Roll No.														

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST 1

Semester: Odd Sem 2019-20
Course Code: PET 219
Course Name: HYDROCARBON EXPLORATION
Program & Sem: B Tech (PET) & III

Date: 30.09.2019
Time: 11.00AM to 12.00PM
Max Marks: 40
Weightage: 20%

Instructions:
(i) All questions are compulsory

Part A [Memory Recall Questions]

Answer the Questions. Each sub question carries one mark. (1Qx10M=10M)

1 Fill in the blanks (i to x)(C.O.NO.1) [Knowledge]

i. The economic volatility in the industry during the Pennsylvania oil rush was controlled by the formation of _____.

ii. The type of contract used in HELP is called _____.

iii. The old idea of conducting exploration along small streams between two rivers is called _____.

iv. The first commercial oil well was drilled in India at _____.

v. Indian PSU _____ started as the subsidiary of Burmah Oil Company.

vi. Invention of _____ by Ludger Mintrope marked the first application of geophysics in hydrocarbon exploration.

vii. The fourth dimension in 4D seismic survey is _____.

viii. Systematic exploration activities began in India after the formation of the _____.

ix. Mangalore refinery operates under the public sector company _____.

x. _____ are fine grain sedimentary rocks that form the source for liquid hydrocarbons.

Part B [Thought Provoking Questions]

Answer both the Questions. Each Question carries ten marks. (2Qx10M=20M)

2. Give reasons why: (C.O.NO.1) [Comprehension]

   i. Absence of fossils at very high depths is considered a supporting tenet of the inorganic theory of origin of petroleum. Why?

   ii. Fluorescence cannot be considered the conclusive evidence of presence of petroleum.

3. Answer the questions:

   i. Write about the two types of active occurrences of surface indications of petroleum.

   ii. What is Kerogen? How is it formed and what are it's types?

Part C [Problem Solving Questions]

Answer the Question. The Question carries ten marks. (1Qx10M=10M)

4. What are sedimentary basins? Briefly explain it's classification along with examples.

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

SCHOOL OF ENGINEERING

GAIN MORE KNOWLEDGE REACH GREATER HEIGHTS

Semester: III

Course Code: PET 219

Course Name: Hydrocarbon Exploration

Date: 30-09-2019

Time: 1 hour

Max Marks: 40

Weightage: 20%

Date:

Time:

Max Marks:

Weightage:

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels			Thought provoking type [Marks allotted] Bloom's Levels			Problem Solving type [Marks allotted]			Total Marks
			K			C			A			
1	1	1	10 x1	=	10							

2	1	1				2x 5	=	10				
3	1	1				2x 5	=	10				
4	1	1							1x 10	=	10	
	Total Marks				10			20			10	40

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

I here certify that All the questions are set as per the above lines Indraneel]

Annexure- II: Format of Answer Scheme

SCHOOL OF ENGINEERING

SOLUTION

Semester: III

Course Code: PET 219

Course Name: Hydrocarbon exploration

Date: 30-09-2019

Time: 1 Hour

Max Marks: 40

Weightage: 20%

Date:

Time:

Max Marks:

Weightage:

Part A (1Q x 10M = 10 Marks)

Q No	Solution	Scheme of Marking	Max. Time re for each Que
1	i. Oil Creek Association ii. Revenue Sharing Contracts iii. Creekology iv. Digboi, Assam v. OIL vi Seismograph vii Time viii Assam Oil Company ix ONGC x Oil Shales	1x10=10	10 Mins

Part B (2Q x 10M = 20 Marks)

