GATE 2009 GG: GEOLOGY AND GEOPHYSICS

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PART A: COMMON TO BOTH GEOLOGY AND GEOPHYSICS CANDIDATES

Q.1 - Q.20 carry one mark each.

Q.1. The Gutenberg discontinuity is located at a depth of around (GATE GG 2009)

(A) 35 km
(B) 150 km
(C) 2900 km
(D) 5000 km

Q.2. What is the age of the ”Barail Series”? (GATE GG 2009)

(A) Jurassic
(B) Paleocene
(C) Oligocene
(D) Miocene

Q.3. Thermohaline circulation in the oceans is driven by (GATE GG 2009)

(A) only salinity gradients
(B) both temperature and salinity gradients
(C) only temperature gradients
(D) only density difference

Q.4. Which one of the following minerals cannot be used as an abrasive ? (GATE GG 2009)

(A) Garnet
(B) Corundum
(C) Quartz
(D) Gypsum

Q.5. Which one of the following lakes is interpreted to be of meteoritic impact origin ? (GATE GG 2009)

(A) Lonar Lake
(B) Chilika Lake
(C) Kolleru Lake
(D) Pulicat Lake

Q.6. Which one of the following geomorphic features is **not** related to desert environments ? (GATE GG 2009)

(A) yardang
(B) bajada
(C) hamada
(D) esker

Q.7. Which one of the following is located closest to the Ninety-East Ridge ? (GATE GG 2009)

(A) Bombay High
(B) Lakshwadweep Islands
(C) Andaman And Nicobar Islands
(D) Maldives

Q.8. LPG (Liquefied Petroleum Gas) consists mainly of (GATE GG 2009)

(A) propane and butane
(B) methane and ethane
(C) methane and butane
(D) ethane and propane

Q.9. Who proposed the principle "the present is the key to the past"? (GATE GG 2009)

(A) Carl von Linnaeus
(B) James Hutton
(C) William Smith
(D) Alcide d'Orbigny

Q.10. Of the following, which is an ore of nickel? (GATE GG 2009)

(A) Pentlandite
(B) Cinnabar
(C) Cassiterite
(D) Scheelite

Q.11. Over a three layered earth, comprising of top dry soil followed by saturated weathered layer and hard rock basement, a resistivity sounding experiment is performed. The obtained VES curve is (GATE GG 2009)

(A) K-type
(B) A-type
(C) H-type
(D) Q-type

Q.12. The logging tool for direct determination of permeability is (GATE GG 2009)

(A) induction
(B) litho-density
(C) sonic
(D) NMR

Q.13. Which of the following parameters is uniquely resolved by residual gravity anomaly data? (GATE GG 2009)

(A) lateral density contrast
(B) excess/deficit mass
(C) absolute density
(D) geometric dimensions of geophysical model

Q.14. Crude oil density, in degree API (American Petroleum Institute), is a measure of viscosity. The value of 10 API is of (GATE GG 2009)

(A) water
(B) heavy crude
(C) average crude
(D) light crude

Q.15. For perfectly conducting medium, skin depth (m) is (GATE GG 2009)

(A) 10^5
(B) 100
(C) 10
(D) 0

Q.16. If a planet revolves around the Sun with a period of 8 years, then its distance from the Sun would be (in terms of distance between Earth and Sun) (GATE GG 2009)

(A) two times
(B) four times
(C) six times
(D) eight times

Q.17. A vast majority of earthquake sources are often linked to (GATE GG 2009)

(A) inner core
(B) outer core
(C) brittle part of the earth's crust
(D) molten part of earth's mantle

Q.18. In paleomagnetism, detrital magnetization is an important process for study of (GATE GG 2009)

(A) sedimentary rocks
(B) metamorphic rocks
(C) basic igneous rocks
(D) acidic igneous rocks

Q.19. A Geiger-Muller counter is used for measuring (GATE GG 2009)

(A) gamma radiation
(B) alpha particles
(C) beta particles
(D) both alpha and beta particles

Q.20. The presence of crustal root beneath a mountain chain can be best explained by (GATE GG 2009)

(A) Pratt's model
(B) Airy's Model
(C) Vening Meinesz model
(D) Plume model

END OF PART A

PART B (SECTION 1): FOR GEOLOGY CANDIDATES ONLY

Q.21 - Q.60 carry two marks each.

