GG: GEOLOGY AND GEOPHYSICS

EE25BTECH11032- KARTIK LAHOTI

1) Which one of the following is a continental hotspot? (GATE GG 2017)

a) Reunion b) Macdonald c) Hawaii d) Afar

2) The diagram given below shows a Mohr circle for two-dimensional stress with points numbered as shown. The mean stress and the maximum shear stress are given by which one of the following number pairs? (GATE GG 2017)

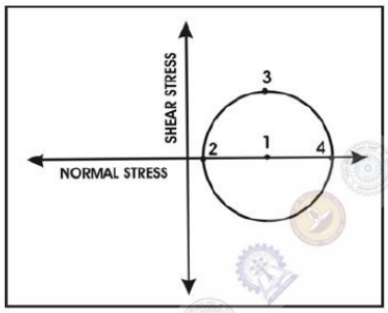

Fig. 1. Q.2.

a) 1 , 2
b) 1 , 3
c) 1 , 4
d) 2 , 3

3) Which type of fault is developed in the setting shown in the figure below? Velocity vectors on either side of the fault are given in the figure. (GATE GG 2017)

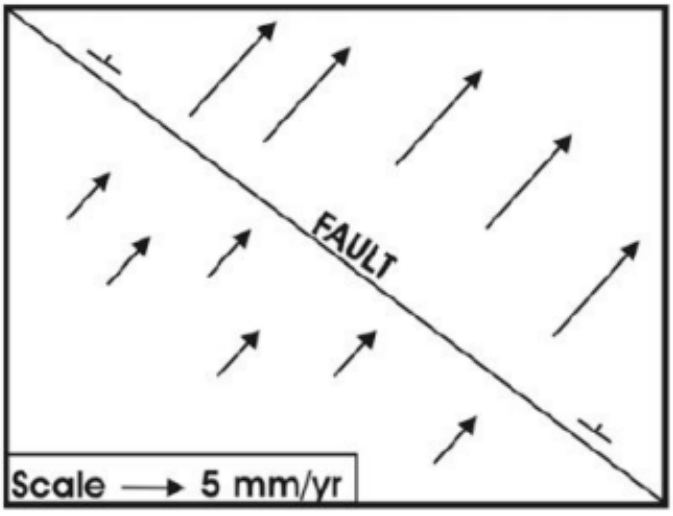

Fig. 2. Q.3.

a) Normal
b) Dextral strike-slip
c) Sinistral strike-slip
d) Thrust

4) The age of most of the bituminous coal seams of India is (GATE GG 2017)

a) Silurian. b) Miocene. c) Carboniferous. d) Permian.

5) The time equivalent of the time-stratigraphic term 'Series' is (GATE GG 2017)
a) Epoch.
b) Period.
c) Age.
d) Stage.

6) Match the following stratigraphic units of India (Group-*I*) with their age (Group-*II*). (GATE GG 2017)

Group *I*	**Group** *II*
p) Barakar Formation	a) Miocene
q) Warkalli (Varkala) Formation	b) Cretaceous
r) Bagh Beds	c) Proterozoic
s) Bhander Limestone	d) Eocene
	e) Permian

a) P-5, Q-1, R-2, S-3
b) P-1, Q-4, R-2, S-5
c) P-5, Q-4, R-2, S-3
d) P-2, Q-3, R-1, S-4

7) Universal Transverse Mercator (UTM) is a type of (GATE GG 2017)

a) conical projection.
b) gnomonic projection.
c) orthogonal projection.
d) cylindrical projection.

8) The groundwater flow equation $\frac{\partial^2 h}{\partial x^2} + \frac{\partial^2 h}{\partial y^2} + \frac{\partial^2 h}{\partial z^2} = 0$, where h refers to the hydraulic head and x, y, z are coordinates, is valid when the flow condition is (GATE GG 2017)
a) steady state in isotropic media.
b) unsteady state in isotropic media.
c) steady state in anisotropic media.
d) unsteady state in anisotropic media.

9) Los Angeles abrasion test was conducted for a granite aggregate with an initial weight of 4800 grams. After the test, the aggregate weighed 3504 grams. The Los Angeles abrasion value is _____ %. (GATE GG 2017)

10) Brightness temperature is a function of surface temperature and (GATE GG 2017)

a) transmittance.
b) reflectance.
c) refractive index.
d) emissivity.

11) Which one of the following minerals has poor cleavage in all directions? (GATE GG 2017)

a) Fluorite b) Orthoclase c) Quartz d) Muscovite

12) The figure below shows the intercepts of the plane HKL with the crystallographic axes a, b, c. The Miller index of the plane HKL is (GATE GG 2017)

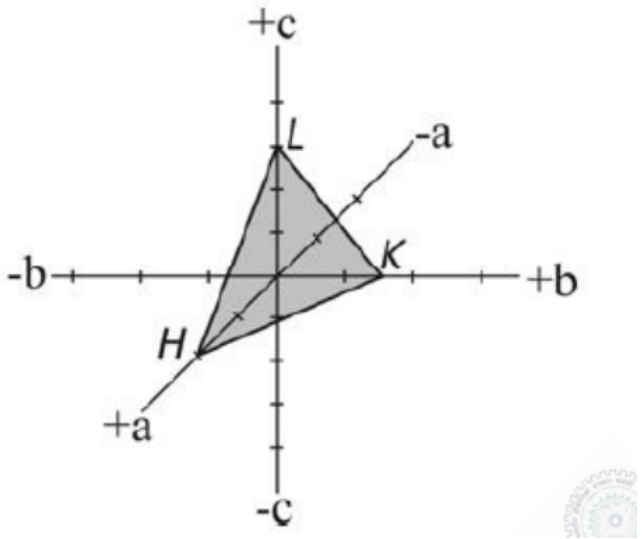

Fig. 3. Q.12.

