near-critical crude oil
- 3- Low-shrinkage crude oil
- 4- Volatile crude oil



- (A) A-3 B-1 C-2 D-4
- (B) A-1 B-3 C-4 D-2
- (C) A-1 B-3 C-2 D-4
- (D) A-3 B-1 C-4 D-2



(29) Select the correct statement from the following?

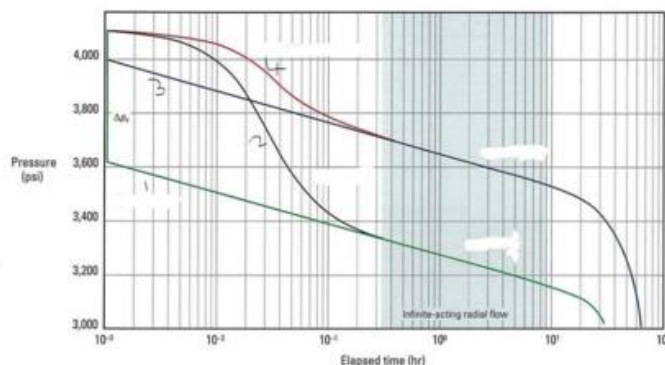
- (A) Abnormal pressure occur in areas where fluids have been drained
- (B) Rock and liquid expansion considers the liquid as compressible
- (C) Saturation is an extensive property
- (D) 2 lb. mole of gas occupies a volume of 759SCF at standard conditions

(30) as project supervisor for an insitu uranium leaching project,you have observed that to maintain a constant injection rate in wellA,the pump pressure has had to be increased so that $P_e - P_w$ has increased by a factor of 20 from the value of the startup.an average permeability of 100md was measured from plugs cored before the injection of leachant.you suspect build up of calcium carbonate precipitate has damaged the formation near the injection well.if the permeability of the damaged section is assumed to be 1md,find the extent of the damage in ft.the wellbore radius is 0.5ft and the distance to the outer boundary of the uranium deposit is estimated to be 1000ft.

(31) Choose the correct option?

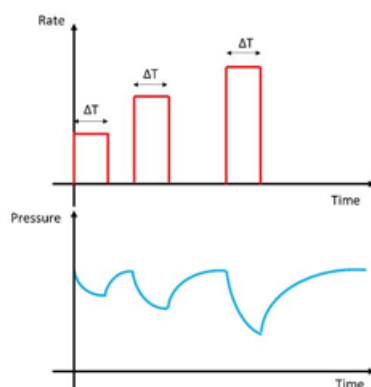
Here P represents the bottom hole pressure for constant flow rate?

- A) IDEAL RESPONSE
- B) SKIN NO STORAGE
- C) WELLBORE STORAGE,NO SKIN
- D) STORAGE+SKIN



- (A) 1-B 2-A 3-D 4-C
- (B) 1-C 2-D 3-A 4-B
- (C) 1-B 2-D 3-A 4-C
- (D) 1-D 2-B 3-A 4-C

(32) Choose the correct option?



What type of well test does above graphs represent?



- (A) Flow after flow test
- (B) Isochronal test
- (C) Modified isochronal test
- (D) Pulse test

(33) Select the equation to find average reservoir pressure of a compressible fluid in semi steady state condition. Q_g in MMSCF/day and remaining all in field units

- (A) $m(P_e) - m(P_{wf}) = \frac{1422 Q_g T}{K h} \left(\ln \left(\frac{r_e}{r_w} \right) - \frac{1}{2} + S \right)$
- (B) $m(P_e) - m(P_{wf}) = \frac{1422 Q_g K}{T h} \left(\ln \left(\frac{r_e}{r_w} \right) - \frac{1}{2} + S \right)$
- (C) $m(P_r) - m(P_{wf}) = \frac{1422 Q_g T}{K h} \left(\ln \left(\frac{r_e}{r_w} \right) - \frac{3}{4} + S \right)$
- (D) $m(P_r) - m(P_{wf}) = \frac{1422 Q_g K}{T h} \left(\ln \left(\frac{r_e}{r_w} \right) - \frac{3}{4} + S \right)$

(34) For the reaction between 20 wt% HCl solution and Calcite, calculate the gravimetric dissolving power?
 $\text{CaCO}_3 + 2 \text{HCl} = \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$

(35) This equipment increases the efficiency of the sucker rod pump by diverting the gas from the barrel of sucker rod pump to the tubing/casing annulus before entering the subsurface pump.

- (A) Gas lift
- (B) Gas controller
- (C) Gas anchor
- (D) Gas header

(36) Choose the correct option?

A) Choke size	1) 60-150°C
B) Filter cake thickness	2) 150-225°C
C) oil window	3) Measured in $\frac{1}{32}$ of an inch
D) gas window	4) Measured in $\frac{1}{64}$ of an inch

- (A) A-3 B-4 C-1 D-2
- (B) A-4 B-3 C-2 D-1
- (C) A-4 B-3 C-1 D-2
- (D) A-3 B-4 C-2 D-1

(37) Which of the following artificial lift has the best efficiency to handle solids?

- (A) Gas lift
- (B) Sucker rod pump
- (C) Progressive cavity pump
- (D) Electrical submersible pump



(38) which of the following case is most ideal for the use of matrix acidizing in a clastic reservoir?

- (A) Low skin Low permeability
- (B) High skin Low permeability
- (C) High skin High permeability
- (D) Low skin High permeability

(39) Choose the correct statement

- (A) Bullet perforator penetrates deeper than shaped charges
- (B) Vertical separators are more suitable for high GOR
- (C) Scale deposited very rapidly are very porous than scale deposited slowly
- (D) Gravel packing is used to control the sloughing shale's

(40) a well is producing from a saturated reservoir with an average reservoir pressure of 2500psia. stabilized production test data indicates that the stabilized rate and well bore pressure are 350 STB/day, and 2000psia respectively. Calculate oil flow in STB/day rate at 1850 Pisa .use Vogel's equation.

(41) Choose the correct option?

Tanks	Fluid
a) floating roof tank	1) diesel
b) bullet tanks	2) high vapour pressure gas
c) Spherical tanks	3) gasoline
d) fixed roof tanks	4) LPG

- (A) A-1 B-4 C-2 D-4
- (B) A-3 B-4 C-2 D-1
- (C) A-3 B-2 C-4 D-1
- (D) A-4 B-3 C-2 D-1

(42) A section of heavy walled tubing that is placed across any perforated interval through which the production tubing must pass, such as may be required in multiple zone completions to resist the jetting action that may result in the proximity of the perforations. What is this device/equipment?

- (A) Ported Nipple
- (B) Flow Coupling
- (C) Blast Joint
- (D) Expansion Joint

(43) Choose the Correct option?