Q.21. Which one of the following is a typical Lower Gondwana plant assemblage ? (GATE GG 2009)

(A) *Glossopteris, Ptilophyllum, Nilssonia, Bucklandia*

(B) *Glossopteris, Gangamopteris, Schizoneura, Sphenophyllum*

(C) *Gangamopteris, Lycopodites, Brachyphyllum, Nilssonia*

(D) *Vertebraria, Alethopteris, Otozamites, Glossopteris*

Q.22. Which of the following is not correct for a Pelecypod shell? (GATE GG 2009)

(A) Pedicle is present.

(B) Pallial sinus, if present, is on the posterior side.

(C) Lunule is towards anterior.

(D) Both the valves have teeth and sockets.

Q.23. Match the following: (GATE GG 2009)

Group *I*	**Group *II***
P. Muschelkalk	1. Cambrian
Q. Katrol Formation	2. Miocene
R. Uttatur Stage	3. Middle Triassic
S. Baripada beds	4. Cretaceous
	5. Pleistocene
	6. Late Jurassic

(A) P-3, Q-6, R-5, S-1

(B) P-1, Q-2, R-3, S-4

(C) P-3, Q-6, R-4, S-2

(D) P-6, Q-3, R-1, S-2

Q.24. Match the following: (GATE GG 2009)

Group *I*	**Group *II***
P. Pelagic	1. Open ocean
Q. Pycnocline	2. Cold sphere
R. Psychrosphere	3. North Atlantic
S. Humboldt Current	4. Density
	5. Thermocline
	6. East Pacific

(A) P-1, Q-4, R-3, S-6

(B) P-6, Q-2, R-1, S-5

(C) P-5, Q-6, R-1, S-3

(D) P-1, Q-4, R-2, S-6

Q.25. Match the following: (GATE GG 2009)

Group *I*	**Group *II***
P. *Globigerina bulloides*	1. Lower Cambrian
Q. *Olenellus*	2. Echinodermata
R. Ambulacrum	3. Graptolites
S. Nema	4. Upwelling
	5. Coelenterata
	6. Silurian

(A) P-1, Q-6, R-2, S-5

(B) P-5, Q-6, R-2, S-3

(C) P-4, Q-1, R-2, S-3

(D) P-2, Q-4, R-5, S-6

Q.26. Dinosaurs can be distinguished from the other Mesozoic reptiles by (GATE GG 2009)

(A) Large size

(B) Carnivorous habit

(C) Erect stance

(D) Sprawling stance

Q.27. Which of the following is a polar planktic formanifer ? (GATE GG 2009)

(A) *Globigerenoides rubber*

(B) *Neogloboquadina pachyderma*

(C) *Globorotalia menardii*

(D) *Orbulina universa*

Q.28. Which one of the following mass-wasting processes is designated as a slow flowage type ? (GATE GG 2009)

(A) Mudflow (B) Solifluction (C) Slump (D) Rockslide

Q.29. Which of the following accurately describes the rock 'phonolite'? (GATE GG 2009)

(A) Undersaturated ultramafic volcanic rock

(B) Undersaturated mafic plutonic rock

(C) Undersaturated ultrabasic volcanic rock

(D) Intermediate alkaline plutonic rock

Q.30. Match the assemblages in Group *I* with the corresponding metamorphic facies in Group *II*: (GATE GG 2009)

Group *I*	**Group *II***
P. Albite-jadeite-glaucophane-lawsonite	1. Greenschist
Q. Garnet-orthopyroxene-clinopyroxene-plagioclase	2. Blueschist
R. Garnet-muscovite-biotite-sillimanite-quartz	3. Granulitec
S. Albite-chlorite-epidote-actinolite	4. Amphibolite
	5. Zeolite
	6. Prehnite-pumpellyite

(A) P-1, Q-6, R-2, S-5
(B) P-5, Q-1, R-3, S-4
(C) P-2, Q-3, R-4, S-1
(D) P-3, Q-2, R-1, S-6

Q.31. When underplated by mafic magmas, and with no erosion, lower crustal rocks will experience _____ during metamorphism. (GATE GG 2009)

(A) isobaric heating followed by isothermal decompression
(B) isothermal compression followed by isobaric heating
(C) isobaric heating followed by isothermal compression
(D) isobaric heating-cooling trajectory