Q No	Solution	Scheme of Marking	Max. Time requ each Quest
2	i. Organic theory dictates petroleum to be a fossil fuel. If petroleum were to have organic origins, we should have been able to find dead remains in the form of fossils at all depths where petroleum is found. The greatest depth of fossil occurrence is 16000' whereas we have drilled oil at 28000-30000' ii. Flourescence refers to the property of petroleum to glow in the presence of UV light. This property is possessed by minerals as well. Thus, even after fluorescence is observed, we need to dissolve the sample in organic solvent. If glow is dispersed in the container, it is concrete evidence of petroleum. Localised glow will imply inorganic mineral presence.	2x5=10	10mins
3	i. A **petroleum seep** is a place where natural liquid or gaseous hydrocarbons escape to the earth's atmosphere and surface, normally under low pressure or flow. Seeps generally occur above either terrestrial or offshore petroleum accumulation structures. The hydrocarbons may escape along geological layers, or across them through fractures and fissures in the rock, or directly from an outcrop of oil-bearing rock. Petroleum seeps are quite common in many areas of the world, and have been exploited by mankind since paleolithic times. Natural products associated with these seeps include bitumen, pitch, asphalt and tar. In locations where seeps of natural gas are sufficiently large, natural "eternal flames" often persist. The occurrence of surface petroleum was often included in location names that developed; these locations are also associated with early oil and gas exploitation as well as scientific and technological developments, which have grown into the petroleum industry. A **mud volcano** or **mud dome** is a landform created by the eruption of mud or slurries, water and gases. Several geological processes may cause the formation of mud volcanoes. Mud volcanoes are not true igneous volcanoes as they do not produce lava and are not necessarily driven by magmatic activity. The Earth continuously exudes a mud-like substance, which may sometimes be referred to as a "mud volcano". Mud volcanoes may range in size from merely 1 or 2 meters high and 1 or 2 meters wide, to 700 meters high and 10 kilometers wide. Smaller mud exudations are sometimes referred to as mud-pots. The mud produced by mud volcanoes is mostly formed as hot water, which has been heated deep below the Earth's surface, begins to mix and blend with subterranean mineral deposits, thus creating the mud slurry exudate. This material is then forced upwards through a geological fault or fissure due to local subterranean pressure imbalances. Mud volcanoes are associated with subduction zones and about 1100 have been identified on or near land. The temperature of any given active mud volcano generally remains fairly steady and is much lower than the typical temperatures found in igneous	2x5=10	10 mins

	volcanoes. Mud volcano temperatures can range from near 100 °C (212 °F) to occasionally 2 °C (36 °F), some being used as popular "mud baths." ii Kerogen is the dark, sticky, insoluble organic matter which forms the original source of hydrocarbons. It is formed by the breakdown of organic matter at high temperatures. They are classified: Type I: H/C ratio>1.5, Oil Prone, H Content Abundant Type II: H/C ratio: 0.8-1.5, Oil & Gas prone, H content moderate Type III: H/C ratio: 0.5-0.8, Gas Prone, H content low Type IV: H/C ratio: 0, Non HC Prone, No H content		

Part C (1Q x 10M = 10 Marks)

Q No	Solution	Scheme of Marking	Max. Time re for each Que
4	A sedimentary basin is a depression in the earth's crust formed by plate tectonic activity, in which sediments accumulate. They vary from bowl shaped to elongated troughs. They are classified as: Category I: Proven Commercial Productivity. These are proved petroliferous with commercial production. Eg: Assam-Arakan, Cambay, Cauvery, KG, Mumbai Offshore, Rajasthan Category II: Identified prospectivity. These are known HC occurences but no commercial production. Eg: Kutch, Andaman & Nicobar, Mahanadi NEC Category III: Prospective basins. These have no significant HC shows, but assumed geologically prospective. Eg: Bengal, Ganga, Himalayan Foreland, Kerala Konkan Lakshwadeep, Saurashtra, Vindhyan	1x10=10	12 mins

	Category IV: Potentially prospective. These are frontier areas with uncertain prospects, deemed prospective on global analogy. Eg: Bastar, Bhima Kaladgi, Chattisgarh, Cuddapah, Deccan Syneclase, Karewa, Narmada, Pranhita Godavari, Satpura S Rewa, Damodar, Spiti Zanskar		

Roll No.													

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

TEST – 2

Sem & AY: Odd Sem 2019-20 | **Date**: 18.11.2019

Course Code: PET 219 | **Time**: 11:00 AM to 12:00 PM

Course Name: HYDROCARBON EXPLORATION | **Max Marks**: 40

Program & Sem: B. Tech (PET) & III | **Weightage**: 20%

Instructions:

(i) ***All questions are compulsory***

Part A [Memory Recall Questions]

Answer the Questions. Each sub question carries one mark. (1Qx10M=10M)

1. Choose the correct answer. (C.O.NO: 3) [Knowledge level]

i. Worden is a _____ type gravimeter. (Stable/Unstable)

ii. Stable type gravimeters involve _____. (Force/Force Moment)

iii. Free air correction is a type of _____ correction. (Latitude/Elevation)

iv. Diagnostic position refers to _____. (Half width/Gradient)

v. For inward dipping structures, inflection point lies towards _____. (Base/Top)

vi. _____ gives measure of modification of magnetic strength by inducing magnetic field. (Permeability/Susceptibility)

vii. _____ has the lowest magnetic susceptibility among rocks. (Metamorphic/Sedimentary)

viii. In _____ substances the valence shells are incomplete and magnetism exists in presence of external magnetic field. (Diamagnetic/Anti ferromagnetic)

ix. The earth's _____ field has variations in directions at different points on the earth. (Magnetic/Gravitational)

x. _____ gravimeter uses zero length spring in it's construction. (Stable/Unstable)