a) (243) b) (342) c) (436) d) (634)

13) Match the rocks listed in Group-*I* with the corresponding general rock classification listed in Group-*II*. (GATE GG 2017)

Group *I*	**Group *II***
p) Granite	a) Extrusive igneous rock
q) Basalt	b) Biochemical sedimentary rock
r) Gneiss	c) Intrusive igneous rock
s) Sandstone	d) Metamorphic rock
	e) Clastic sedimentary rock

a) P-1; Q-3; R-5; S-2
b) P-4; Q-5; R-1; S-2
c) P-3; Q-1; R-4; S-5
d) P-3; Q-4; R-1; S-5

14) Which one of the following oceanic ridges is known to be aseismic? (GATE GG 2017)

a) Carlsberg
b) Mid Atlantic
c) Ninety East
d) Southwest Indian

15) Isogonic lines are contours of equal magnetic (GATE GG 2017)

a) inclination.
b) declination.
c) total field intensity.
d) horizontal field intensity.

16) Match the geophysical terms in Group-*I* with their corresponding units of measurements in Group-*II*. (GATE GG 2017)

Group *I*	**Group *II***
p) Transit time	a) mGal
q) Conductivity	b) nanoTesla
r) Gravity anomaly	c) siemens
s) Magnetic field intensity	d) millivolt
	e) microsecond per feet

a) P-5; Q-4; R-2; S-1
b) P-5; Q-4; R-3; S-2
c) P-5; Q-3; R-1; S-2
d) P-4; Q-3; R-2; S-1

17) The Maxwell's equation based on Ampere's law is (GATE GG 2017)
a) $\nabla \times E = -\frac{\partial B}{\partial t}$
b) $\nabla \times H = j + \frac{\partial D}{\partial t}$
c) $\nabla \cdot B = 0$
d) $\nabla \cdot E = \frac{\rho}{\epsilon}$

18) The normal gravity formula (for e.g. GRS80) is a function of (GATE GG 2017)
a) geocentric latitude.
b) geodetic latitude.
c) longitude.
d) altitude.

19) A seismic reflection survey was carried out over a subsurface consisting of a stack of horizontal isotropic layers. In the common midpoint (CMP) domain, the moveout (traveltime v/s offset) curve for any primary reflection event is best approximated by (GATE GG 2017)
a) an ellipse.
b) a parabola.
c) a circle.
d) a hyperbola.

20) Assertion (a): Magnetic stripes are observed around mid-oceanic ridge regions.
Reason (r): The earth's magnetic field undergoes reversals of polarity. (GATE GG 2017)
a) (a) is true but (r) is false.
b) (a) is false but (r) is true.
c) Both (a) and (r) are true and (r) is one of the correct reasons for (a).
d) Both (a) and (r) are true but (r) is not the correct reason for (a).

21) A seismic gap refers to a (GATE GG 2017)
a) time gap between two great earthquakes.
b) distance gap between the epicenters of two great earthquakes.
c) segment of an active belt where a historical great earthquake has not occurred.
d) wide gap in the earth created by a great earthquake.

22) The travel time difference between the arrival times of a shear wave (S) and primary wave (P) observed on a seismogram recorded at an epicentral distance of 100 km from a near surface earthquake is _____s. (Assume the average P and S wave velocities to be 6.0 km/s and 3.5 km/s, respectively). (GATE GG 2017)

23) The percentage increase in P-wave velocity (km/s) across the Mohorovicic discontinuity from the lower crust to the upper mantle beneath a craton is approximately _____ (%). (GATE GG 2017)

24) Which one amongst the following logging tools has the largest depth of investigation? (GATE GG 2017)

a) Density b) Laterolog 3 c) Laterolog 8 d) Neutron

25) The most abundant radioactive isotope in the continental crust is (GATE GG 2017)

a) ^{40}K b) ^{232}Th c) ^{235}U d) ^{238}U

Geology (Part B) (Section-1)

26) Stylolitic foliation developed during diagenetic processes is typically (GATE GG 2017)
a) parallel to bedding.
b) perpendicular to bedding.
c) oblique to bedding.
d) vertical.

27) A coal seam with an attitude $090°, 50°S$ outcrops at an elevation of $1400\,m$ in an area that has flat topography. A vertical exploratory drill hole will intersect the seam (GATE GG 2017)
a) north of the outcrop at elevations greater than $1400\,m$.
b) north of the outcrop at elevations less than $1400\,m$.
c) south of the outcrop at elevations less than $1400\,m$.
d) south of the outcrop at elevations greater than $1400\,m$.

28) Earthquakes result in the formation of which one of the following features? (GATE GG 2017)

a) Porphyroblast b) Porphyroclast c) Pseudotachylite d) Pressure shadow

29) In a bilaterally symmetrical brachiopod fossil, the angle between the hinge line and the median line changes to 45° after deformation. The shear strain observed in the deformed fossil is _____. (GATE GG 2017)

30) The empirical probability distribution of gold (Au) grades shows a unimodal distribution with mode $= 2\,g/t$, median $= 3\,g/t$, and mean $= 5\,g/t$. This probability distribution is (GATE GG 2017)
a) positively skewed.
b) negatively skewed.
c) normally distributed.
d) platykurtic.