A) Spontaneous Potential	1) $\mu\text{sec/ft}$
B) Density log	2) seimien
C) Transit time	3) milli volt
D) conductivity	4) gm/cc

- (A) A-4 B-3 C-2 D-1
- (B) A-3 B-4 C-2 D-1
- (C) A-4 B-3 C-1 D-2
- (D) A-3 B-4 C-1 D-2



(44) Consider a sandstone formation has a resistivity of $80 \Omega\text{m}$ when the formation is 100% saturated with Brine which has a resistivity of $0.8 \Omega\text{m}$. find the resistivity of the sandstone formation in Ωm . when it is 100% saturated with diesel which has a resistivity of $1.5 \Omega\text{m}$.

(45) Resistivity Is Inversely Proportional To:

- (A) Tightness.
- (B) Oil Presence.
- (C) Formation water salinity
- (D) Hole Inclination

(46) Which of the following is a lithology log?

- (A) Density log
- (B) SP log
- (C) Neutron log
- (D) Sonic log

(47) Which of the following platforms has the maximum Operating Depth?

- (A) Jack up platform
- (B) Compliant tower
- (C) SPAR
- (D) Tension leg platform

(48) The equipment that is used to connect the floating drilling/production facility with subsea wells and are critical to safe field operations is?

- (A) Mooring lines
- (B) Thrusters
- (C) Riser
- (D) Tethers

(49) Choose the correct option?

A) Yield strength	1) gal/sack
B) Dose	2) celerity
C) Yield of cement	3) lb/100ft ²
D) Wind Speed	4) ppm
	5) bbl.

- (A) A-4 B-3 C-1 D-2
- (B) A-3 B-5 C-1 D-2
- (C) A-3 B-4 C-5 D-2
- (D) A-3 B-4 C-1 D-2

(50) Select the correct sequence of torque transmission

- (A) Rotarytable-Masterbushing-Kellybushing-Drillpipe -Kelly
- (B) Rotary table-Master bushing-Kelly bushing-Kelly-Drill pipe
- (C) Rotary table-Kelly bushing -Master bushing -Kelly-Drill pipe
- (D) Rotarytable-Masterbushing-Kellybushing-Drillpipe



(51) a well has been drilled to a depth of 10,000ft using a mud of density 13.5 ppg. on reaching the 10,000ft there is a intrusion of gas into the mud which changed the density of mud from 13.5 to 12.8 ppg in the first 900 ft and to 12.5 ppg from 900 to 7000ft. calculate the reduction in bottom hole pressure in psi?

(52) Choose the Correct option?

A) Annular Preventer	1) Cuts the pipe
B) Shear Ram	2) Closes in open hole
C) Blind Ram	3) Closes on any object
D) Pipe Ram	4) Closes on drill pipe excluding tool joints

- (A) A-3 B-1 C-2 D-4
(B) A-3 B-1 C-4 D-2
(C) A-4 B-1 C-2 D-3
(D) A-3 B-2 C-1 D-4

(53) A well is to be acidized by using 5inch, 19.5ppf grade G drill pipe and a buttonhole packer is set at 13,000ft. a 15% HCL of density 67PCF will be pumped at a surface pressure of 8000psi. the drill pipe casing annulus is filled with 90PCF mud. Determine the Worst burst load on the drill pipe in psi?

(54) Calculate the amount of Water Required per sack in gallons to provide a slurry of 13ppg. the slurry contains cement G, water, 8% bentonite. specific gravity of cement G is 3.143 and specific gravity of bentonite is 2.644. density of water is 8.33ppg.
Note: 1 sack of cement G contains 94 lbs of it

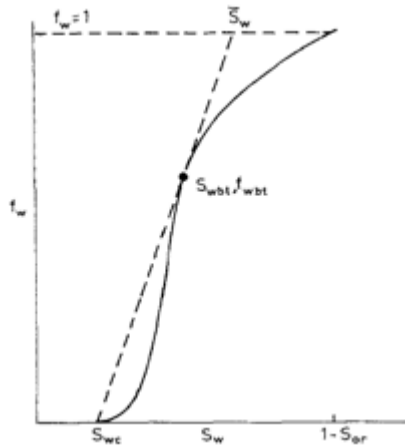
(55) A down hole tool that is used to impart a heavy blow or impact load to a down hole tool assembly. Commonly used in fishing operations to free stuck objects.
(A) Drill Collar
(B) Reamers
(C) Drilling Jars
(D) Stabilizers

(56) Calculate the Yield Point for the Following rotational viscometer readings
0300=30 0600=51

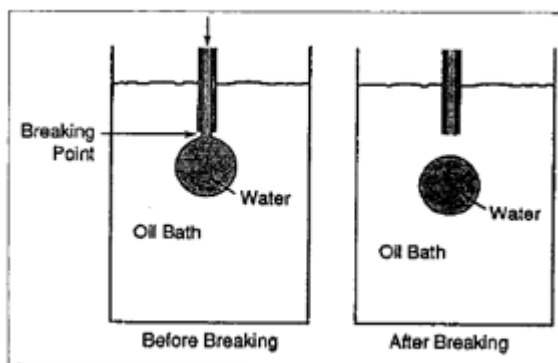
(57) Which of the following is **NOT** one of the Principles of Stratigraphy?
(A) Law of Super position
(B) Principle of Original horizontality
(C) Principle of Sedimentology
(D) Principle of Original lateral continuity



- (58) Assume a cubical reservoir under active water drive with oil production 1000 bbl/day the flow can be approximated as linear flow whose water front has an average saturation of 55% the cross sectional area is the product of the 1320 ft width and true formation thickness of 20 ft for a porosity of 0.25 with the length between production and injection well is 750 ft and the connate water saturation before flooding is 24%. Calculate the breakthrough time in days of a water flood.



- (59) To determine the Water/oil IFT, water is being displaced through a small tube into an oil bath as shown in figure. The water forms a spherical drop, which breaks away from the water in the injection tube when it is large enough and falls into the bottom of the container. for this experiment, the following data is given
rt = inside radius of discharge tube = 0.04 in
rd = drop radius (at the time of breaking away) = 0.104 in
 ρ_w = water density = 1 gm/cc
 ρ_o = oil density = 0.75 gm/cc
With these data estimate the water/oil IFT in $\times 10^{-4}$ lbf/ft.