Part B [Thought Provoking Questions]

Answer the Questions. Each Question carries five marks. (4Qx5M=20M)

2. Why are gravity and magnetic survey methods collectively known as the potential methods of surveying? (CO No: 4 Comprehension level)

3. On the basis of the understanding of their basic theories, cite the differences between gravity and magnetic survey. (CO No: 4 Comprehension level)

4. Briefly explain how gradient-amplitude method is used in gravity interpretation.

(CO No: 3 Comprehension level)

5. What are paramagnetic substances? Why are ferro and anti ferromagnetism considered to be a special case of paramagnetism? (CO No: 4 Comprehension level)

Part C [Problem Solving Questions]

Answer the Question. Question carry ten marks. (1Qx10M=10M)

6. With neat diagrams explain the working of La Coste Romberg gravimeter.

(CO No: 3 Comprehension level)

SCHOOL OF ENGINEERING

GAIN MORE KNOWLEDGE REACH GREATER HEIGHTS

Semester: III

Course Code: PET 219

Course Name: Hydrocarbon Exploration

Date: 18-11-2019

Time: 1 hour

Max Marks: 40

Weightage: 20%

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels			Thought provoking type [Marks allotted] Bloom's Levels			Problem Solving type [Marks allotted]			Total Marks
			K			C			A			
1	3	3	10 x1	=	10							
2	4	4				1x 5	=	5				
3	4	4				1x 5	=	5				
4	3	3				1x 5	=	5				
5	4	4				1x 5	=	5				
4	3	3							1x 10	=	10	
	Total Marks				10			20			10	40

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

Annexure- II: Format of Answer Scheme

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

SCHOOL OF ENGINEERING

SOLUTION

Semester: III

Course Code: PET 219

Course Name: Hydrocarbon exploration

Date: 18-11-2019

Time: 1 Hour

Max Marks: 40

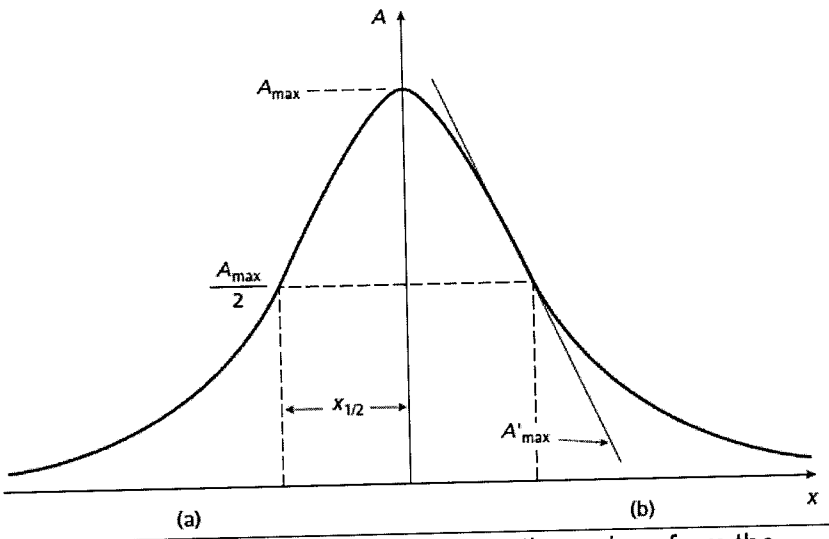
Weightage: 20%

Part A (1Q x 10M = 10Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
1.	i. Unstable ii. Force iii. Elevation iv. Half width v. Top vi. Permeability vii. Sedimentary viii. Paramagnetic ix. Magnetic x. Unstable	10x1=10	10 Mins