31) A limb of a non-plunging fold with an attitude $070°, 40°S$ is rotated about its fold axis 30° clockwise (looking towards ENE). The plunge amount of the pole to the fold limb after rotation is _____ degrees. (GATE GG 2017)

32) The Bulk Silicate Earth (BSE) is best approximated by the average (GATE GG 2017)
a) enriched upper mantle composition.
b) mantle and continental crust composition.
c) depleted mantle composition.
d) primitive upper mantle composition.

33) Which one of the following is the stable mineral assemblage in metamorphism of a rock with pelitic bulk composition under granulite facies? (GATE GG 2017)
a) staurolite + muscovite + sillimanite + K-feldspar
b) phengite + garnet + chloritoid + biotite
c) garnet + orthopyroxene + clinopyroxene + plagioclase
d) garnet + cordierite + K-feldspar + sillimanite

34) The given P-T diagram shows four distinct metamorphic paths designated as 1, 2, 3 and 4. Which one of these P-T paths represents crustal thickening in a collisional tectonic setting? (GATE GG 2017)

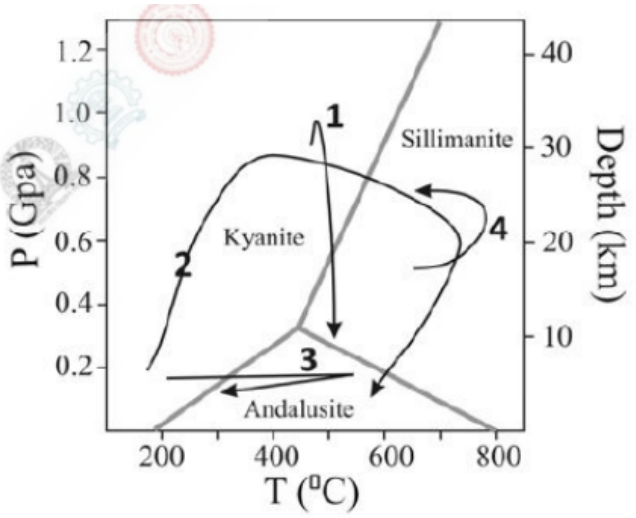

Fig. 4. Q.34.

a) 1 b) 2 c) 3 d) 4

35) The pressure on a rock overlain by a 7 km thick basaltic crust ($\rho = 3100\, kg\, m^{-3}$) is _____ kilobar. (Use $g = 9.8\, ms^{-2}$; $10^5\, Pa = 1 bar$) (GATE GG 2017)

36) The given T-X diagram shows the phase relations in olivine solid solution at 1 bar pressure. If 'P' is the initial position of melt, the proportion of melt at 1500°C is _____%. (GATE GG 2017)

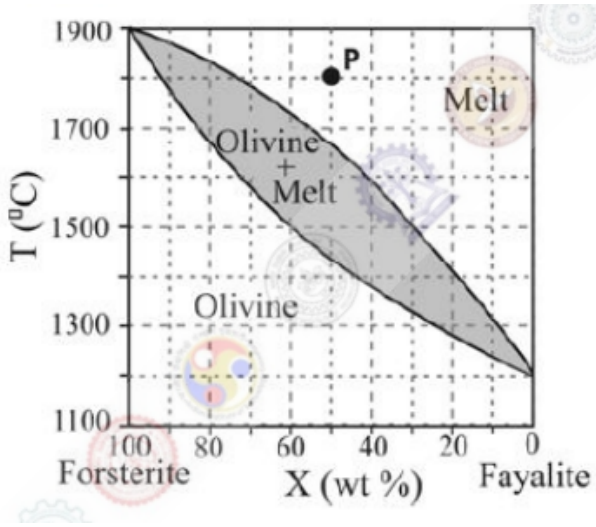

Fig. 5. Q.36.

37) Fluorite crystal (CaF_2) adopts face-centered cubic structure with lattice parameter a = 5.463 Å. If the ionic radius of anion (F^-) is 1.31 Å, the ionic radius of cation $\left(Ca^{2+}\right)$ is _____ Å. (GATE GG 2017)

38) The diagram below shows the interference figure of a mineral. The mineral is (GATE GG 2017)

a) uniaxial positive
b) biaxial negative
c) uniaxial negative
d) biaxial positive

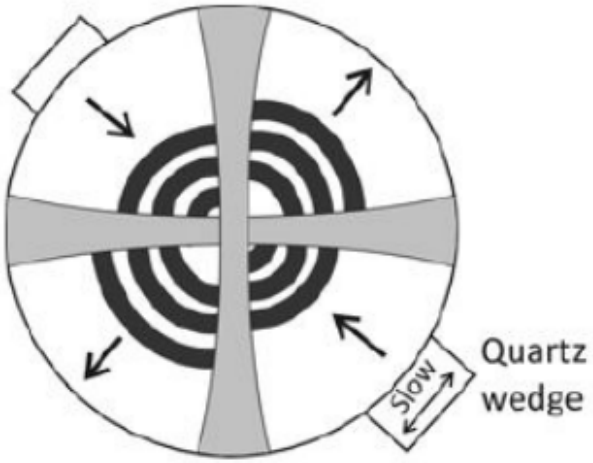

Fig. 6. Q.38.