- (60) Which of the following Thermal recovery process is used for deep reservoirs?
- (A) Steam Drive
 - (B) Steam Stimulation
 - (C) Insitu Combustion
 - (D) Hot water Flooding



- (61) Which of the Following Enhanced Oil Recovery Method increases the Microscopic displacement efficiency?
- (A) Polymer Flooding
 - (B) Surfactant Flooding
 - (C) Gas Flooding
 - (D) Steam Flooding
- (62) Which Programme is initiated by the Government to Explore and produce gas hydrates in india to meet the India's growing energy demand?
- (A) Gas Hydrate Programme (GHP)
 - (B) National Gas Hydrate Development Programme (NGHDP)
 - (C) National Gas Hydrate Programme (NGHP)
 - (D) Gas Hydrate Development Programme (GHDP)
- (63) Which of the following gas storage mechanism does Coal Bed Methane Exercise?
- (A) Absorption
 - (B) Adsorption
 - (C) Compression
 - (D) None of the above
- (64) Consider an oil spill taken place in an open ocean which Equipment/device collects and removes oil from the surface of the water.
- (A) Booms
 - (B) Skimmer
 - (C) Free boards
 - (D) Acoustic Barriers
- (65) What type of extinguishing agent should we use when we encounter Fire of this type of sign?



- (A) Water
- (B) Foam Spray
- (C) Wet Chemical
- (D) Dry Powder

END OF THE QUESTION PAPER



ANSWERS AND EXPLANATION

(1) If the transpose of a matrix is equal to its inverse, then the matrix is

- (A) Symmetric
- (B) Orthogonal
- (C) Skew symmetric
- (D) singular

Ans: B

Exp:

(2) If the following linear system of equations has non-trivial solutions

$$px + y + z = 0$$

$$2x + y - 2z = 0$$

$$x + 2y - 3z = 0$$

the value of p is

- (A) 1
- (B) 0
- (C) -1
- (D) -7

Ans: D

Exp: determinant of above equations is 0

$$\begin{vmatrix} p & 1 & 1 \\ 2 & 1 & -2 \\ 1 & 2 & -3 \end{vmatrix} = p(-3+4) - 1(-6+2) + 1(4-1) = 0$$

$$p + 4 + 3 = 0$$

$$p = -7$$

(3) The value $\int_0^{\frac{\pi}{2}} \log(\cos x) dx$ is

- (A) $-\frac{\pi}{2} \log 2$
- (B) $-\frac{\pi}{4} \log 2$
- (C) $\frac{\pi}{2} \log 2$
- (D) $\frac{\pi}{4} \log 2$

Ans: A

$$\text{Exp: } I = \int_0^{\frac{\pi}{2}} \log(\cos x) dx = \int_0^{\frac{\pi}{2}} \log(\sin x) dx$$

$$2I = \int_0^{\frac{\pi}{2}} \log(\cos x) dx + \int_0^{\frac{\pi}{2}} \log(\sin x) dx$$

$$= \int_0^{\frac{\pi}{2}} \log(2 \sin x \cos x / 2) dx$$

$$= \int_0^{\frac{\pi}{2}} \log(\sin 2x / 2) dx$$

$$= \int_0^{\frac{\pi}{2}} \log(\sin 2x) dx - \int_0^{\frac{\pi}{2}} \log 2 dx$$

$$= \frac{1}{2} \int_0^{\pi} \log(\sin 2x) d2x - \frac{\pi}{2} \log 2$$

take $2x = t$

$$= \frac{1}{2} \int_0^{\pi} \log(\sin t) dt - \frac{\pi}{2} \log 2$$

$$= \int_0^{\frac{\pi}{2}} \log(\sin t) dt - \frac{\pi}{2} \log 2$$



$$2I = \int_0^{\frac{\pi}{2}} \log(\sin t) dt - \frac{\pi}{2} \log 2$$

$$2I = I - \frac{\pi}{2} \log 2$$

$$I = -\frac{\pi}{2} \log 2$$

(4) If $3 \leq X \leq 5$ and $8 \leq Y \leq 11$ then which of the following options is **True**?

- (A) $\frac{3}{5} \leq \frac{X}{Y} \leq \frac{8}{5}$
(B) $\frac{3}{11} \leq \frac{X}{Y} \leq \frac{5}{8}$
(C) $\frac{3}{11} \leq \frac{X}{Y} \leq \frac{8}{5}$
(D) $\frac{3}{5} \leq \frac{X}{Y} \leq \frac{8}{11}$

Ans: B

Exp:

for $\frac{X}{Y}$ we need to find the extremes in between the intervals

$\frac{X}{Y}$ for minimum value x should be less and y should be more

$$\frac{X}{Y} = \frac{3}{11}$$

$\frac{X}{Y}$ for maximum value x should be more and y should be less

$$\frac{X}{Y} = \frac{5}{8}$$

(5) The Headmaster _____ to speak to you.

Which of the following options is incorrect to complete the above sentence?

- (A) Is wanting
(B) Wants
(C) Want
(D) Was wanting

Ans: C

Exp:

(6) Mahatma Gandhi was known for his humility as

- (A) He played an important role in humiliating exit of British from India.
(B) He worked for humanitarian causes.
(C) He displayed modesty in his interactions.
(D) He was a fine human being.

Ans: C

Exp:

(7) All engineering students should learn mechanics, mathematics and how to do computation.

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II

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IV

Which of the above underlined parts of the sentence is not appropriate?

- (A) I
(B) II
(C) III
(D) IV

Ans: D

Exp:



(8) Select the pair that best expresses a relationship similar to that expressed in the pair:

water: pipe::

- (A) cart: road
- (B) electricity: wire
- (C) sea: beach
- (D) music: instrument

Ans: B

Exp:

(9) Given the following differential equation

$$\frac{d^2y}{dx^2} + 7\frac{dy}{dx} + 12y = 0$$

the general solution is

- (A) $y = Ae^{4x} + Be^{-3x}$
- (B) $y = Ae^{-4x} + Be^{-3x}$
- (C) $y = Ae^{3x} + Be^{-4x}$
- (D) $y = Ae^{4x} + Be^{3x}$

Ans: B

Exp: $\frac{d}{dx} = D$

$$D^2 + 7D + 12 = 0$$

$$D^2 + 4D + 3D + 12 = 0$$

$$D(D+4) + 3(D+4) = 0$$

$$(D+3)(D+4) = 0$$

$$D = -3, -4$$

as these are real distinct roots

$$y = Ae^{m_1x} + Be^{m_2x}$$

m_1, m_2 are real roots

$$y = Ae^{-3x} + Be^{-4x}$$

(10) Velocity of an object fired directly in upward direction is given by $V = 80 - 32t$, where t (time) is in seconds. When will the velocity be between 32 m/sec and 64 m/sec?

- (A) (1, 3/2)
- (B) (1/2, 1)
- (C) (1/2, 3/2)
- (D) (1, 3)

Ans: C

Exp: $V = 80 - 32t$,

$$32 = 80 - 32t$$

$$t = 1.5 \text{ sec}$$

$$64 = 80 - 32t$$

$$t = 0.5 \text{ sec}$$

$$t \in (0.5, 1.5)$$

(11) In a factor, two machines M1 and M2 manufacture 60% and 40% of the autocomponents respectively. Out of the total production, 2% of M1 and 3% of M2 are found to be defective.