Q.32. Match the minerals in Group *I* with their characteristic optical properties in Group *II*: (GATE GG 2009)

Group *I*	**Group *II***
P. Biotite	1. Uniaxial negative
Q. Sodalite	2. Mottled extinction
R. Nepheline	3. Uniaxial positive
S. Quartz	4. Isotropic, low relief
	5. Isotropic, high relief
	6. Biaxial negative

(A) P-5, Q-1, R-3, S-6
(B) P-6, Q-2, R-5, S-1
(C) P-3, Q-2, R-4, S-5
(D) P-2, Q-4, R-1, S-3

Q.33. A single slice of rock bound by thrust faults on all sides is called a (GATE GG 2009)

(A) horse
(B) pop-up structure
(C) duplex
(D) graben

Q.34. A strike-slip dip fault strikes $30°N$, and dips $45°SE$. The net slip of the fault plunges (GATE GG 2009)

(A) 30° towards $45°N$
(B) 0° towards $30°N$
(C) 45° towards $120°N$
(D) 90° towards $30°N$

Q.35. The boundary between the Indian and Eurasian plates is the (GATE GG 2009)

(A) Main Central Thrust

(B) Main Boundary Thrust

(C) South Tibetan Detachment Zone

(D) Indus-Tsangpo Suture Zone

Q.36. Plagioclase feldspars belong to the _____ crystal system. (GATE GG 2009)

(A) Triclinic

(B) Monoclinic

(C) Orthorhombic

(D) Rhombic

Q.37. The plane by which twinned crystals are united is called the (GATE GG 2009)

(A) mirror plane

(B) twin plane

(C) glide plane

(D) composition plane

Q.38. In satellite remote-sensing, the spectral bands near 1.4 μm and 1.9 μm are avoided because of (GATE GG 2009)

(A) absorption due to H_2O and CO_2 in the atmosphere

(B) absorption due to ozone layer in the atmosphere

(C) absorption due to nitrogen in the atmosphere

(D) absorption by vegetation

Q.39. Formation of chromitite from a basaltic magma can be explained by (GATE GG 2009)

(A) liquid immiscibility

(B) assimilation

(C) magma mixing

(D) Soret effect

Q.40. Match the following economic deposits in Group *I* with their places of occurrences in Group *II*: (GATE GG 2009)

Group *I*	**Group *II***
P. Bauxite	1. Naliya
Q. Phosphorite	2. Maldeota
R. Magnesite	3. Pahalgam
S. Barite	4. Salem
	5. Mangampeta
	6. Belgaum

(A) P-1, Q-2, R-4, S-5

(B) P-2, Q-3, R-4, S-6

(C) P-3, Q-1, R-6, S-5

(D) P-6, Q-2, R-4, S-5

Q.41. What is the host rock for sulphide mineralization in Rampura-Agucha belt? (GATE GG 2009)

(A) Graphitic mica schist

(B) Garnetiferous mica schist

(C) Graphitic biotite-sillimanite gneiss

(D) Garnetiferous sillimanite-feldspar gneiss

Q.42. Which of the following is the correct order of decreasing permeability? (GATE GG 2009)

(A) silty sandstone > siltstone > sandstone > pebbly sandstone

(B) siltstone > silty sandstone > sandstone > pebbly sandstone

(C) pebbly sandstone > sandstone > silty sandstone > siltstone

(D) pebbly sandstone > sandstone > siltstone > silty sandstone

Q.43. Which of the following varieties of coal has the least H/C ratio? (GATE GG 2009)

(A) peat

(B) lignite

(C) bituminous

(D) anthracite

Q.44. What is the age of the reservoir rock in the Cambay basin? (GATE GG 2009)

(A) Eocene

(B) Oligocene

(C) Miocene

(D) Paleocene

Q.45. Which one of the following can be considered the best cap rock for oil and gas traps? (GATE GG 2009)

(A) chert

(B) evaporite

(C) sandstone

(D) shale

Q.46. A negative *Eu* anomaly will develop in a fractionating magma following separation of (GATE GG 2009)

(A) garnet

(B) olivine

(C) plagioclase

(D) orthopyroxene

Q.47. In which of the following islands is the Mid-oceanic ridge exposed above sea-level? (GATE GG 2009)