39) The standard thermodynamic data for enstatite ($Mg_2Si_2O_6$), quartz (SiO_2) and forsterite (Mg_2SiO_4) is given in the table below. The Gibbs' free energy of the reaction ($Mg_2Si_2O_6 + SiO_2 = Mg_2SiO_4$) at 600 K and 1 bar is _____ J. (Assume $C_p = 0$ for all minerals in the reaction) (GATE GG 2017)

Mineral	$\Delta \mathbf{H}^\circ_{f,298}$ **(kJ)**	$\mathbf{S}^\circ\left(\mathbf{JK}^{-1}\right)$
Enstatite	−3090.47	132.5
Quartz	−910.83	41.5
Forsterite	−2172.2	95.1

40) The modal abundance in an ultramafic rock and the partition coefficients of lutetium (Lu) in clinopyroxene, orthopyroxene, olivine and plagioclase are tabulated below. The bulk distribution coefficient of lutetium (D_{Lu})) in the ultramafic rock is _____. (GATE GG 2017)

Mineral	**Modal abundance** (%)	**Partition coefficient**
Clinopyroxene	45	0.506
Orthopyroxene	40	0.42
Olivine	10	0.045
Plagioclase	05	0.019

41) Match the following classical ore deposits (Group-I) with their associated ore minerals (Group-II). (GATE GG 2017)

Group I

p) Sudbury type deposit
q) Mississippi valley type deposit
r) Climax type deposit
s) IOCG type deposit

Group II

a) Molybdenite
b) Uraninite and chalcopyrite
c) Pentlandite
d) Psilomelane
e) Sphalerite and Galena

a) P-4; Q-5; R-2; S-1
b) P-3; Q-5; R-1; S-2
c) P-5; Q-2; R-4; S-1
d) P-3; Q-5; R-2; S-4

42) Which one of the following microfossils is commonly used in biostratigraphic correlation of Palaeozoic marine strata? (GATE GG 2017)

a) Angiosperm pollen b) Diatoms c) Dinoflagellates d) Chitinozoans

43) Given below are pairs of "living fossils". Which one of the following is a brachiopod-mollusc pair? (GATE GG 2017)
   a) *Lingula, Nautilus*
   b) *Ginkgo, Metasequoia*
   c) *Sphenodon, Notorhynchus*
   d) Coelacanths, *Sidderoidea*

44) Match the sedimentary rocks and their features listed in Group *I* with depositional environments listed in Group *II*. (GATE GG 2017)

Group *I*	**Group *II***
p) Sandstone with herring-bone cross bedding	a) Eolian
q) Chalk with coccolith	b) Glacial
r) Well sorted arenite with large cross bedding (5-10 m thick)	c) Sabkha
	d) Tidal
s) Poorly sorted sediments with faceted and striated pebbles	e) Pelagic

   a) P-2, Q-1, R-4, S-5
   b) P-4, Q-5, R-1, S-2
   c) P-4, Q-1, R-2, S-5
   d) P-5, Q-1, R-2, S-3

45) Arrange the following stratigraphic formations sequentially from older to younger: (P) Jodhpur Sandstone (Q) Cambay Shale (R) Krol Limestone (S) Tipam Sandstone (GATE GG 2017)

   a) P, R, Q, S
   b) R, Q, P, S
   c) P, S, R, Q
   d) R, P, Q, S

46) $2\,g$ air dried coal contains $0.2\,g$ moisture, $0.3\,g$ ash and $0.5\,g$ volatile matter. The volatile matter content in the coal in dry mineral matter free ($d.m.f$) basis is _____ %. (mineral matter content = 1.1× ash content) (GATE GG 2017)

47) The approximate temperature for "oil window" ranges from (GATE GG 2017)

   a) $30°C$ to $50°C$
   b) $60°C$ to $160°C$
   c) $180°C$ to $250°C$
   d) $260°C$ to $350°C$

48) Which one of the following biopolymers is the major source of liquid hydrocarbons? (GATE GG 2017)
   a) Lignin
   b) Proteins
   c) Lipids
   d) Carbohydrates

49) The hydraulic conductivity (K) of an isotropic aquifer is $10\,m/day$. If the hydraulic head within the aquifer drops $4\,m$ over a distance of $750\,m$, the groundwater flow velocity within the aquifer is _____m/day. (Up to third decimal place) (GATE GG 2017)

50) Drainage network of a watershed ordered as per the Strahler method is given below. Maximum observed bifurcation ratio for the given network is _____. (GATE GG 2017)

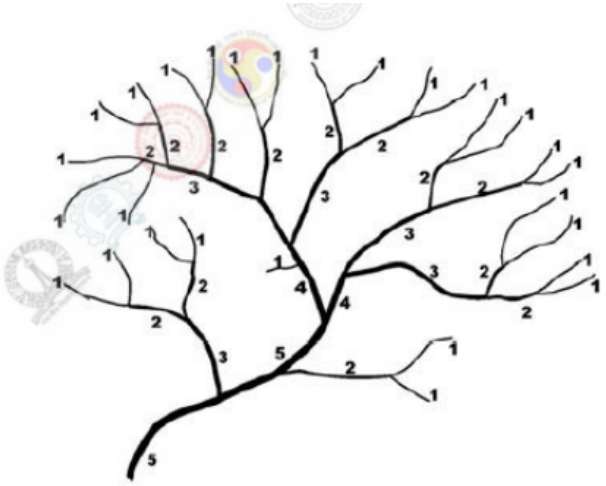

Fig. 7. Q.50.