If a

randomly drawn autocomponent from the combined lot is found defective, what is the probability

that it was manufactured by M2?



- (A) 0.35
- (B) 0.45
- (C) 0.5
- (D) 0.4

Ans: C

Exp: Bayes theorem

$$P(M2/M) = P(M2 \cap M)/P(M) = 0.03 \times 0.4 / (0.6 \times 0.02 + 0.4 \times 0.03) = 0.5$$

P(M) = Probability that it is a defective item.

p(M2 ∩ M) = Probability that the defective item is from M2

(12) Following table gives data on tourists from different countries visiting India in the year 2011.

Country	Number of Tourists
USA	2000
England	3500
Germany	1200
Italy	1100
Japan	2400
Australia	2300
France	1000

Which two countries contributed to the one third of the total number of tourists who visited India in 2011?

- (A) USA and Japan
- (B) USA and Australia
- (C) England and France
- (D) Japan and Australia

Ans: C

Exp:

total no of tourists = 13500

no of tourists from England and France = 4500

no of tourists from England and France / total no of tourists = $4500/13500 = 1/3$

(13) If $|-2X + 9| = 3$ then the possible value of $|-X| - X^2$ would be:

- (A) 30
- (B) -30
- (C) -42
- (D) 42

Ans: B

Exp: $-2X + 9 = 3$ or -3

$$-2X = 3 - 9 \text{ or } -3 - 9$$

$$-2X = -6 \text{ or } -12$$

$$X = 3 \text{ or } 6$$

for $X = 3$

$$|-X| - X^2 = 3 - 9 = -6$$

for $X = 6$



$$|-X| - X^2 = 6 - 36 = -30$$

(14) All professors are researchers

Some scientists are professors

Which of the given conclusions is logically valid and is inferred from the above arguments:

- (A) All scientists are researchers
- (B) All professors are scientists
- (C) Some researchers are scientists
- (D) No conclusion follows

Ans: C

Exp:

(15) The number of ways in which the letters in the word MINING can be arranged is

- (A) 90
- (B) 180
- (C) 360
- (D) 720

Ans: B

Exp: number of permutations with repetition is given by $= \frac{n!}{r_1!r_2!}$ n=no of objects r₁=no of same objects of type1 r₂= no of same objects of type2
 $= 6!/2!2! = 180$

(16) Events A and B are independent but NOT mutually exclusive. If the probabilities P(A) and P(B) are

0.5 and 0.4 respectively, then $P(A \cup B)$ is

- (A) 0.6
- (B) 0.7
- (C) 0.8
- (D) 0.9

Ans:B

Exp: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$P(A \cup B) = P(A) + P(B) - P(A) \times P(B) = 0.5 + 0.4 - 0.2 = 0.7$$

(17) Identify the correct statement for a 'normal distribution'

- (A) Mean is greater than mode but less than median
- (B) Mean is less than mode but greater than median
- (C) Mean is greater than mode and median
- (D) Mean, median and mode are equal

Ans: D

Exp:

(18) John Thomas an _____ writer, passed away in 2018

- (A) Imminent
- (B) Prominent
- (C) Eminent
- (D) dominant

Ans: C

Exp:



(19) M and N had Four children P,Q,R and S of them, only P and R were married. They had children X and Y respectively. if Y is a legitimate child of Which one of the following statements is necessarily False ?

- (A) M is the grandmother of Y
- (B) R is the father of Y
- (C) W is the wife of R
- (D) W is the wife of P

Ans: D

Exp: M,N

P W R Q S

X Y

we can say there is an answer one of C or D

so considering B and C is a legitimate statement then we can say R and W are married

but considering B and D is a legitimate statement the two statements contradict each other so we can say statement D is false

(20) Find the correct relationship in the following?

- (A) $(WOR)_{\text{surface}} = \frac{B_0}{B_w} (WOR)_{\text{reservoir}}$
- (B) $(WOR)_{\text{reservoir}} = \frac{B_0}{B_w} (WOR)_{\text{surface}}$
- (C) $B_w(WOR)_{\text{surface}} + B_0 (WOR)_{\text{reservoir}} = 1$
- (D) none of these

Ans: A

Exp:

(21) What is the property that does not change from reservoir to laboratory?

- (A) Porosity
- (B) J function
- (C) Contact angle
- (D) Such property does not exist

Ans:B

Exp:

(22) A helium porosimetry experiment was carried out on a 5 in. long and 1.5 in. Diameter core sample. The initial pressures in the reference chamber and the Sample chamber (both of equal volumes of 300 cc) were 300 and 14.7 psia, Respectively. After maintaining isothermal conditions, the valve connecting the Two chambers was opened and pressures were allowed to equilibrate, which was Found to be 185 psia. What is the porosity of the core sample in percentage?

Ans: 35 to 40

Exp: bulk volume=8.835in³=144.9cc

$$P_1V_1 + P_2V_1 = P(2V_1 - V_g)$$

$$300 \times 300 + 14.7 \times 300 = 185(600 - V_g)$$

$$V_g = 89.675 \text{ cc}$$

$$\text{Porosity} = 1 - (V_g/BV) = 1 - (89.675/144.9) = 0.381145$$



- (23) Calculate the bubble point pressure and the composition of the vapour for a solution containing 100lb of propane and 90lb of n-pentane at 100F. assume ideal behaviour. Vapour pressure of propane and n pentane are 38.20 and 54 psia respectively.

Ans: 40 to 45

Exp:

	Molecular wt	Weight	No of moles=wt/mwt	Molefraction (Zi)	Vapur pressure(Pi)	PiZi
Propane	44	100	2.273	0.74	38.20	28.268
N pentane	72	90	0.8	0.26	54	14.04
		Total no of moles=	3.073		Bubblepoint=	42.308

- (24) A 10lb block of dry ice is placed in a 50 cuft tank that contains air at atmospheric pressure 14.7 psia and 75F. what will be the final pressure in psia of the sealed tank when all the dry ice has evaporated and cooled the gas to 45F?

note:- (consider the volume of ice very small when compared to the container)

Ans: 35 to 40

Exp:

$$V=50\text{ft}^3 \quad V=50\text{ft}^3$$

$$P=14.7\text{psia} \quad P=?$$

$$T=75\text{F}=75+460=535\text{R} \quad T=45\text{F}=45+460=505\text{R}$$

$$\text{No of moles of H}_2\text{O} = 10/44 = 0.227$$

$$PV=nRT \quad n=\text{no of moles gas in the tank excluding dry ice}$$

$$14.7 \times 50 = n \times 10.73 \times 535$$

$$n=0.128$$

after evaporation all the dry ice converts to vapour

$$\text{total no of moles} = 0.128 + 0.227 = 0.355$$

$$PV=nRT$$

$$P \times 50 = 0.355 \times 10.73 \times 505$$

$$P=38.47\text{psia}$$

- (25) A volumetric oil reservoir whose PVT properties are given below. When the reservoir pressure is dropped from an initial pressure of 2500psi to an average pressure of 1600psia, a total of 26 MMSTB of oil had been produced. The cumulative GOR at 1600psia was 954 SCF/STB, and the current GOR was 2250 SCF/STB. the average porosity for the field is 0.18 and average connate water saturation is 0.18. now water was produced and standard conditions were 14.7psia and 60F. calculate the average gas saturation in the reservoir at 1600psi?