(A) Japan

(B) Seychelles

(C) Hawaii

(D) Iceland

Q.48. _____ dams are constructed where the foundation rock is strong. (GATE GG 2009)

(A) Gravity

(B) Arch

(C) Buttress

(D) Earth

Q.49. Which type of cross-bedding is a definite indicator of tidal currents? (GATE GG 2009)

(A) epsilon cross-bedding
(B) herring-bone cross-bedding
(C) hummocky cross-bedding
(D) trough cross-bedding

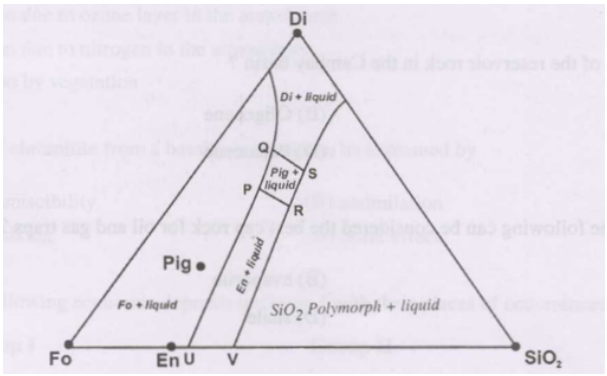
Q.50. Which type of sedimentary basin is formed close to continent-continent collisional settings? (GATE GG 2009)

(A) Fore-arc basin
(B) Peripheral foreland basin
(C) Back-arc basin
(D) Retro-arc foreland basin

Common Data Questions

Common Data Questions 51 and 52:

A rock contains 65% forsterite (Fo), 27% enstatite (En)and 8% pigeonite (Pig) and its melting relationships at 1 bar can be represented by the figure given below:



Q.51. The name of the rock is (GATE GG 2009)

(A) Lherzolite
(B) Harzburgite
(C) Wehrlite
(D) Dunite

Q.52. On partially melting this rock, the first melt will have the composition of point (GATE GG 2009)

(A) P
(B) Q
(C) R
(D) S

Common Data Questions 53 and 54:

An unfossiliferous sedimentary succession is characterized by the following features - (*i*) sandstone-shale alternation, with sheet-like geometry of the sandstone beds;(*ii*) the sandstones exhibit graded bedding;(*iii*) erosional structures under the sandstone beds;(*iv*) convolute lamination, and (*v*)ripple marks on the sandstone beds.

Q.53. Which depositional environment is indicated for the above sedimentary succession? (GATE GG 2009)

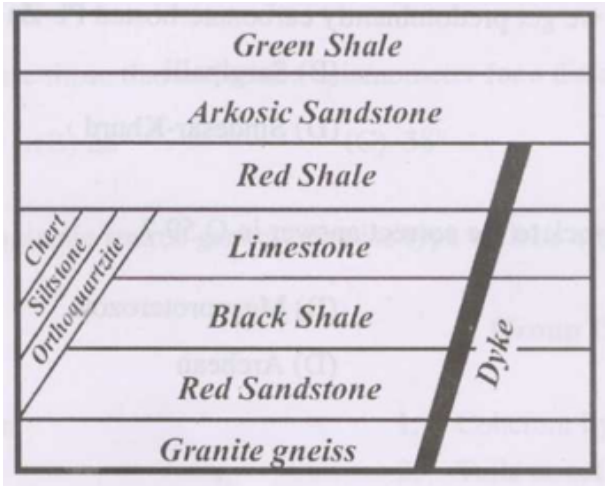
(A) Fluvial
(B) Eolian
(C) Intertidal
(D) Deep marine

Q.54. What type of paleocurrent pattern is expected from the erosional structures in the succession? (GATE GG 2009)

(A) Unimodal
(B) Bimodal
(C) Bimodal - bipolar
(D) Polymodal

Common Data Questions 55 and 56:

Examine the given geological section, which contains sedimentary successions interrupted by a dyke, and which contains no tectonic discontinuities.



Q.55. How many unconformities can be identified in the section? (GATE GG 2009)

(A) 3
(B) 4
(C) 5
(D) 6

Q.56. Which of the following contacts is a nonconformity? (GATE GG 2009)

(A) Granite gneiss - Red Sandstone
(B) Black Shale - Limestone
(C) Limestone - Red Shale
(D) Red Shale - Arkosic Sandstone

Linked Answer Questions

Statement for Linked Answer Questions 57 and 58:

Microfossils may have following is a siliceous microfossil group ?

