GATE-01

ee25btech11063 - VEJITH

1) Earth's dipole field originates mainly from

(GATE GG 2010)

a) mantle b) outer core c) inner core d) crust

2) sunspots are regions of

(GATE GG 2010)

a) high pressure
b) low magnetic field
c) high temperature
d) high magnetic field

3) The electrical conduction mechanism in sedimentary rocks is usually.

(GATE GG 2010)

a) pyroelectric b) electronic c) electrolytic d) dielectric

4) The unit of electrical resistivity is

(GATE GG 2010)

a) ohm b) ohm-m c) ohm-m^2 d) ohm-m^{-1}

5) outcrop pattern parallel to topographic contours signifies

(GATE GG 2010)

a) horizontal beds
b) vertical beds
c) inclined beds
d) folded beds

6) A rock with equal modal contents of quartz,plagioclase and orthoclase is known as

(GATE GG 2010)

a) diorite b) gabbro c) granite d) syenite

7) The main factors in soil-forming processes are

(GATE GG 2010)

a) bedrock and time only
b) topography and bedrock only
c) climate,time and topography only
d) climate,topography,bedrock and time

8) Glacial drift refers to the

(GATE GG 2010)

a) movement of glaciers
b) interglacial intervals
c) erosional landforms produced by glaciers
d) sediments deposited by glaciers

9) sand dunes are long ridges whose alignment is

(GATE GG 2010)

a) always parallel to prevailing wind direction
b) always perpendicular to prevailing wind direction
c) either parallel or perpendicular to prevailing wind direction
d) not related to prevailing wind direction

10) The oldest rocks in India are

(GATE GG 2010)

a) more than 3 billion years old
b) between 2.5 and 3 billion years old
c) between 2 and 2.5 billion years old
d) less than 2 billion years old

11) The sequential placement of geological events as determined by their position in the rock record is known as

(GATE GG 2010)

a) relative dating
b) correlation
c) absolute dating
d) uniformitarianism

12) Time equivalence of rock units in different areas can be established primarily by considering similarity in (GATE GG 2010)

a) lithology
b) fossil assemblages
c) sedimentary structures
d) mineral assemblages

13) Which of the following volcanic events has been suggested as a major cause of the extinction of dinosaurs? (GATE GG 2010)

a) Panjal volcanism
b) Deccan volcanism
c) Rajmahal volcanism
d) Malani volcanism

14) Bode's law express the approximate distance between (GATE GG 2010)

a) earth and other planets
b) moon and sun
c) planets and sun
d) moon and earth

15) India's northward drift from Gondwanaland is believed to have started approximately (in million years ago,Ma) (GATE GG 2010)

a) 50 Ma
b) 150 Ma
c) 300 Ma
d) 400 Ma

16) Which of the following instruments contain piezoelectric material? (GATE GG 2010)

a) hydrophone
b) geophone
c) gravimeter
d) magnetometer

17) If the average crustal thickness is 35 km and the height of a mountain is 5 km above the mean sea level.the crustal thickness on Airy's model beneath the mountain will be approximately (GATE GG 2010)

a) 35 km
b) 40 km
c) 50 km
d) 70 km

18) The equipotential surface over which the gravitational field has equal value is known as (GATE GG 2010)

a) geoid
b) spheroid
c) ellipsoid
d) mean sea level

19) The angle between the present geographic north and geomagnetic north is (GATE GG 2010)

a) 1.5°
b) 7.5°
c) 11.5°
d) 23.5°

20) Among the following the best reconnaissance method for determining basement configuration of sedimentary basins is (GATE GG 2010)

a) gravity method
b) self potential method
c) seismic method
d) electromagnetic method

21) Cooling of basic lava under water will lead to the formation of (GATE GG 2010)

a) lava tunnel
b) pillow structure
c) columnar jointing
d) cumulus texture

22) What would you expect to find at the base of a typical oceanic plate? (GATE GG 2010)

a) Basalt b) Diorite c) Gabbro d) peridotite

23) Major coal deposits of India are found in the

(GATE GG 2010)

a) cuddapah supergroup
b) vindhyan supergroup
c) Gondwana supergroup
d) Dharwar supergroup

24) Which of the following is a product of residual weathering process?

(GATE GG 2010)

a) Placer gold
b) Banded iron ore
c) Bauxite
d) Porphyry copper

25) