Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 1

Winter Semester: 2021 - 22

Course Code: PET 301

Course Name: Well Design and Construction

Program & Sem: B.Tech (PET) & VI Sem

Date: 26th April 2022

Time: 1.30 PM to 2.30 PM

Max Marks: 30

Weightage: 15%

Instructions:

(i) Read the all questions carefully and answer accordingly.
(ii) Question paper consist of three parts, PART A, B & C
(iii) All questions are mandatory

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries one marks. (6Qx 1M= 6M)

Q.NO.1. Near Bit Stabilizers are used in TYPE ____ well profile. (I/II/III)

(C.O.No.1) [Knowledge]

Q.NO.2. To drill a 15000 ft. well form the surface we need _____ft. length of drill string considering Kelly length=29 ft. Drill pipe length=31 ft. and RT height=50 ft.

(C.O.No.1) [Knowledge]

Q.NO.3.Find the ODD one from the following, Draw work, Kelly, Crown block, Travelling block, Hook

(C.O.No.1) [Knowledge]

Q.NO.4. "*Pin and Box are cut from the pipe body in Drill collars*"- TRUE/FALSE?

(C.O.No.1) [Knowledge]

Q.NO.5. What we call a used Drill pipe? (C.O.No.1) [Knowledge]

Q.NO.6. Which components of Drill string add to increase WOB? (C.O.No.1) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries three marks. (3Qx3M=9M)

Q.NO.7. "*ID of Drill collar is less than the ID on Drill Pipe*"-What problem we may encounter because of this and how we will mitigate this problem? (C.O.No.1) [Comprehension]

Q.NO.8. There are different subs are used in drill string assemble. Mention any three subs used in drill string assembly along with the problem we might face if we don't add that component in the drill string. (C.O.No.1) [Comprehension]

Q.NO.9. "*Air weight of drill string is different from the submerged weight of the drill string is different*"- What is the remedy for this problem? (C.O.No.1) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. The question carries fifteen marks. (1Qx15M=15M)

Q.NO.10. Design a drilling string for an exploratory well with the following parameters:

Hole size= 9 inch, Hole depth=20000 ft.

7"×$3^{1}/_{2}$", 700 ft. Drill collar

Remaining length is Drill pipe

Select any higher grade Drill Pipe of Class 2 type.

Safety factor=1.35; MOP= 30000 lb.

Average length of Drill Pipe=30 ft.

Percentage yield=90%

Mud weight=15 ppg; Density of steel=489.5 pcf.

Take the required values from the standard API tables.

[Students have to take the design parameters from the API recommended manuals. Students can carry the neat and clean (without any marking) hard copy of these manuals in the examination hall]
(C.O.No. 1) [Application]

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GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 2

Winter Semester: 2021 - 22
Course Code: PET 301
Course Name: Well Design and Construction
Program & Sem: B.Tech (PET) & VI Sem

Date: 1st June 2022
Time: 01.30 PM to 02.30 PM
Max Marks: 30
Weightage: 15%

Instructions:

(i) Read the all questions carefully and answer accordingly.
(ii) Question paper consist of three parts, PART A, B & C
(iii) All questions are mandatory

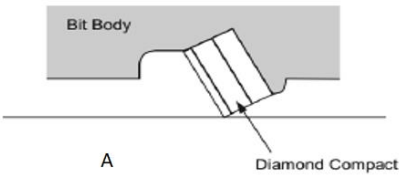
Part A [Memory Recall Questions]

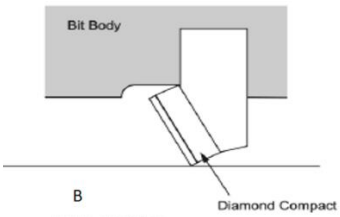
Answer all the Questions. Each question carries TWO marks. (2Qx2M=4M)

1. Match the following (*There can be multiple match*):

Formation	Formation
(A) Soft	(a) Low ROP
(B) Moderate	(b) Extremely high ROP
(C) Hard	(c) Closely spaced tooth
	(d) Shorter and Stubbier teeth
	(e) High cleaning required

2. Identify the bit body material for PDC bit.





Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries FOUR marks. (3Qx4M=12M)

3. Give one supporting comment for the following statements
(a) Insert tooth bit for hard rocks is preferable
(b) The amount of offset is directly related to the strength of rock being drilled

(c) The smaller the journal angle the greater the gouging and scraping action by the three cones
(d) The magnitude of the journal angle directly affects the size of the cone

(C.O.No.2) [Comprehension]

4. The journal angle is defined as the angle formed by a line perpendicular to the axis of the journal and the axis of the bit. But we can also define that the angel made by the Journal axis with the Horizontal line is also called as Journal Angle. Prove with a neat diagram.