Q.57. Which of the following is a siliceous microfossil group? (GATE GG 2009)

(A) Conodonts
(B) Radiolaria
(C) Dinoflagellates
(D) Foraminifera

Q.58. What is the preferred microhabitat of the microfossil group that is the correct answer in Q.57? (GATE GG 2009)

(A) Benthic
(B) Planktic
(C) Nektic
(D) Nektobenthic

Statement for Linked Answer Questions 59 and 60:

$Pb - Zn$ sulphide deposits can form in different types of host rocks.

Q.59. Of the following, where do we get predominantly carbonate-hosted $Pb - Zn$ sulphide deposits? (GATE GG 2009)

(A) Mochia - Zawar
(B) Sargipalli
(C) Pur - Banera
(D) Sindesar-Khurd

Q.60. What is the age of the host rock to the correct answer in $Q.59$? (GATE GG 2009)

(A) Neoproterozoic
(B) Mesoproterozoic
(C) Paleoproterozoic
(D) Archean

END OF SECTION 1 OF PART B

PART B (SECTION 2): FOR GEOPHYSICS CANDIDATES ONLY

Q.20 - Q.60 carry two marks each.

Q.21. Match the following functions in time-domain with their Fourier spectra: (GATE GG 2009)

Group *I*

P. $\Pi(t) = \begin{cases} 1, -1/2 \le t \le 1/2 \\ 0, t < -1/2 and \;\; t > 1/2 \end{cases}$

Q. Dirac delta function, $\delta(t)$

R. $x(t) = e^{-|t|}$

S. $\Lambda(t) = \begin{cases} 1 + t, -1 < t < 0 \\ 1 - t, 0 < t < 1 \\ 0, otherwise \end{cases}$

Group *II*

1. 1
2. $\frac{\sin(\pi f)}{f}$, where f is frequency
3. $\frac{2}{1 + 4\pi^2 f^2}$, where f is frequency
4. $\frac{\sin^2(\pi f)}{f^2}$, where f is frequency

(A) P-2, Q-3, R-1, S-4 (C) P-1, Q-4, R-2, S-3

(B) P-1, Q-3, R-2, S-4 (D) P-2, Q-1, R-3, S-4

Q.22. The teleseismic rays are those that arrive at a seismometer for a distance greater than (GATE GG 2009)

(A) 18° (B) 28° (C) 38° (D) 48°

Q.23. Match the following seismic source generated noise type with its appearance on the seismogram : (GATE GG 2009)

Group *I*	**Group *II***
P. Reverberation	1. Coherent hyperbolic events
Q. Multiples	2. Tails on reflected events
R. Guided waves	3. Events paralleling first breaks
S. Diffractions	4. Reflections at even time intervals after the primary reflections

(A) P-1, Q-3, R-2, S-4 (C) P-2, Q-4, R-3, S-1

(B) P-3, Q-4, R-2, S-1 (D) P-4, Q-1, R-3, S-2

Q.24. Which is the parameter for measuring the size of the earthquake that does not need an instrumental record? (GATE GG 2009)

(A) Richter Magnitude (C) Moment

(B) Intensity (D) M_W

Q.25. The standard form of wave equation for propagation of cubical dilatation (θ) is (GATE GG 2009)

$$\rho \frac{\partial^2 \theta}{\partial t^2} = (\lambda + 2\mu)\, \nabla^2 \theta$$

The compressional wave velocity is given by

(A) $\sqrt{\dfrac{2\lambda + \mu}{\rho}}$ (B) $\sqrt{\dfrac{\lambda + 2\mu}{2\rho}}$ (C) $\sqrt{\dfrac{\lambda + \mu}{\rho}}$ (D) $\sqrt{\dfrac{\lambda + 2\mu}{\rho}}$

Q.26. PKIKP is a seismic body wave which travels through (GATE GG 2009)

(A) upper mantle

(B) upper and lower mantle

(C) mantle, outer core and inner core

(D) mantle and outer core

Q.27. A seismic signal is recorded in a frequency band, $50 - 100\,Hz$. The sampling interval (ms) to avoid aliasing would be (GATE GG 2009)