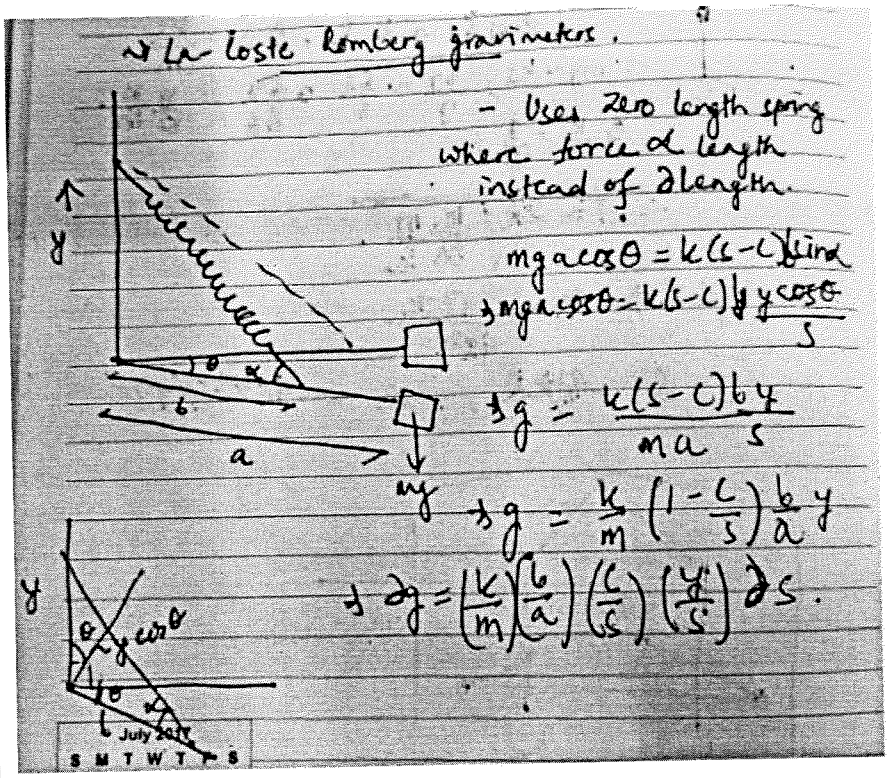
Part B (2Q x 10 M = 20 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
2	Both measure changes in the total potential field. Gravity survey measures changes in gravity potential whereas magnetic survey involves changes in magnetic potential.	5 marks	5 Mins

3	i. Gravity survey neglects direction whereas magnetic survey measures changes in direction of field as well. ii. Gravity is attractive force only whereas magnetic is both attractive and repulsive. iii. Gravity survey involves bulk modification by large rock masses. Magnetic can be influenced by tiny traces of rocks.	5 marks	7 mins
4	*(b) Gradient–amplitude ratio method.* This method requires the computation of the maximum anomaly amplitude (A_{max}) and the maximum horizontal gravity gradient (A'_{max}) (Fig. 6.18(b)). Again the initial assumption is made that a three-dimensional anomaly is caused by a point mass and a two-dimensional anomaly by a line mass. By differentiation of the relevant formulae, for any three-dimensional body $z < 0.86 \left\lvert \frac{A_{max}}{A'_{max}} \right\rvert$ (6.17) and for any two-dimensional body $z < 0.65 \left\lvert \frac{A_{max}}{A'_{max}} \right\rvert$ (6.18)  	5 marks	9 mins
5	Electron shells are incomplete and magnetism arises from the spin of unpaired electrons. When placed in an external magnetic field, dipoles rearrange in the in the same way as that of the inducing magnetic field. Ferro and antiferro magnetism arises only in atoms with incompleter outer shells similar to paramagnetic substances.	5 marks	5 mins

Part C (1Q x 10M = 10 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question

6		1x10=10Marks	15 mins

Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF ENGINEERING

END TERM FINAL EXAMINATION

Semester: Odd Semester: 2019 - 20 | **Date**: 24 December 2019

Course Code: PET 219 | **Time**: 1:00 PM to 4:00 PM

Course Name: HYDROCARBON EXPLORATION | **Max Marks**: 80

Program & Sem: B.Tech (PET) & III | **Weightage**: 40%

Instructions:

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

(ii) Question paper consists of 3 parts.