	2500psi	2000psi	1600psi
Bo bbl/stb	1.29	1.272	1.21
Rs SCF/STB	575	510	385
Z	0.87	0.82	0.82

Ans: 0.1 to 0.2

$$\text{Exp: } N_p(Bo + (R_p - R_s)Bg) = N(B_t - B_{ti})$$

$$26(1.21 + (954 - 385)0.001574) = N(1.21 + (575 - 385)0.001574 - 1.29)$$

$$N=250\text{MMSTB}$$

$$S_{oi} = 1 - S_{wc} = 1 - 0.18 = 0.82$$



$$\frac{S_o}{S_{oi}} = \frac{B_o}{B_{oi}} \left(1 - \frac{N_p}{N}\right)$$

$$S_o = 0.689$$

$$S_g = 1 - S_o - S_{wc}$$

$$= 0.1308$$

- (26) During the gravel rock operation the 6in I.D.liner became filled with gravel, and a layer of mill scale and dirt accumulated to a thickness of 1in on top of the gravel within the pipe. If the permeability of the accumulation is 1000md, what additional pressure drop in psi is placed on the system when pumping a 1cp of fluid at the rate of 100bbl/hr.?

Ans: 900 to 906

Exp: $Q/A = 0.001127K(P_1 - P_2)/\mu L$

$$Q = 100 \text{ bbl/hr} = 2400 \text{ bbl/day}$$

$$A = \pi 6^2 / 4$$

$$= 28.274 \text{ in}^2 = 0.19634 \text{ ft}^2$$

$$2400 / 0.19634 = 0.001127 \times 1000 \times \text{pressure drop} / 1 \times (1/12)$$

$$\text{Pressure drop} = 904 \text{ psi}$$

- (27) During a period of production from a certain reservoir, the average reservoir pressure remained constant at 3200psia. during the stabilized pressure, the oil and water producing rates were 30,000STB/day and 5000STB/day, respectively. Calculate the incremental water influx for a later period when the pressure drops from 3000psia to 2800psia. assume the following relationship for pressure and time holds

$$\frac{dP}{dt} = -0.003 \text{ p, psia/month}$$

Other data are the following:

$$P_i = 3500 \text{ psia, } R_{si} = 750 \text{ SCF/STB}$$

$$AT \ 3200 \text{ psia}$$

$$B_t = 1.45 \text{ bbl/STB, } B_g = 0.002 \text{ bbl/STB, } R_p = 800 \text{ SCF/STB, } B_w = 1.04 \text{ bbl/STB}$$

Note:- use schilithius steady state model 1 month=30days

$$\frac{dWe}{dt} = C(p_i - p)$$

$$C = \text{constant}$$

Ans: 22 to 25

$$\text{Exp: } \frac{dWe}{dt} = N_p(B_t + (R_p - R_{si})B_g) + W_p B_w$$

$$= 51700 \text{ bbl/day}$$

use schilithius steady state model

$$\frac{dWe}{dt} = C(p_i - p)$$

$$\frac{dWe}{dt} = C(3500 - 3200)$$

$$51700 = C300$$

$$C = 172.3 \text{ bbl/day/psi}$$

$$\frac{dP}{dt} = -0.003 \text{ p}$$

After integrating

$$\ln\left(\frac{P_1}{P_2}\right) = 0.003t$$

$$\ln\left(\frac{3000}{2800}\right) = 0.003t$$

$$T = 23 \text{ months}$$



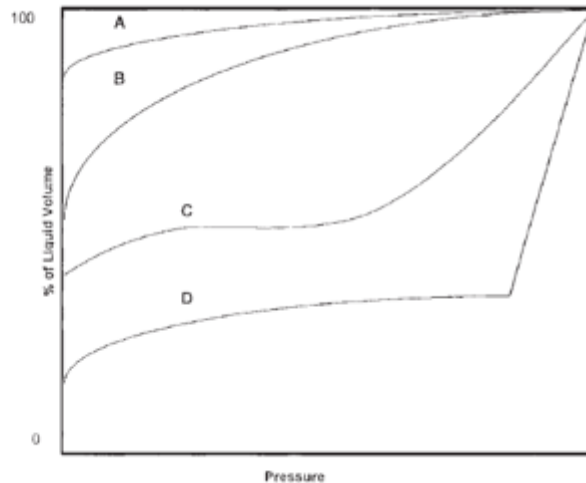
$$\frac{dWe}{dt} = \frac{51700bbl}{day} \frac{(p_i - p)}{psi}$$

$$dWe = 517000 \times (3000 - 2800) \times 23 \times 30$$

$$= 24 \text{MMbbl}$$

(28) Choose the correct option?

- 1- Ordinary black oil
- 2- Near-critical crude oil
- 3- Low-shrinkage crude oil
- 4- Volatile crude oil



- (A) A-3 B-1 C-2 D-4
- (B) A-1 B-3 C-4 D-2
- (C) A-1 B-3 C-2 D-4
- (D) A-3 B-1 C-4 D-2

Ans: D

Exp:

(29) Select the correct statement from the following?

- (A) Abnormal pressure occur in areas where fluids have been drained
- (B) Rock and liquid expansion considers the liquid as compressible
- (C) Saturation is an extensive property
- (D) 2 lb. mole of gas occupies a volume of 759SCF at standard conditions

Ans: D

Exp:

(30) as project supervisor for an insitu uranium leaching project, you have observed that to maintain a constant injection rate in wellA, the pump pressure has to be increased so that $P_e - P_w$ has increased by a factor of 20 from the value of the startup. an average permeability of 100md was measured from plugs cored before the injection of leachant. you suspect build-up of calcium carbonate precipitate has damaged the formation near the injection well. If the permeability of the damaged section is assumed to be 1md, find the extent of the damage in ft. The wellbore radius is 0.5ft and the distance to the outer boundary of the uranium deposit is estimated to be 1000ft.