(A) 5 (B) 10 (C) 15 (D) 20

Q.28. The minimum appreciable amplitude recorded by a seismometer is 0.2 mm and the maximum one is 20.0 cm, then the dynamic range in dB is (GATE GG 2009)

(A) 80 (B) 60 (C) 40 (D) 20

Q.29. Match the following: (GATE GG 2009)

Group *I*	**Group** *II*
P. Primary wave	1. Propagate along surface of the medium
Q. Secondary wave	2. Particle motion is orthogonal to direction of propagation
R. Rayleigh wave	3. Particle motion describes a retrograde ellipse
S. Love wave	4. Particle motion in the direction of propagation

(A) P-3, Q-4, R-1, S-2 (C) P-1, Q-3, R-2, S-4

(B) P-1, Q-4, R-2, S-3 (D) P-4, Q-2, R-3, S-1

Q.30. Which of the following is a minimum-phase wavelet? The first value in each case is at time zero. (GATE GG 2009)

(A) $\{-2, 5, -2\}$ (C) $\{6, -1, -2\}$

(B) $\{-2, 5, 2\}$ (D) $\{3, 4, -4\}$

Q.31. In a gas zone, true porosity ϕ_t, neutron log ϕ_n, and density derived porosity $\phi_d$are related as (GATE GG 2009)

(A) $\phi_n < \phi_d > \phi_t$ (C) $\phi_n > \phi_d = \phi_t$

(B) $\phi_n > \phi_d > \phi_t$ (D) $\phi_n < \phi_d = \phi_t$

Q.32. Identify the equation for formation water resistivity (Rw_e) estimation from SP log, wherein SSP, $K(T)$, and R_{mfe} are respectively static SP, temperature dependent coefficient and mudfiltrate resistivity. (GATE GG 2009)

(A) $SSP = -Rw_e log\left(\frac{K(T)}{R_{mfe}}\right)$

(B) $SSP = -K(T)\, log\left(\frac{Rw_e}{R_{mfe}}\right)$

(C) $SSP = -R_{mfe} log\left(\frac{K(T)}{Rw_e}\right)$

(D) $SSP = -K(T)\, log\left(\frac{R_{mfe}}{Rw_e}\right)$

Q.33. Gamma ray detected in density log is (GATE GG 2009)

(A) natural gamma present in the formation

(B) gamma ray from epithermal neutron source

(C) gamma ray scattered from the formation

(D) gamma ray emitted from neutron capture reaction

Q.34. In Turam method, one measures the reduced field ratio of the amplitude and of the phase difference between the two coils. In the absence of subsurface conducting body, the response is characterized as (GATE GG 2009)

(A) the successive reduced field ratio is equal to 1.0 and phase difference is 0°

(B) the successive reduced field ratio is equal to 1.0 and phase difference is 45°

(C) the successive reduced field ratio is equal to 0.5 and phase difference is 90°

(D) the successive reduced field ratio is equal to 0.5 and phase difference is 60°

Q.35. Electric field $\left(\overrightarrow{E}\right)$ through a polarizable dielectric medium with polarization vector $\left(\overrightarrow{P}\right)$, electric susceptibility (χ_e) and dielectric permittivity (ε_0). The electric displacement vector $\left(\overrightarrow{D}\right)$ for the medium can be written as (GATE GG 2009)

(A) $\overrightarrow{D} = \varepsilon_0 (1 + \chi_e)$

(B) $\overrightarrow{D} = \varepsilon_0 \overrightarrow{E} - \overrightarrow{P}$

(C) $\overrightarrow{D} = \varepsilon_0 \overrightarrow{E} + \chi_e$

(D) $\overrightarrow{D} = \varepsilon_0 \overrightarrow{E} + \overrightarrow{P}$

Q.36. Using different electrodes configuration, maximum depth of investigation is achieved in (GATE GG 2009)

(A) Schlumberger

(B) dipole

(C) tri-electrodes

(D) Wenner

Q.37. Relevant differential equation to study low frequency electromagnetic prospecting for a conducting target can be written in the form of (GATE GG 2009)

(A) Wave equation

(B) Laplace's equation

(C) Helmholtz equation

(D) Poisson's equation

Q.38. In a layered medium, if the basement is perfectly conducting, magnetotelluric phase response asymptotically approaches to (GATE GG 2009)