Part A [Memory Recall Questions]

Answer all the sub Questions. Each Sub Question carries 2 marks. (10Qx2M=20M)

1.

i. Which year marked the peak of the Pensylvannia Oil Rush? Which organization was formed to control the economic volatility of the industry during this phase? (C.O.No.1) [Knowledge]

ii. Mangalore refinery operates under which PSU? Which Indian PSU started as the subsidiary of a Scottish Exploration & Production company? (C.O.No.1) [Knowledge]

iii. Who is referred to as the father of modern drilling? The first instance of application of geophysics in hydrocarbon exploration was the use of a device invented by a German scientist. What is it's name? (C.O.No.1) [Knowledge]

iv. Which is the cleanest hydrocarbon fuel? What are fine grain sedimentary rocks that form the source for liquid hydrocarbons or shale oil commonly referred to as? (C.O.No.1) [Knowledge]

v. Which theory suggests petroleum exploration along folds with a crest and two downward dipping slopes? In early stages of the industry, exploration was conducted along small streams between two mountain ranges. What was this referred to as? (C.O.No.1) [Knowledge]

vi. Which entity was responsible for the monopolistic business environment in Pennsylvania during the oil rush? Which private sector company is primarily responsible for CBM exploration in Raniganj? (C.O.No.1) [Knowledge]

vii. Name the units of measurement used in gravity and magnetic survey. (C.O.No.3) [Knowledge]

viii. What are the different types of reserves under SPE classification? (C.O.No.2) [Knowledge]

ix. What are macerals? What are the three types of macerals? (C.O.No.4) [Knowledge]

x. What is a time slice or a seiscrop? (C.O.No.5) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each Question carries 10 marks. (4Qx10M=40M)

2. Write in details about 4D Seismic Surveys and their need and applicability in the petroleum industry. (C.O.No.5) [Comprehension]

3. What are the different seismic sources onland? Write about their working procedures along with advantages and disadvantages. (C.O.No.5) [Comprehension]
4. Explain the working of proton magnetometer with neat diagrams. (C.O.No.4) [Comprehension]
5. Write about different types of seismic processing steps used in petroleum industry (C.O.No.5) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. The Question carries 20 marks. (1Qx20M=20M)

6. Vertical resolution wasn't found to be enough in a planned well. So, vertical seismic profile is to be obtained for the same. Explain the working of this process in details along with it's different types using neat diagrams of the same. (C.O.No.5) [Comprehension]

SCHOOL OF ENGINEERING

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

Semester: VII
Course Code: PET 219
Course Name: Hydrocarbon Exploration

Date: 24-12-2019
Time: 1 Hour
Max Marks: 40
Weightage: 20%

Extract of question distribution [outcome wise & level wise]

Q.NO.	C.O.NO	Unit/Module Number/Unit /Module Title	Memory recall type [Marks allotted] Bloom's Levels	Thought provoking type [Marks allotted] Bloom's Levels	Problem Solving type [Marks allotted]	Total Marks
			K	C	A	
1	1,2,3,4,5	1,2,3,4,5	20			
2	2	2		10		
3	4	4		10		
4	4	4		10		
5	4	4		10		
6	4	4			20	
	Total Marks		20	40	20	80

K =Knowledge Level C = Comprehension Level, A = Application Level

Note: While setting all types of questions the general guideline is that about 60%

Of the questions must be such that even a below average students must be able to attempt, About 20% of the questions must be such that only above average students must be able to attempt and finally 20% of the questions must be such that only the bright students must be able to attempt.

I hereby certify that all the questions are set as per the above guidelines.

Faculty Signature: 18/12/2019

Reviewer Comment:

Annexure- II: Format of Answer Scheme

GAIN MORE KNOWLEDGE REACH GREATER HEIGHTS

SCHOOL OF ENGINEERING

SOLUTION

Semester: VII

Course Code: PET 219

Course Name: Hydrocarbon Exploration

Date: 24-12-2019

Time: 1pm-4pm

Max Marks: 80

Weightage: 40%

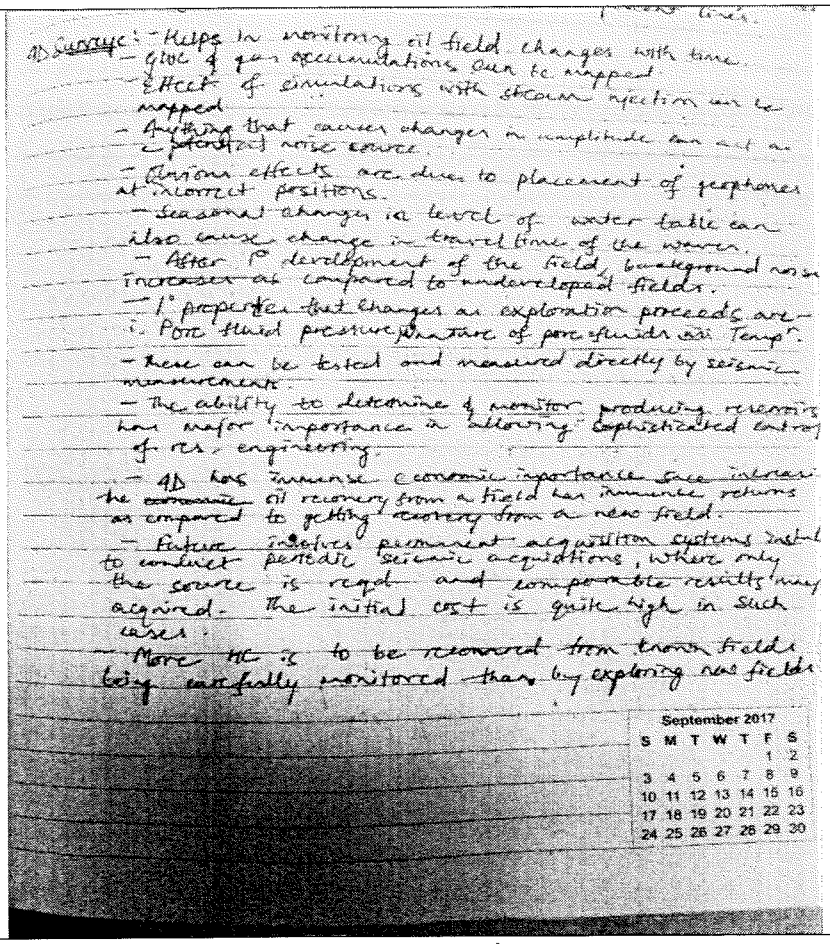
Part A (1 x 20 = 20 Marks)

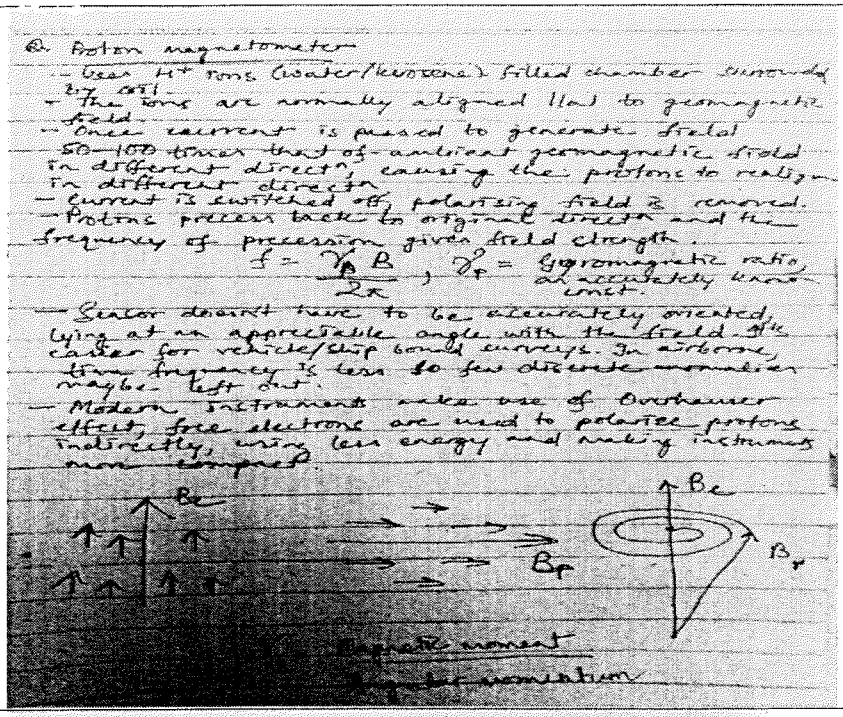
Q No	Solution	Scheme of Marking	Max. Time required for each Question
1	**i.** 1891, Oil Creek Association **ii.** **ONGC, OIL** **iii.** **Col. Edwin Drake, Seismograph** **iv.** **Natural Gas, Oil Shales** **v.** **Anticlinal, Creekology** **vi.** **Standard Oil, Essar** **vii.** **Gals and nano Tesla** **viii.** 1P-Proved 2P-Probable 3P-Possible **ix.** A maceral is a component of coal or oil shale with organic origin. They form the basic building blocks of coal. The three types of macerals are Inertinite, Liptinite and vitrinite. **x.** Horizontal slices taken through the data in a 3 Dimensional seismic model to display the pattern of	1x20=20	15 Mins

