Total No. of Questions : 12]

SEAT No. :

P1099

[Total No. of Pages : 7

[4659]-269
B.E. (Petroleum)
WELL ENGINEERING AND DESIGN
(2008 Course) (412383) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any three questions from each section.***
2) ***Answers to the two sections should be written in separate books.***
3) ***Assume suitable data if necessary.***
4) ***Use of electronic pocket calculator is allowed.***

SECTION - I

Q1) Data given: **[18]**

17-1/2'' hole and 13-3/8'' csg surface casing

a)	This Section Depth	1150	M
b)	RT to GL Level	10	M
c)	Maximum mud weight to drill this hole section	9.8	Ppg
d)	Mud Weight to drill next hole Section	11	Ppg
e)	Expected Pore pressure gradient in next section	10.1	Ppg
f)	Influx Gradient	0.1	psi/ft
g)	Fracture Gradient at Shoe - Expected	18	Ppg
h)	Cement Slurry Weight (Lead)	12.8	Ppg
i)	Cement Slurry Height (Lead)	700	M
j)	Cement Slurry Weight (Tail)	15.8	Ppg
k)	Cement Slurry Height (Tail)	150	M
l)	Next Section Depth	2630	m (TVD)

P.T.O.

Using graphical method find out 13-3/8" intermediate casing grade from the following:

Nominal Size OD Inch	13.375	13.375
Nominal weight ppf	54.5	68
Grade	K55	K55
Collapse resistance (Mpa)	7.8	13.4
Internal yield pressure (Mpa)	18.9	23.8
Pipe body yield strength (daN)	3,80,000	4,76,000

Mpa × 145 = Psi, daN × 2.25 = lb

OR

Q2) a) Data given: **[6]**

13-3/8" shoe = 10008 ft RKB, Next TD (12-1/4") = 14190 ft RKB

Fracture gradient at 13-3/8" shoe = 16ppg, Planned mud weight at TD of next hole 15.5 ppg, Maximum formation pressure at TD 14 ppg, gas gradient 0.15 psi/ft RKB to MSL = 85 ft.

Calculat : Maximum kick volume.

b) Discuss different casing design load cases in detail. **[6]**

c) Discuss pore pressure prediction by D exponent. **[6]**

Q3) a) Existing inclination I_1 and Required inclination I_2 = 8 deg., Existing Azimuth = 117 deg. **[8]**

Dogleg = 3.5 deg/ 100ft.

Assuming that left hand change in azimuth is required over a 100ft interval, what will be the new azimuth of the bore hole?

b) Discuss Minimum curvature method and find out ΔV, ΔN, ΔE for below survey data **[8]**

Measured depth ft	Inclination deg	Azimuth deg
2000	2.0	45
2090	4.5	50

OR

Q4) a) Discuss geometry of the "S" type well trajectory in detail. **[8]**

b) Discuss Reactive torque in brief. **[3]**

c) A directional well is to be drilled from an offshore platform to intersect a target whose horizontal displacement is 3500ft at a depth of 10,500ft. A L type profile is used with KOP = 1600ft and BUR of 1.5 deg per 100ft. Calculate: **[5]**

i) Inclination at the end of the build up section.

ii) Horizontal displacement and TVD at the end of build up section.

iii) The total MD to the target.

Q5) Well data: **[16]**

Hole size : 12.25", Hole depth 12,800 ft MD, 11660 ft TVD

Casing 13-3/8" set at 9000ft TVD

Drill pipe 5", capacity 0.0176" bbl/ft

HWDP 5", 310 ft long, capacity 0.0088 bbl/ft

Drill collars 8", 630 feet long, capacity 0.007 bbl/ft

Mud density : 12 ppg

Capacities:

Drill collars in open hole 0.0836 bbl/ft

Drill pipe/HWDP in open hole 0.1203 bbl/ft

Drill pipe / HWDP in casing 0.1269 bbl/ft

Mud pumps : 0.103 bbl/stroke

SCR : 650 psi at 30 SPM

A leak off test was carried out at 13-3/8" casing shoe and fracture gradient recorded at the shoe was 0.87 psi/ft

The well has been shut after a kick

SIDPP 595 psi, SICP 643 psi.