51) In a vertical aerial photo, the top and bottom of a tower built on a flat terrain is displaced by 2 mm. In the photograph, the distance between top of the tower and nadir point is 100 mm . The flying height of the aircraft was 3000 m above the ground. The estimated height of the tower is _____ m. (GATE GG 2017)

52) Brazilian test was conducted on a rock sample having radius of 27 mm and thickness of 22 mm . The failure load was 5 kN . The tensile strength of the rock is _____ N/mm^2. (GATE GG 2017)

53) The average assay (a) and area of influence (A) of a placer gold deposit of uniform thickness sampled at four locations W, X, Y and Z are given below. The weighted average assay of the ore body is _____ g/t. (GATE GG 2017)

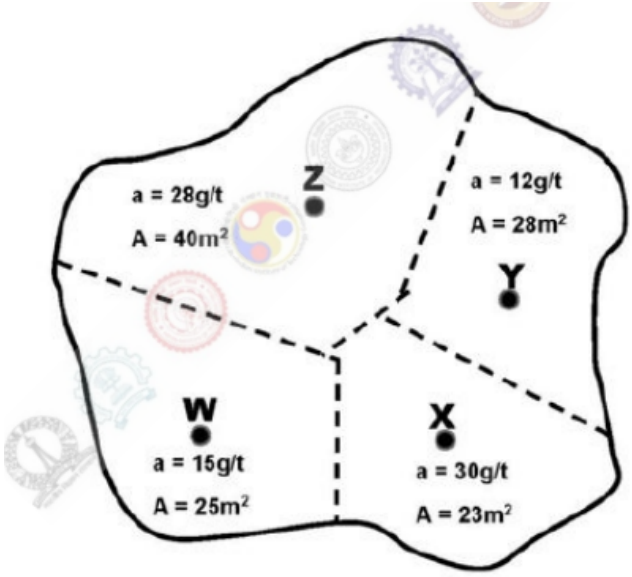

Fig. 8. Q.53.

54) The minimum and maximum values of the digital number (DN) of a remote sensing image are 8 and 32 respectively. The digital data was linearly stretched between 0 and 255 by using min-max linear

stretching method. The post stretched integer DN value of a pixel with an original DN value of 27 will be _____. (GATE GG 2017)

55) The length and width of concave and convex sides of a landslide is shown in the figure below. The Dilation Index of the landslide is _____. (GATE GG 2017)

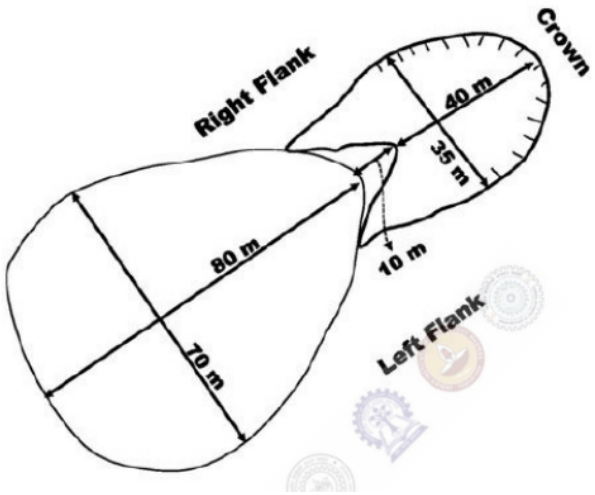

Fig. 9. Q.55.

GEOPHYSICS (*PartB*) (*Section* − 2)

56) Which one of the following seismic phases is observable in the P-wave shadow zone? (GATE GG 2017)

a) P b) PnP c) PcS d) PKIKP

57) Consider a geological body buried at the equator at a certain depth. If the same body were to be buried at the North pole at the same depth, how would the gravity and magnetic field responses measured over the body differ? Assume the same magnetic susceptibility and density contrasts. (Consider only geomagnetic induction) (GATE GG 2017)

a) Both gravity and magnetic field responses do not change
b) Both gravity and magnetic field responses change significantly
c) Gravity field response changes significantly but magnetic field response does not change
d) Gravity field response does not change but magnetic field response changes significantly

58) Given the Bouguer density of $2.8\,g/cc$, the Bouguer correction for a gravity station at an elevation of $30\,m$ above the datum is _____ *mGals*. (Use $\pi = 3.14$) (GATE GG 2017)

59) Given the following data for a resistivity sounding experiment over a two-layered half-space, the resistivity transform for the top layer is _____ Ωm. (Data: resistivity of top layer $\rho_1 = 10\,\Omega m$, resistivity of half space $\rho_2 = 100\,\Omega m$, thickness of top layer $h_1 = 10\,m$ and current electrode spacing $AB/2 = 5\,m$) (GATE GG 2017)

60) The ratio of eccentricity to the polar flattening of an ellipsoidal Earth with equatorial radius 'a' and polar radius 'b' can be expressed as (GATE GG 2017)

a) $\frac{\sqrt{e^2+p^2}}{\sqrt{e-p}}$ b) $\frac{\sqrt{e^2-p^2}}{\sqrt{e+p}}$ c) $\frac{\sqrt{e+p}}{\sqrt{e-p}}$ d) $\frac{\sqrt{e^2+p^2}}{\sqrt{e+p}}$

61) The vertical field intensity anomaly A_z due to a vertically polarized vertical dyke is given by

$$A_z = 2Mt\left(\frac{z_1}{\left(z_1^2 + x^2\right)} - \frac{z_2}{\left(z_2^2 + x^2\right)}\right)$$

where M is the magnitude of intensity of magnetization. All relevant parameters are provided in the figure below. The dyke has 1% magnetite (magnetic susceptibility of magnetite = 0.5 SI unit) distributed homogeneously. Then, the magnitude of peak vertical field intensity over the dyke is _____ nT. (GATE GG 2017)