Ans: 2.2 to 2.4

Exp: $P_e - P_w = 20(P_e - P_w)_{\text{initial}}$

$$K = 100 \text{md}, K_{\text{skin}} = 1 \text{md}, r_w = 0.5 \text{ft}, r_e = 1000 \text{ft}$$

$$(P_e - P_w)_{\text{initial}} = 141.2 q \mu B_o / kh \ln(r_e / r_w)$$

$$= m \ln(1000 / 0.5)$$



$$=7.6\text{m}$$

$$\text{Pressure loss due to skin} = 141.2 q \mu B_o / kh S = mS$$

$$S = (K / K_{skin} - 1) \ln(r_{skin} / r_w)$$

$$= 99 \ln(r_{skin} / 0.5)$$

$$\text{Pressure loss due to skin} = m 99 \ln(r_{skin} / 0.5)$$

$$20(P_e - P_w)_{\text{initial}} = 99m \ln(r_{skin} / 0.5)$$

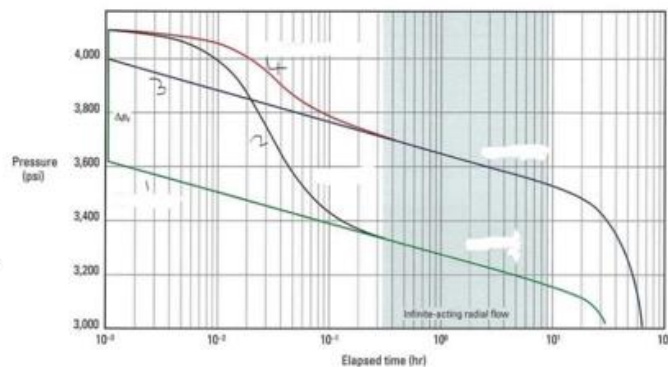
$$20 \times 7.6 \times m = 99m \ln(r_{skin} / 0.5)$$

$$R_{skin} = 2.3215\text{ft}$$

(31) Choose the correct option?

Here P represents the bottom hole pressure for constant flow rate?

- A) IDEAL RESPONSE
- B) SKIN NO STORAGE
- C) WELLBORE STORAGE, NO SKIN
- D) STORAGE + SKIN

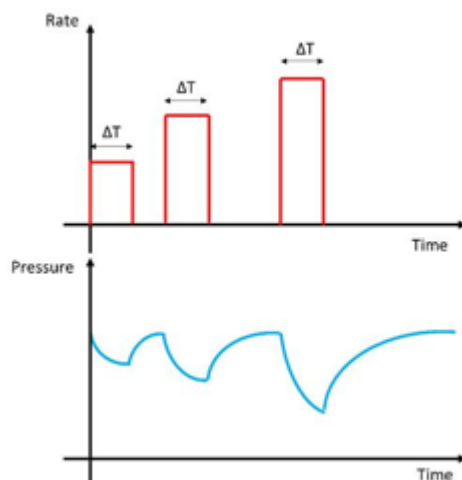


- (A) 1-B 2-A 3-D 4-C
- (B) 1-C 2-D 3-A 4-B
- (C) 1-B 2-D 3-A 4-C
- (D) 1-D 2-B 3-A 4-C

Ans: C

Exp:

(32) Choose the correct option?



What type of well test does above graphs represent?



- (A) Flow after flow test
- (B) Isochronal test
- (C) Modified isochronal test
- (D) Pulse test

Ans: B

Exp:

(33) select the equation to find average reservoir pressure of a compressible fluid in semi steady state condition. Qg in MMSCF/day and remaining all in field units

- (A) $m(P_e) - m(P_{wf}) = \frac{1422 Q_g T}{Kh} \left(\ln \left(\frac{r_e}{r_w} \right) - \frac{1}{2} + S \right)$
- (B) $m(P_e) - m(P_{wf}) = \frac{1422 Q_g K}{Th} \left(\ln \left(\frac{r_e}{r_w} \right) - \frac{1}{2} + S \right)$
- (C) $m(P_r) - m(P_{wf}) = \frac{1422 Q_g T}{Kh} \left(\ln \left(\frac{r_e}{r_w} \right) - \frac{3}{4} + S \right)$
- (D) $m(P_r) - m(P_{wf}) = \frac{1422 Q_g K}{Th} \left(\ln \left(\frac{r_e}{r_w} \right) - \frac{3}{4} + S \right)$

Ans: C

Exp:

(34) For the reaction between 20 wt.% HCl solution and Calcite, calculate the gravimetric dissolving power?
 $\text{CaCO}_3 + 2 \text{HCl} = \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$

- (A) 0.26 to 0.29

Ans: A

Exp:

$$\text{Gravimetric dissolving power } (\beta) = \frac{\text{wt of mineral}}{\text{wt of acid}} \times \frac{\text{no of moles of acid} \times \text{molecular wt of mineral}}{\text{no of moles of mineral} \times \text{molecular wt of acid}}$$

$$= \frac{1 \times 100}{2 \times 36.5}$$

$$= 1.369$$

$$\beta_{20\%} = 0.2 \times \beta = 0.2738$$

(35) this equipment increase the efficiency of the sucker rod pump by diverting the gas from the barrel of sucker rod pump to the tubing/casin annulus before entering the subsurface pump.

- (A) Gas lift
- (B) Gas controller
- (C) Gas anchor
- (D) Gas header

Ans: C

Exp:



(36) Choose the correct option?

A) Choke size	1) 60-150°C
B) Filter cake thickness	2) 150-225°C
C) oil window	3) Measured in $\frac{1}{32}$ of an inch
D) gas window	4) Measured in $\frac{1}{64}$ of an inch

- (A) A-3 B-4 C-1 D-2
(B) A-4 B-3 C-2 D-1
(C) A-4 B-3 C-1 D-2
(D) A-3 B-4 C-2 D-1

Ans: C

Exp:

(37) Which of the following artificial lift has the best efficiency to handle solids?

- (A) Gas lift
(B) Sucker rod pump
(C) Progressive cavity pump
(D) Electrical submersible pump

Ans: C

Exp:

(38) which of the following case is most ideal for the use of matrix acidizing in a clastic reservoir?

- (A) Low skin Low permeability
(B) High skin Low permeability
(C) High skin High permeability
(D) Low skin High permeability

Ans: C

Exp:

(39) Choose the correct statement

- (A) Bullet perforator penetrates deeper than shaped charges
(B) Vertical separators are more suitable for high GOR
(C) Scale deposited very rapidly are very porous than scale deposited slowly
(D) Gravel packing is used to control the sloughing shale's

Ans: C

Exp:

(40) A well is producing from a saturated reservoir with an average reservoir pressure of 2500psia. stabilized production test data indicates that the stabilized rate and well bore pressure are 350 STB/day, and 2000psia respectively. Calculate oil flow in STB/day rate at 1850 psia .use vogels equation.