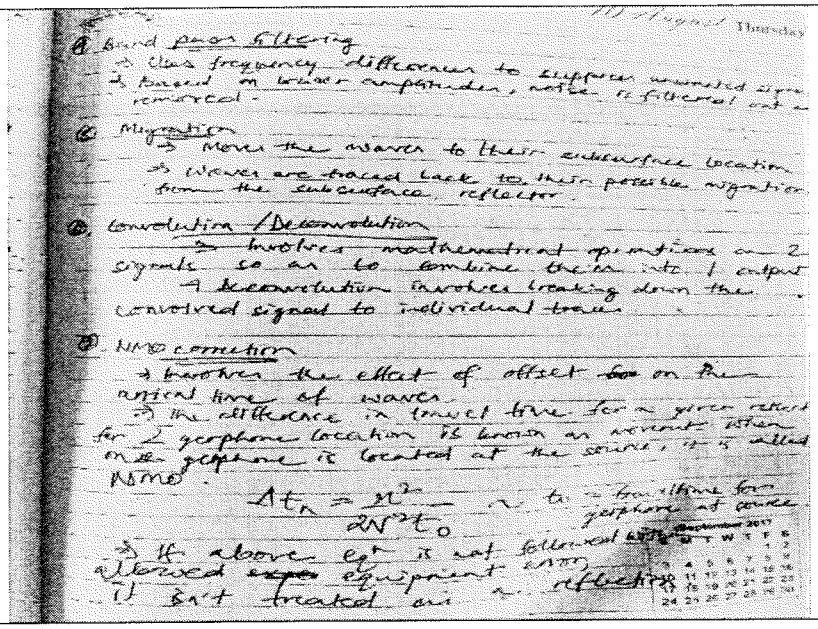
	reflections intersected by any time plane is referred to as seiscrop or time slice		

Part B (3Qx6M = 18 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
2		1x10=10	15mins

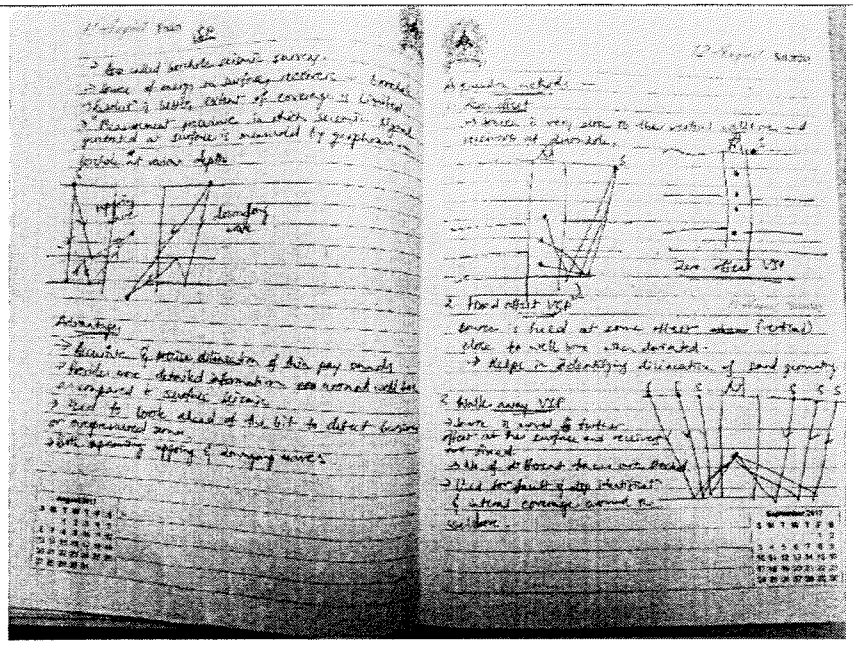
			
3	On land seismic survey uses two primary sources: 1. Explosives: Here a set of charged explosives like dynamites are used to generate seismic waves. The explosives are placed in a hole dug in the earth to a depth of 50-60m called a shot hole. The charges are then placed in a special casing and then set off. The explosive source is questionable because it requires a lot of time in setting up, needs special permissions and give non repeatable results. Vibroesis: Vibroesis involves the generation of seismic waves by using a vibroesis truck also called a thumper truck. The truck has a strong base plate which is lowered onto the ground to create the waves for the survey. The truck uses its own weight to cause vibrations that are directed towards the subsurface. The duration for which the vibration is induced is called sweep length and it may last for a minimum of 7-12 seconds.	1x10=10	15 mins
4		1x10=10	15mins