(A) 0°

(B) 45°

(C) 60°

(D) 90°

Q.39. Magnetotelluric spectral impedance can be defined as (GATE GG 2009)

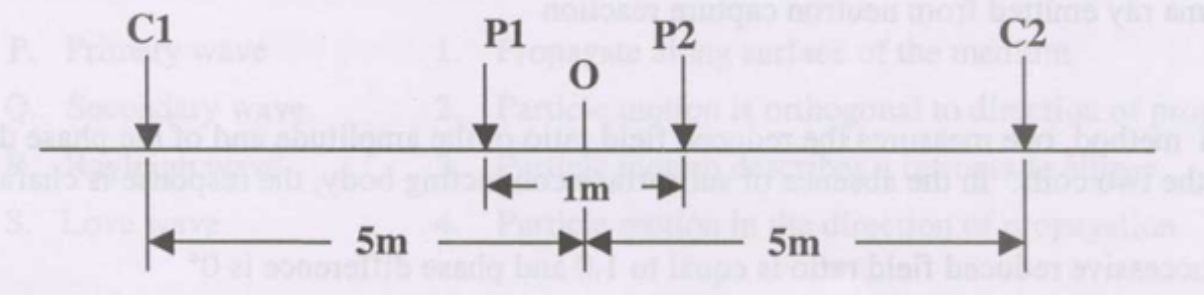
(A) the ratio of the spatial spectrum from mutually orthogonal horizontal components of the electric and magnetic field

(B) the ratio of the spatial spectrum of the vertical component to the horizontal component of magnetic field

(C) the ratio of the spatial spectrum of the vertical component to the horizontal component of electric magnetic field

(D) the ratio of the spatial spectrum of the two horizontal components of electric field

Q.40. Following four electrodes array: P1, P2 are measuring electrodes and C1, C2 are current electrodes used in resistivity measurement. Inter-electrode separation is also shown in figure. (GATE GG 2009)



The above electrodes configuration is

(A) radial dipole

(B) parallel dipole

(C) Schlumberger

(D) Wenner

Q.41. In DC resistivity method, direct filter coefficients are used to compute (GATE GG 2009)

(A) apparent resistivity data from resistivity transform

(B) resistivity transform from apparent resistivity data

(C) apparent resistivity from measured potential difference

(D) apparent resistivity from one electrode configuration to other electrode configuration

Q.42. A counting rate of 15, 100 counts per minute is recorded by a radiation counter having a dead time of $300\,\mu sec$. The count rate (counts per minute) in the absence of dead time (GATE GG 2009)

(A) 13, 333 (B) 14, 333 (C) 15, 333 (D) 16, 333

Q.43. The output of a linear and invariant system for a unit input is $\{3, 1\}$. Then what would be the output for an input $\{-2, 1\}$? (GATE GG 2009)

(A) $\{-6, 1, 1\}$ (B) $\{-1, 1, 6\}$ (C) $\{-1, 6, 1\}$ (D) $\{1, -1, 6\}$

Q.44. Geophysical inverse problems are described by (GATE GG 2009)

(A) Fredholm's integral equation of first kind

(B) Fredholm's integral equation of second kind

(C) Volterra's equation of second kind

(D) Legendre equation

Q.45. Spot the ANN method from the following: (GATE GG 2009)

(A) Singular value decomposition

(B) Monte-Carlo technique

(C) Ridge regression procedure

(D) Back propagation technique

Q.46. The concept of resolving kernel is used in (GATE GG 2009)

(A) Tikhonov's regularization method

(B) Ridge regression method

(C) Backus-Gilbert method

(D) Simulated annealing method

Q.47. For underwater gravity measurements, the following correction is needed: (GATE GG 2009)

(A) Prey correction

(B) Free-air correction

(C) Bouguer correction

(D) Isostatic correction

Q.48. The source of magnetic anomalies extend up to (GATE GG 2009)

(A) upper mantle

(B) core-mantle boundary

(C) lower mantle

(D) Curie-point isotherm

Q.49. In magnetic prospecting scalar magnetometers are used. Then, the prime assumption involved in magnetic data acquisition is (GATE GG 2009)

(A) remnant magnetization is predominant

(B) both remnant and induced magnetization are responsible

(C) induced magnetization plays a dominant role

(D) only diamagnetic sources are responsible

Q.50. Source of main geomagnetic field is best represented by (GATE GG 2009)

(A) a system of electric currents at core-mantle boundary

(B) a system of dipoles, quadrupoles, octupoles and multipoles

(C) an inclined geomagnetic dipole at center of earth

(D) a system of currents in the ionosphere

Common Data Questions

Common Data Questions 51 and 52:

In a resistivity sounding experiment using Schlumberger configuration the apparent resistivity function asymptotically approaches a sloping straight line of slope 45° with abscissa.