Ans: 439 to 443

Exp:

$$Q_o = Q_{o\max} \left(1 - 0.2 \frac{P_{wf}}{P_r} - 0.8 \left(\frac{P_{wf}}{P_r} \right)^2 \right)$$



$$350 = Q_{\max} \left(1 - 0.2 \frac{2000}{2500} - 0.8 \left(\frac{2000}{2500} \right)^2 \right)$$
$$Q_{\max} = 1067.1 \text{ STB/day}$$
$$Q_o = 1067.1 \left(1 - 0.2 \frac{1850}{2500} - 0.8 \left(\frac{1850}{2500} \right)^2 \right)$$
$$= 441.7 \text{ STB/day}$$

(41) Choose the correct option?

Tanks	Fluid
a) floating roof tank	1) diesel
b) bullet tanks	2) high vapour pressure gas
c) Spherical tanks	3) gasoline
d) fixed roof tanks	4) LPG

- (A) A-1 B-4 C-2 D-4
(B) A-3 B-4 C-2 D-1
(C) A-3 B-2 C-4 D-1
(D) A-4 B-3 C-2 D-1

Ans: B

Exp:

(42) A section of heavy walled tubing that is placed across any perforated interval through which the production tubing must pass, such as may be required in multiple zone completions to resist the jetting action that may result in the proximity of the perforations. What is this device/equipment?

- (A) Ported Nipple
(B) Flow Coupling
(C) Blast Joint
(D) Expansion Joint

Ans: C

Exp:

(43) Choose the Correct option?

A) Spontaneous Potential	1) $\mu\text{sec/ft}$
B) Density log	2) seimien
C) Transit time	3) milli volt
D) conductivity	4) gm/cc

- (A) A-4 B-3 C-2 D-1
(B) A-3 B-4 C-2 D-1
(C) A-4 B-3 C-1 D-2
(D) A-3 B-4 C-1 D-2

Ans: D

Exp:



- (44) Consider a sandstone formation has a resistivity of 80 Ωm when the formation is 100% saturated with Brine which has a resistivity of 0.8 Ωm . find the resistivity of the sandstone formation in Ωm . when it is 100% saturated with diesel which has a resistivity of 1.5 Ωm .

Ans: 150

Exp:

$$F_r = \frac{\text{resistivity of rock 100\% saturated with a fluid}}{\text{resistivity of fluid}}$$

Formation resistivity factor is always constant and does not depend on the resistivity of the saturating fluid as long it completely fills the void space

$$F_r = \frac{80}{0.8} = 100$$

resistivity of rock 100% saturated with a diesel = $F_r \times \text{resistivity of diesel}$

$$= 100 \times 1.5$$

$$= 150 \Omega\text{m}.$$

- (45) Resistivity Is Inversely Proportional To:

- (A) Tightness.
- (B) Oil Presence.
- (C) Formation water salinity
- (D) Hole Inclination

Ans: C

Exp:

- (46) Which of the following is a lithology log?

- (A) Density log
- (B) SP log
- (C) Neutron log
- (D) Sonic log

Ans: B

Exp:

- (47) Which of the following platforms has the maximum Operating Depth ?

- (A) Jack up platform
- (B) Compliant tower
- (C) SPAR
- (D) Tension leg platform

Ans: C

Exp:

- (48) The equipment that is used to connect the floating drilling/production facility with subsea wells and are critical to safe field operations is ?

- (A) Mooring lines
- (B) Thrusters
- (C) Riser
- (D) Tethers

Ans: C

Exp:



(49) Choose the correct option?

A) Yield strength	1) gal/sack
B) Dose	2) celerity
C) Yield of cement	3) lb/100ft ²
D) Wind Speed	4) ppm
	5) bbl.

- (A) A-4 B-3 C-1 D-2
(B) A-3 B-5 C-1 D-2
(C) A-3 B-4 C-5 D-2
(D) A-3 B-4 C-1 D-2

Ans:D

Exp:

(50) Select the correct sequence of torque transmission

- (A) Rotarytable-Masterbushing-Kellybushing-Drillpipe -Kelly
(B) Rotary table-Master bushing-Kelly bushing-Kelly-Drill pipe
(C) Rotary table-Kelly bushing -Master bushing -Kelly-Drill pipe
(D) Rotarytable-Masterbushing-Kellybushing-Drillpipe

Ans:B

Exp:

(51) a well has been drilled to a depth of 10,000ft using a mud of density 13.5 ppg.on reaching the 10,000ft there is a intrusion of gas into the mud which changed the density of mud from 13.5 to 12.8 ppg in the first 900 ft and to 12.5 ppg from 900 to 7000ft. calculate the reduction in bottom hole pressure in psi?

Ans: 348 to 352

Exp:

initial bottom hole pressure

$$P_i = 0.052 \times \rho_m (\text{ppg}) \times \text{depth} (\text{ft})$$

$$= 0.052 \times 13.5 \times 10,000$$

$$= 7020 \text{ psi}$$

Final pressure

$$P_f = 0.052 \times 12.8 \times 900 + 0.052 \times 12.5 \times 6100 + 0.052 \times 13.5 \times 3000$$

$$= 6670.04 \text{ psi}$$

Reduction in bottom hole pressure

$$\Delta P = P_i - P_f = 7020 - 6670 = 350 \text{ psi}$$

(52) Choose the Correct option?

A) Annular Preventer	1) Cuts the pipe
B) Shear Ram	2) Closes in open hole
C) Blind Ram	3) Closes on any object
D) Pipe Ram	4) Closes on drill pipe excluding tool joints



- (A) A-3 B-1 C-2 D-4
- (B) A-3 B-1 C-4 D-2
- (C) A-4 B-1 C-2 D-3
- (D) A-3 B-2 C-1 D-4

Ans: A

Exp:

(53) A well is to be acidized by using 5inch,19.5ppf grade G drill pipe and a buttonhole packer is set at 13,000ft.a 15%HCL of density 67PCF will be pumped at a surface pressure of 8000psi.the drill pipe casing annulus is filled with 90PCF mud. Determine the Worst burst load on the drill pipe in psi?

Ans: 8000

Exp: worst burst load is experienced at maximum internal pressure and minimum external pressure i.e at the top of drill pipe i.e surface

(54) Calculate the amount of Water Required per sack in gallons to provide a slurry of 13ppg .the slurry contains cement G, water,8%bentonite. Specific gravity of cement G is 3.143 and specific gravity of bentonite is 2.644.density of water is 8.33ppg.