Calculate:

a) How many strokes are required to pump kill mud from surface to bit?

b) How many strokes are required to pump kill mud from bit to surface?

c) What is the pressure safety Margin at casing shoe with the well shut in?

d) What is the kill mud density?

e) ICP.

f) FCP.

g) What is the MAASP at the time of well shut in?

h) What is the MAASP after circulation of kill mud?

OR

Q6) a) What will be the reduction in bottom hole pressure if 6 stands of drill pipes are pulled out wet without filling the hole?

One stand length 92 ft, casing capacity 0.0745 bbls/ft, drill pipe capacity 0.0176 bbls/ft,

Drill pipe steel displacement 0.0080 bbls/ft.

Mud weight 14.5 ppg. **[4]**

b) Use following information **[4]**

Accumulator bottle capacity = 10 gal

Number of bottles 20

During a BOP function the pressure on accumulator bottle bank drops from 3000psi to 1900psi. How many gallons of fluid did that function use?

Max. operating pressure 3000 psi, minimum operating pressure 1200 psi, precharge pressure 1000psi.

c) Discuss Driller's method of well control in detail. **[8]**

SECTION - II

Q7) Calculate: **[16]**

a) Quantity of cement required in sacks and the amount of mix water required. Use 20% excess cement on liner/ open hole annulus volume.

b) Total hook load immediately prior to setting the linear hanger (weight of block etc. 103 KN/22,000lbs).

c) Hook load after having hung the liner and before cementing.

d) Chase volume to displace the drill pipe wiper plug to land in liner wiper plug.

e) Chase volume to displace the combined wiper plugs to the float collar. Top of open hole section 11,980ft.

TD 13,960 ft, Drilling fluid density 0.728 psi/ft, BF 0.787

Drill pipe 5" - 19.5ppf, casing 9-5/8" - 47 ppf - ID 8.681"

Liner 7" - 32 ppf - ID 6.094"

Liner shoe track 80 ft, Liner wiper plug 40ft below top of liner i.e. 11,690 ft.

Capacities:

Drill pipe: 0.0178 bbls/ft, liner 0.0361bbls/ft

Annulus liner / open hole 0.0226 bbls /ft

Annulus liner / casing 0.0256 bbls/ft

Water spacer of 0.5m^3 are used ahead of and behind the cement.

Slurry density 16.4 ppg (123 pcf)

Slurry yield 1.06 ft^3/sack, water mix - 4.30 gals / sack

OR

Q8) a) Discuss squeeze cementation in detail. **[6]**

b) Discuss liner setting and cementation process with suitable sketch. **[10]**

Q9) a) Calculate tensile load act on top joint of drill pipe. **[8]**

Well depth 13,500 ft, Mud weight 14.3 ppg, Drill collar 8" OD, 3" ID, 540ft,147 ppf Drill pipe 5" OD 4.276"ID, 19.5 ppf

b) Discuss drill string design based on Tension, collapse, bending and torque. **[8]**

OR

Q10)a) Find E grade and G drill pipe length for 12.25" hole **[8]**

Weight of 8" drill collar 150 ppf, length 9.40m

Weight of 6.5" drill collar 83 ppf, length 9.40m

5" E grade Drill pipe 19.5 ppf, Tensile strength 141.8T, length 9.27m

5" G grade drill pipe 19.5 ppf, Tensile strength 197.6T, length 9.27 m

5" HWDP 50 ppf, length 9.27m

Bit diameter 12.25", Hole depth 2960m, BHA length 253m, Mud weight 1.69 gm/cc, safety factor in tension 1.8, safety factor in collapse 1.125.

b) Calculate BSR of 9-1/2" × 3" drill collar and 8-1/2" × 3' drill collar combination. **[3]**

c) Discuss hydrogen embrittlement phenomenon and material used in H2S environment. **[5]**

Q11)a) Discuss field method of optimizing bit hydraulics with flow behaviour parameters hedstrom number and Renold number. Discuss different pressure losses in the system. **[9]**

b) Determine Pressure loss at bit and parasitic pressure loss. **[9]**

Mud weight 9.6 ppg, Flow rate 485 gpm, Pump pressure 2800 psi, nozzle size 3 × 12/32".