(C.O.No.2) [Comprehension]

5. During Drill stem testing (DST), the drillpipe is run partially full or empty, to reduce the hydrostatic pressure exerted against the formation. This is done to encourage formation fluids to flow into the well bore, which is the object of the test. Discuss how collapse pressure will be calculated in both the cases. (C.O.No.2) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. Question carries FOURTEEN marks. (1Qx14M=14M)

6 Being a Drilling Engineer you were assign a well at some XYZ location. The target depth is 9000 ft. The formation is heterogeneous and contain rocks of various compressive strength. The rock classification based on compressive strength is given in Table 1. Now select the most appropriate bit for each depth also mention each bit specification. Bit specification must include: Journal Angle, Cone Offset, Tooth size and spacing and requirement for Bit cleaning. Make a table and write your answer.

FORMATION CATALOGUE	COMPRESSIVE STRENGTH (Psi)
VERY SOFT	<4000
SOFT & STICKY	4000-6000
SOFT & STICKY	6000-9000
SOFT MEDIUM	9000-11000
MEDIUM	11000-14000
MEDIUM HARD	14000-18000
HARD	18000-24000
EXTREAMLY HARD	>24000

DEPTH (ft.)	FORMATION CHARACTERISTICS
0-1000	Mostly unstratified montmorilonite particles. Expected WOB 3500 lb/inch; Compressive strength 2500 Psi; Pore pressure (PP) 880 Psi
1000-2500	Well sorted and cemented clay; Expected WOB 4200 lb/inch; Compressible strength 4221 Psi; PP=1200 Psi
2500-3500	Sandstone; Expected WOB 5100 lb/inch; Compressive strength 9750 Psi; PP=1750 Psi
3500-4700	Gypsum, Expected WOB 5800 lb/inch; Compressive strength 13500 Psi; PP=2000 Psi
4700-6000	Anhydrite; Expected WOB 7500 lb/inch; Compressive strength 19810 Psi; PP= 2600 Psi
6000-7000	Dolomite; Expected WOB 9500 lb/inch; Compressive strength 26000 Psi; PP=3250 Psi

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PRESIDENCY UNIVERSITY
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SCHOOL OF ENGINEERING

END TERM EXAMINATION

Winter Semester: 2021 - 22
Course Code: PET 301
Course Name: Well Design and Construction
Program & Sem: B.Tech (PET) & VI

Date: 30th June 2022
Time: 09.30 AM to 12.30 PM
Max Marks: 100
Weightage: 50%

Instructions:

(i) Read the all questions carefully and answer accordingly.

(ii) All questions are mandatory

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries two marks. (15Qx 2M= 30M)

1. Arrange the following equipments in the correct sequence:

(a) Shale shaker, Kelly, Desilter, Desander, Swivel, Hose pipe

(b) Kelly, Rotary table, Drill Bit, Master Busing, Drill String, Kelly busing [From the origin of Rotary motion] (C.O.No.1) [Knowledge]

2. Following two are **wrong** statements, correct it. (C.O.No.1) [Knowledge]

(a) Non Magnetic Drill collars are manufactured from high grades of chrome molybdenum steel.

(b) Premium: The are new drill pipes which are not yet run into the wellbore

3. The Eaton Method is used in most sedimentary basins for calculating pore pressure from _____dc values. The Ratio Method has been used successfully in _____sequences in the Middle East (C.O.No.2) [Knowledge]

4. Make "**SET**" from the following *[e.g. {a, A}]*

Formation: (a) Soft formation (b) Hard Formation

Bit Characteristic: (A) Less bit cleaning required (B) Closely spaced teeth (C) More ROP (D) Long teeth bit (C.O.No.3) [Knowledge]

5. What is Subnormal Pressure formation? How it occurs? (C.O.No.4) [Knowledge]

6. How CHDP is calculated? (C.O.No.4) [Knowledge]

7. Write TRUE/FALSE, with respect to TRENDLINE, (C.O.No.4) [Knowledge]

(a) In normal compaction trendline, Resistivity decreases with depth

(b) CEC value decreases with depth

8. Write any two limitation of DST tool. (C.O.No.3) [Knowledge]

9. Find the **ODD** one out

(a) Drilling Jar, Over shot, Grapple spear, Wireline spear

(b) PDC, TSP, Diamond Bit, Roller cone (C.O.No.4) [Knowledge]