Note: 1 sack of cement G contains 94 lbs of it

Ans: 10 to 11

Exp:

Material	Weight(lb)	Absolute volume(gal/lb)=1/(8.33S.G)	Volume (gal)
Cement G	94	0.0382	3.5908
Bentonite	94x0.08=7.52	0.0454	0.3414
Water	8.33v	0.1200	v
Total weight=	101.52+8.33v	Total volume=	3.9322+v

Slurry density = total volume/total weight

$$13 = \frac{101.52 + 8.33v}{3.922 + v}$$
$$v = 10.8 \text{ gallons}$$

(55) A down hole tool that is used to impart a heavy blow or impact load to a down hole tool assembly. Commonly used in fishing operations to free stuck objects.

- (A) Drill Collar
- (B) Reamers
- (C) Drilling Jars
- (D) Stabilizers

Ans: C

Exp:

(56) Calculate the Yield Point for the Following rotational viscometer readings

$$\theta 300 = 30 \quad \theta 600 = 51$$

Ans: 9

Exp: $YP = 2 \times \theta 300 - \theta 600$
 $= 2 \times 30 - 51$
 $= 9$



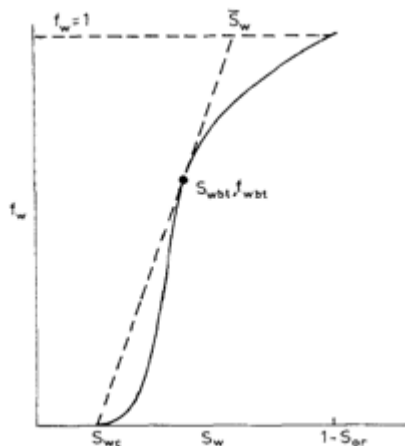
(57) Which of the following is **NOT** one of the Principles of Stratigraphy?

- (A) Law of Super position
- (B) Principle of Original horizontality
- (C) Principle of Sedimentology
- (D) Principle of Original lateral continuity

Ans:C

Exp:

(58) Assume a cubical reservoir under active water drive with oil production 1000bbl/day the flow can be approximated as linear flow whose water front has an average saturation of 55% the cross sectional area is the product of the 1320ft width and true formation thickness of 20ft for a porosity of 0.25 with the length between production and injection well is 750 ft and the connate water saturation before flooding is 24%. Calculate the breakthrough time in days of a water flood.



Ans: 270 to 277

Exp:

$$\frac{df_w}{dsw} = \frac{1-0}{S_w - S_{wc}} \quad S_w = \text{avg reservoir pressure} = S_w \text{ bar}$$

$$= \frac{1-0}{0.55-0.24}$$

$$= 3.226$$

$$t_{bt} Q_{bt} = \frac{AL\phi}{\frac{df_w}{dsw}} \quad t_{bt} = \frac{1320 \times 20 \times 750 \times 0.25}{3.226 \times 1000 \times 5.6146} \quad t_{bt} = 274 \text{ days}$$

(59) To determine the Water/oil IFT, water is being displaced through a small tube into an oil bath as shown in figure. The water forms a spherical drop, which breaks away from the water in the injection tube when it is large enough and falls into the bottom of the container.

for this experiment, the following data is given

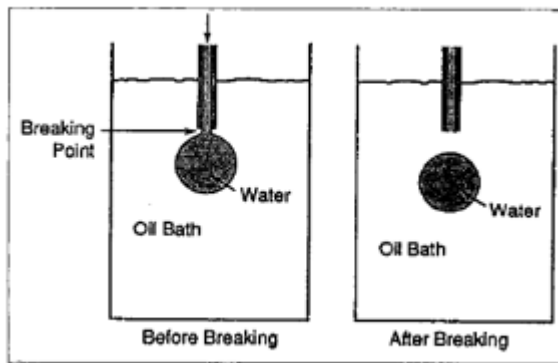
rt=inside radius of discharge tube=0.04in

rd=drop radius(at the time of breaking away)=0.104in

pw=water density=1 gm/cc

po = oil density =0.75gm/cc

with these data estimate the water/oil IFT in $\times 10^{-4}$ lbf/ft



Ans: 18 to 22

Exp:

$$\sigma_{ow}(2\pi r t) = \frac{4}{3}\pi r d^3 (\rho_w - \rho_o)g$$

$$\sigma_{ow} t = \frac{2}{3}\pi r d^3 (\rho_w - \rho_o)g$$

$$\sigma_{ow} \times 0.04 \text{ in} = \frac{2}{3} (0.104 \text{ in})^3 (1 - 0.75) \text{ gm/cc } g$$

$$\sigma_{ow} \times 0.04 \text{ in} = \frac{2}{3} (0.104 \text{ in})^3 (1 - 0.75) \text{ gm/cc } g$$

$$\sigma_{ow} = 0.00468 \text{ in}^2 \text{ gm/cc}$$

$$= \frac{0.1416 \text{ ft}^2 \times 62.4 \text{ pcf} \times g}{144} \quad 1 \text{ ft} = 12 \text{ in}$$

$$= 0.00203 \text{ lbf/ft} \quad 1 \text{ gm/cc} = 62.4 \text{ lbm/ft}^3$$

$$1 \text{ lbm} \times g = 1 \text{ lbf}$$

(60) Which of the following Thermal recovery process is used for deep reservoirs?

- (A) Steam Drive
- (B) Steam Stimulation
- (C) Insitu Combustion
- (D) Hot water Flooding

Ans: C

Exp:

(61) Which of the Following Enhanced Oil Recovery Method increases the Microscopic displacement efficiency?

- (A) Polymer Flooding
- (B) Surfactant Flooding
- (C) Gas Flooding
- (D) Steam Flooding

Ans: B

Exp:

(62) Which Programme is initiated by the Government to Explore and produce gas hydrates in India to meet the India's growing energy demand?

- (A) Gas Hydrate Programme (GHP)
- (B) National Gas Hydrate Development Programme (NGHDP)
- (C) National Gas Hydrate Programme (NGHP)
- (D) Gas Hydrate Development Programme (GHDP)



Ans:C

Exp:

(63) Which of the following gas storage mechanism does Coal Bed Methane Exercise?

- (A) Absorption
- (B) Adsorption
- (C) Compression
- (D) None of the above

Ans: B

Exp:

(64) Consider an oil spill taken place in an open ocean which Equipment/device collects and removes oil from the surface of the water.

- (A) Booms
- (B) Skimmer
- (C) Free boards
- (D) Acoustic Barriers

Ans: B

Exp: Boom accumulates the spilled oil where as skimmer collects and removes it

(65) What type of extinguishing agent should we use when we encounter Fire of this type of sign?



- (A) Water
- (B) Foam Spray
- (C) Wet Chemical
- (D) Dry Powder

Ans:D

Exp:

END OF ANSWERS AND EXPLANATION



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