Q.51. From the above data it can be inferred that the basement is (GATE GG 2009)

(A) Perfectly conducting
(C) Relatively conducting
(B) Relatively resistive
(D) Perfectly resistive

Q.52. If the intercept at $\rho_a = 1\ ohm - m$ is 5 and resistivity of top layer is $10\ ohm - m$, then the depth of basement is (GATE GG 2009)

(A) $50.0\,m$
(C) $2.0\,m$
(B) $5.0\,m$
(D) $0.5\,m$

Common Data Questions 53 and 54:

In a seismic refraction experiment involving a two-layered earth of P-wave velocities, $3\,km/sec$ and $4.5\,km/sec$ the delay time is found to be $49.69\,ms$.

Q.53. From the above data, the depth to the interface is given by (GATE GG 2009)

(A) $150\,m$
(C) $100\,m$
(B) $120\,m$
(D) $50\,m$

Q.54. Using the above depth, the computed critical distance (m) would be (GATE GG 2009)

(A) 151.20
(C) 221.67
(B) 178.88
(D) 169.87

Common Data Questions 55 and 56:

The peak gravity anomaly over a 2-D line mass of circular cross-section (*horizontalcylinder*) of density contrast $500\,kg/m^3$ is $1.674\,mgal$. The anomaly decreases to $0.837\,mgal$ at a distance of $500\,m$ along a principal profile. The universal gravitation constant, $G = 6.6667 \times 10^{-11} m^3 sec^{-2} kg^{-1}$

Q.55. The depth (m) to center of line mass and radius (m) of the horizontal cylinder are (GATE GG 2009)

(A) 500, 199.80
(C) 200, 100.33
(B) 200, 150.93
(D) 100, 60.37

Q.56. Hence compute the excess mass per unit length (kg/m) of the line mass (GATE GG 2009)

(A) 11.0×10^7

(B) 9.0×10^7

(C) 6.27×10^7

(D) 3.67×10^7

Linked Answer Questions

Statement for Linked Answer Questions 57 and 58:

Resistivity log recorded using normal device with measuring electrode, M, is situated close to the current electrode, A, in logging device placed in borehole. A constant current, I, injected from current electrode into the formation.

Q.57. If the spacing between A and M is r, and the potential difference ΔV is measured between the measuring electrode, M and remotely placed surface electrode. Then the expression for the apparent resistivity can be written as (GATE GG 2009)

(A) $\rho_a = \dfrac{2\pi r}{I}\Delta V$

(B) $\rho_a = \dfrac{4\pi r^2}{I}\Delta V$

(C) $\rho_a = \dfrac{2\pi r^2}{I}\Delta V$

(D) $\rho_a = \dfrac{4\pi r}{I}\Delta V$

Q.58. If $r = 0.40\,m$; $I = 0.02\,amp$; $\Delta V = 0.04\,volt$, then the measured apparent resistivity will be (GATE GG 2009)

(A) $1\,\Omega m$

(B) $5\,\Omega m$

(C) $10\,\Omega m$

(D) $20\,\Omega m$

Statement for Linked Answer Questions 59 and 60:

Given the wavelets,$a = \{3, -2\}$ and $b = \{1, -2\}$

Q.59. The cross-correlation, ϕ_{ab}, is given by (GATE GG 2009)

(A) $\{-6, 7, -2\}$

(B) $\{-6, 10, -12\}$

(C) $\{-4, -11, -6\}$

(D) $\{-6, 11, -4\}$

Q.60. The inverse of wavelet 'a',W_a^{-1} is given by (GATE GG 2009)

(A) $\{4/3, 16/9, 17/7, 64/81\}$

(B) $\{1/3, 2/9, 4/27, 8/81\}$

(C) $\{4/9, 1/3, 64/81, 16/27\}$

(D) $\{16/27, 64/81, 4/9, 1/3\}$

END OF THE QUESTION PAPER