10. Match the following (C.O.No.3) [Knowledge]

(I) Hard Formation	(i) Milled tooth
(II) Soft formation	(ii) Insert bit

11. Why Kelly Sever sub and Kelly cock are used? (C.O.No.2) [Knowledge]

12. How we can connect two different size of Drill pipe and a Bit with different diameter drill pipe?

(C.O.No.2) [Knowledge]

13. Write the meaning of following codes for Roller Cone Bit: (a) 2-1-1 (b) 3-2-3

(C.O.No.3) [Knowledge]

14. Write the relationship for the following

(a) Journal Angle and Crushing action of Bit

(b) Offset and Scrapping action of Bit (C.O.No.3) [Knowledge]

15. Write any two reason for Kelly failure. (C.O.No.2) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries twenty marks. (2Qx20M=40M)

16. Identify the components present in the Fig 1 and mention to which system these components are belongs to? Then elaborate the importance of each and every component with their function.

(C.O.No.2) [Comprehension]

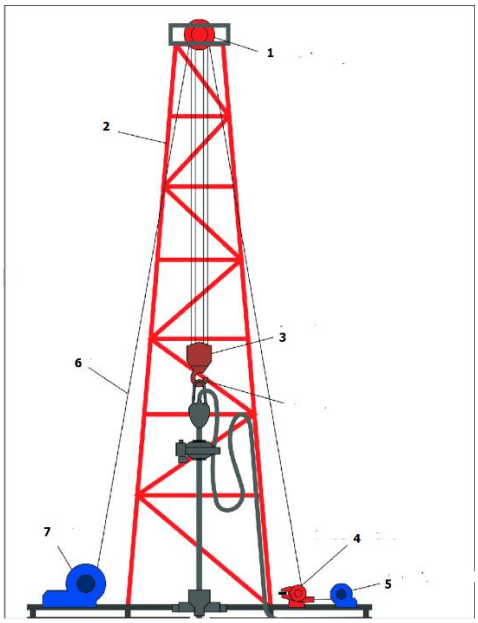

Fig: 1

17. Do as directed *(Each question carry 5 marks)*

(a) Show and Prove with a neat a clear diagram, why the angle made by the Journal axis with the horizontal plane is also called Journal Angle.

(b) During the DST, Collapse resistance of the drilling pipe should be the maximum if it is run fully empty as compared to the pipe run partially empty.

(c) "*Cone size decreases as the journal angle increases"*- Explain with neat and clear diagram that the cone size decreases as the journal angle increases from 0° to 45

(d) Let's assume you are given responsibility to select Drill Bit for different formation. Discuss how will select these bits from IADC guidelines (Only for Roller cone bit).

(C.O.No.1, 2, 3 & 4) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. The question carries thirty marks. (1Qx30M=30M)

18. GTO and Driller's log for some XYZ formation is given in the Table No 1. Read the data carefully and identify the variation for each parameter. If the Pore Pressure and Overburden Pressure gradient for the formation is 0.385 Psi/ft. and 0.478 Psi/ft. then where are the possibility of encountering OVER PRESSURE zones. Relate all the parameters and also graphically (use semi log) measure expected pore pressures at those zones.

Depth (ft.)	ROP (ft/hr)	d(exponent)	CEC (meq./100 g)	Resistivity (ohm)	Transit time (ms)	Density (g/cc)
500	200	13	212	6	5.565	2.3
800	195	20	205.342	9	5.545	2.56
1100	192	23	192.684	12	5.525	2.81
1400	187	23	180.026	15	5.505	3.07
1700	186	29	167.368	18	5.485	3.33
2000	180	30	154.71	21	5.465	3.58
2300	176	33	142.052	24	5.445	3.84
2600	172	39	129.394	27	5.425	4.10
2900	165	44	116.736	30	5.405	4.35
3200	160	48	104.078	33	5.385	4.61
3500	156	50	91.42	36	5.365	4.87
3800	165	44	97.42	39	5.595	5.12
4100	178	40	103.42	42	5.825	5.38
4400	189	34	109.42	45	6.055	5.64
4700	173	29	115.42	48	6.285	5.90
5000	160	22	121.42	51	6.515	6.15
5300	158	29	119.42	54	6.495	5.49
5600	155	33	117.42	57	6.475	4.84
5900	151	39	115.42	60	6.455	4.18
6200	148	42	113.42	63	6.435	3.52
6500	147	49	111.42	66	6.415	2.86
6800	155	44	109.42	63	6.395	3.12
7100	159	35	107.42	60	6.375	3.38
7400	163	30	105.42	57	6.355	3.63
7700	163	26	103.42	54	6.335	3.89
8000	160	29	101.42	57	6.315	4.15
8300	156	35	99.42	60	6.295	4.40
8600	151	41	97.42	63	6.275	4.66

(C.O.No. 4) [Application]