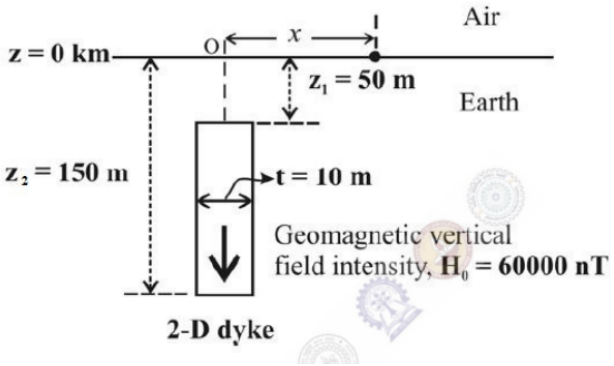

Fig. 10. Q.61.

62) In a magneto-telluric (MT) experiment over a homogeneous and isotropic half-space, the apparent resistivity is $50\,\Omega m$ for an electric field intensity of $12\,mV/km$ and time period of $10\,s$. Then, the magnetic field strength is _____ nT. (GATE GG 2017)
63) The apparent resistivity for Wenner and Schlumberger configurations in an electrical sounding experiment is the same for a certain electrode spacing a (Wenner configuration). Given the current electrode spacing of $18m$ and the potential electrode spacing of $2m$ for a Schlumberger configuration, the value of a is _____ m. (GATE GG 2017)
64) In a time-domain (T-D) induced polarization experiment with a steady voltage of $10mV$ during the current flow interval, the voltage decay after the current cut-off is given by:

$$v(t) = 4.0e^{-0.3t}mV$$

The chargeability after current cut-off between $t_1 = 1s$ and $t_2 = 4s$ is _____ ms . (GATE GG 2017)
65) Which one of the following statements is TRUE for a near-surface earthquake occurring in a homogeneous, isotropic Earth? (GATE GG 2017)
   a) Rayleigh waves are generated.
   b) Love waves are generated.
   c) Shear waves are split.
   d) P waves undergo refraction.
66) A dynamic range of $60dB$ in power corresponds to an increase in amplitude by a factor of _____. (GATE GG 2017)
67) The slope of the Wadati plot obtained using the P and S arrival times of a local earthquake is 1.0. The corresponding V_p/V_S ratio of the subsurface medium is _____. (GATE GG 2017)
68) The beach ball figure given below depicts the focal mechanism of an earthquake. The shaded and unshaded portions indicate compressional and dilatational quadrants, respectively. $FP1$ is the fault plane solution. The focal mechanism and $FP1$ represent: (GATE GG 2017)

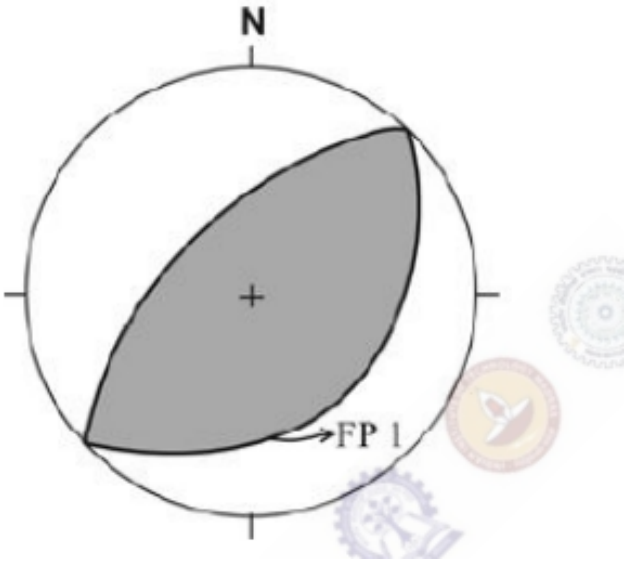

Fig. 11. Q.68.

a) A thrust fault with strike 45°and dip 30°with the tension axis in the compression quadrant.
b) A normal fault with strike 45° and dip 30° with the tension axis in the compression quadrant.
c) A thrust fault with strike 225° and dip 60° with the pressure axis in the compression quadrant.
d) A normal fault with strike 225° and dip 60° with the pressure axis in the compression quadrant.

69) The characteristic log responses of a thick coal seam are: (GATE GG 2017)
a) Low transit time, low resistivity and high gamma ray count.
b) Low transit time, low resistivity and low gamma ray count.
c) High transit time, high resistivity and low gamma ray count.
d) High transit time, low resistivity and high gamma ray count.

70) The SP response of a thick, clean sandstone bed is $-54mV$. Given the mud filtrate resistivity to be $0.45\Omega m$ at a formation temperature of $130°F$ and the coefficient $K = 77.29$, the formation water resistivity is _____ $\Omega\, m$. (GATE GG 2017)

71) Which one of the following log responses is TRUE for a porous and permeable sandstone bed, when the resistivity of the mud filtrate used is equal to the resistivity of the formation water? (GATE GG 2017)
a) A large negative SP is observed.
b) A large positive SP is observed.
c) LLs and LLm logs show appreciably large separation.
d) LLm and LLd logs overlap with each other.