OR

Q12)Find nozzle sizes for Max. BHHP **[18]**

Pump –3423 psi max surface pressure., 1600 hp max input

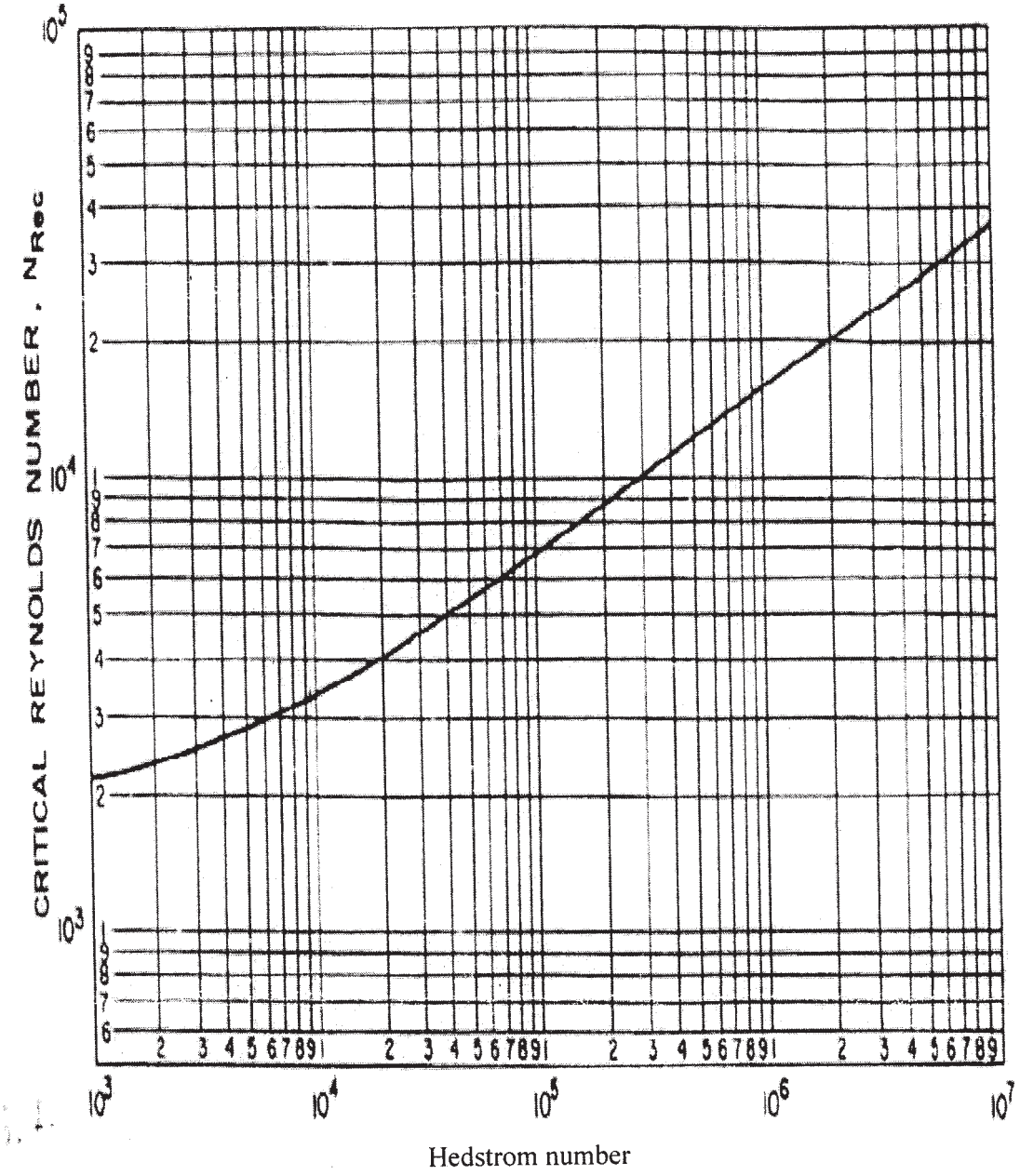
Drill pipe 4.5", 16.6 ppf, 3.826" ID

600 ft of 7.5" OD, 2.75" ID

Surface equipment

Pressure loss 340ft of drill pipe, Hole size 10.05", Min annular velocity 120ft/min, assume flow rate 500gpm

Depth ft	Mud density ppg	Plastic viscosity Cp	Yield point lbs/100sq.ft
5000	9.5	15	5



Hedstrom number Vs Renold Number