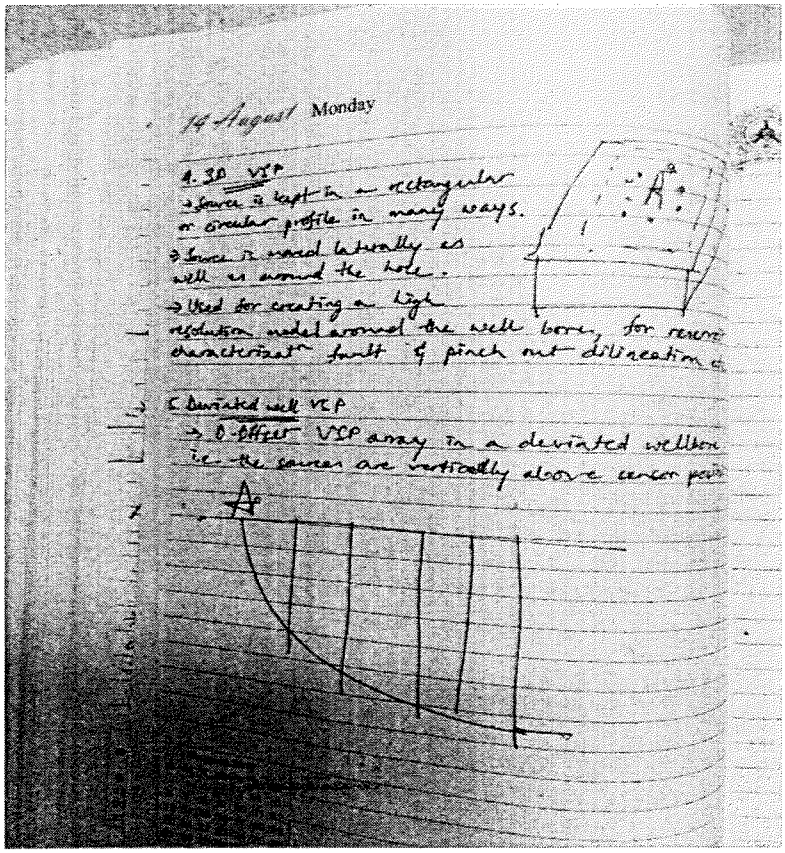
	Q. Proton magnetometer – Uses H+ rons (water/kerosene) filled chamber surrounded by coil – The ions are normally aligned ⊥ to geomagnetic field – Once current is passed to generate field 50–100 times that of ambient geomagnetic field in different direct°, causing the protons to realign in different direction – Current is switched off, polarising field is removed. – Protons precess back to original direction and the frequency of precession given field strength. $f = \frac{\gamma_p B}{2\pi}$, γ_p = Gyromagnetic ratio, an accurately known const. – Sensor doesn't have to be accurately oriented, lying at an appreciable angle with the field. Makes easier for vehicle/ship towed surveys. In airborne, time frequency is less so few discrete readings may be left out. – Modern instruments make use of Overhauser effect, free electrons are used to polarise protons indirectly, using less energy and making instruments more compact.  		
5	09 August Wednesday Seismic processing ⇒ Conversion of raw data into readable form. ⇒ Minimal processing need if acquisition is perfect. ⇒ Series of routines are performed. ⇒ Objective is to increase SNR in a way to satisfy client's requirements & represent the subsurface geology. ① Demultiplexing: → Changes time sequenced samples to trace sequence. ⇒ Time sequence means, 1st sample of Channel 1 is followed by 1st sample of Channel 2 Trace sequence means, all samples of 1 particular channel is 1st acquired before moving to 2nd channel. ② Reformatting & Editing. → Involves conversion of data to a recognisable format (SEG-Y / SEG-D) by Society of Exploration Geophysicists. ⇒ Editing involves removal of bad records, misfired shots etc. ③ Geometrical Spreading Correction ⇒ Also known as amplitude correction. ⇒ Involves maximizing amplitudes for geophones placed further away from the source. August 2017 S M T W T F S 1 2 3 4 5 6 7 8 9 10 11 12	1Qx10= 10	15 Mins

Part C (1Q x 12M = 12 Marks)

Q No	Solution	Scheme of Marking	Max. Time required for each Question
6		1Qx20=20	20 mins




14 August Monday
1. 3D VSP
2 Deviated well VSP