72) The number of half-lives ($T_{1/2}$) required for a certain amount of radioactive isotope in a rock to reduce to 3% of its original amount is _____ (GATE GG 2017)

73) VLF fields can be measured over continental distances (r) because: (GATE GG 2017)
a) The magnetic field decreases at the rate $1/r$ and the output at the transmitting station is 1 to $10kW$.
b) The magnetic field decreases at the rate $1/r^3$and the output power at the transmitting station is 1 to $10kW$.
c) The magnetic field decreases at the rate $1/r$and the output power at the transmitting station is 100 to $1000kW$.
d) The magnetic field decreases at the rate $1/r^2$ and the output power at the transmitting station is 100 to $1000kW$.

74) Convolution of two boxcar functions of different widths yields a: (GATE GG 2017)

a) Stem function.
b) Trapezoidal function.
c) Boxcar function.
d) Sinc functon.

75) Assuming the Z-transform to be defined with Z as the unit delay operator, the pole of the infinite sequence $[1, 1/2, 1/4, 1/8, \dots]$ is at $Z =$ _____. (GATE GG 2017)

76) Normal moveout (NMO) correction was applied to seismic data in the common midpoint (CMP) domain. The frequency distortion due to NMO stretch is highest for: (GATE GG 2017)

a) Larger offsets of deeper reflections.
b) Smaller offsets of shallower reflections.
c) Larger offsets of shallower reflections.
d) Smaller offsets of deeper reflections.

77) Consider a hypothetical zero-offset seismic reflection survey acquired over a reflector whose dip is 30°. The velocity of the medium above the reflector is $2km/s$ and the trace spacing is $25m$. The maximum unaliased frequency in the data is _____ Hz. (HInt: The difference in traveltime between adjacent traces should be less than or equal to half a cycle.) (GATE GG 2017)

78) In statistical wavelet deconvolution, the reflectivity series is assumed to be a random sequence. Then, the autocorrelation of the wavelet is: (GATE GG 2017)

a) A scaled version of the autocorrelation of the seismic trace.
b) A random sequence.
c) Zero.
d) Dirac delta function.

79) A vector field u is expressed by its Helmholtz decomposition as:

$$u = \nabla\phi + \nabla \times \psi$$

with $\phi = \frac{1}{2}\left(x^2 - y^2 + z^2\right)$ and $\psi = zy^2 i + xzj + x^2 k$ The magnitude of the ivergence of the vector field u at $(1, 1, 1)$ is _____ (GATE GG 2017)

80) In the figure shown, a ray corresponding to a P-wave is incident on the interface between layer 1 and layer 2 at an angle of 30° The P-wave velocity is $1km/s$, $1.2km/s$, and $1.5km/s$ in layer 1, layer 2, and the half-space, respectively. The emergence angle of the ray into the half-space is _____ degrees. (GATE GG 2017)

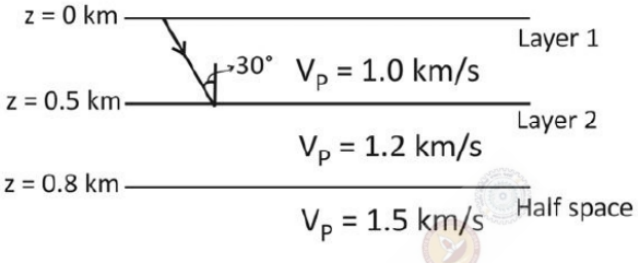

Fig. 12. Q.80.

81) How do the P-wave velocity $\left(V_p\right)$ S-wave velocity (V_s), and Poisson's ratio (σ) change from a water-saturated sandstone to a gas-saturated sandstone? (GATE GG 2017)

a) $\left(V_p\right)$ increases, $\left(V_p\right)$ decreases, and σ increases.
b) $\left(V_p\right)$ decreases, (V_s) remains the same, and σ decreases.
c) $\left(V_p\right)$ decreases, (V_s) increases, and σ decreases.
d) $\left(V_p\right)$, $\left(V_p\right)$, and σ all remain constant.

82) In a VSP experiment, the subsurface consists of a horizontal layer of $2km$ thickness underlain by a semi-infinite half-space. The P-wave velocities $\left(V_p\right)$ in the first layer and half-space are $2.0km/s$ and

$2.5km/s$, respectively. A vertical well has receivers spaced $10m$ apart, from depth $0.5km$ to $1.5km$. The source is placed $0.5km$ from the well head.The traveltime of the primary reflection event at the deepest receiver is _____s. (GATE GG 2017)

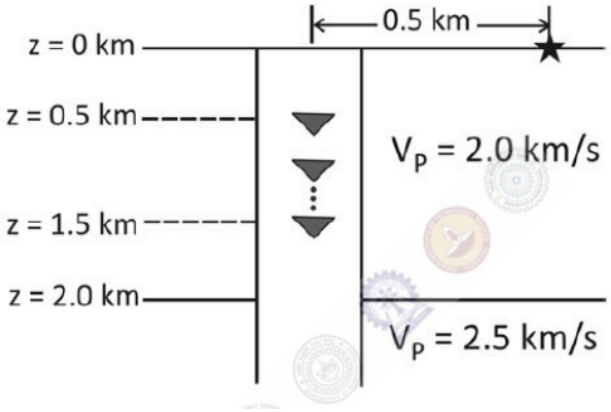

Fig. 13. Q.82.

83) Which one of the following sets of vectors $\{V_1, V_2, V_3\}$ is lineraly dependent? (GATE GG 2017)
   a) $V_1 = (0, -1, 3), V_2 = (2, 0, 1), v_3 = (-2, -1, 3)$
   b) $V_1 = (2, -2, 0), V_2 = (0, 1, -1), v_3 = (0, 4, 2)$
   c) $V_1 = (2, 6, 2), V_2 = (2, 0, -2), v_3 = (0, 4, 2)$
   d) $V_1 = (1, 4, 7), V_2 = (2, 5, 8), v_3 = (3, 6, 9)$

84) Thecondition number for the matrix $A = \begin{pmatrix} 2 & 1 \\ 0 & 3 \end{pmatrix}$ is _____ (GATE GG 2017)

85) Match the items in Group *I* with their corresponding analytical expressions in Group *II*: (GATE GG 2017)

Group *I*	**Group *II***
p) Wave equation	a) $\left\|\nabla u\right\|^2 = 1$
q) Heat conduction equation	b) $\frac{\partial^2 u}{\partial t^2} - \nabla^2 u = 0$
r) Eikonal equation	c) $\nabla^2 u = -4\pi\sigma$
s) Poisson equation	d) $\frac{\partial u}{\partial t} - \nabla^2 u = 0$
	e) $\frac{\partial u}{\partial t} + u \cdot \nabla u = 0$

   a) P-2, Q-3, R-4, S-1
   b) P-2, Q-4, R-1, S-3
   c) P-4, Q-2, R-5, S-3
   d) P-4, Q-3, R-1, S-5

General Aptitude

86) The ways in which this game can be played _____ potentially infinite. (GATE GG 2017)

   a) is b) is being c) are d) are being

87) If you choose plan P, you will have to _____ plan Q, as these two are manually _____. (GATE GG 2017)

   a) forgot, exclusive
   b) forget, inclusive
   c) accept, exhaustive
   d) adopt, intrusive

88) If a and b are integers and $a-b$ is even, which of the following must always be even? (GATE GG 2017)

a) ab b) $a^2 + b^2 + 1$ c) $a^2 + b + 1$ d) $ab - b$

89) A couple has 2 children. The probability that both children are boys if the older one is a boy is (GATE GG 2017)

a) $1/4$ b) $1/3$ c) $1/2$ d) 1

90) P looks at Q while Q looks at R. P is married, R is not. The number of pairs of people in which a married person is looking at an unmarried person is (GATE GG 2017)

a) 0 b) 1 c) 2 d) Cannot be determained

91) "If you are looking for a history of India, or for an account of the rise and fall of the British Raj, or for the reason of the cleaving of the subcontinent into two mutually antagonistic parts and the effects this mutilation will have in the respective sections, and ultimately on Asia, you will not find it in these pages; for though I have spent a lifetime in the country, I lived too near the seat of events, and was too intimately associated with the actors, to get the perspective needed for the impartial recording of these matters." Which of the following is closest in meaning to 'cleaving'? (GATE GG 2017)

a) deteriorating b) arguing c) departing d) splitting

92) X bullocks and Y tractors take 8 days to plough a field. If we halve the number of bullocks and double the number of tractors, it takes 5 days to plough the same field. How many days will it take X bullocks alone to plough the field? (GATE GG 2017)

a) 30 b) 35 c) 40 d) 45

93) There are 4 women P, Q, R, S, and 5 men V, W, X, Y, Z in a group. We are required to form pairs each consisting of one woman and one man. P is not to be paired with Z, and Y must necessarily be paired with someone. In how many ways can 4 such pairs be formed? (GATE GG 2017)

a) 74 b) 76 c) 78 d) 80

94) All people in a certain island are either 'Knights' or 'Knaves' and each person knows every other person's identity. Knights NEVER lie, and knaves ALWAYS lie. P says "Both of us are knights". Q says "None of us are knaves". Which one of the following can be logically inferred from the above? (GATE GG 2017)

a) Both P and Q are knights
b) P is a knight; Q is a knave
c) Both P and Q are knaves
d) The identities of P, Q cannot be determined

95) In the graph below, the concentration of a particular pollutant in a lake is plotted over (alternate) days of a month in winter (average temperature $10°C$) and a month in summer (average temperature $30°C$).

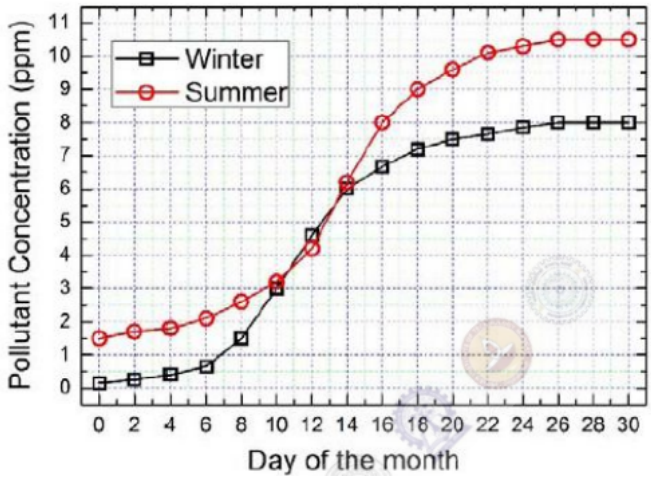

Fig. 14. Q.95.

Consider the following statements based on the data shown above:
i. Over the given months, the difference between the maximum and the minimum pollutant concentrations is the same in both winter and summer.
ii. There are at least four days in the summer month such that the pollutant concentrations on those days are within 1 ppm of the pollutant concentrations on the corresponding days in the winter month.
Which one of the following options is correct? (GATE GG 2017)

a) Only *i* b) Only *ii* c) Both *i* and *ii* d) Neither *i* nor *ii*

END OF THE QUESTION PAPER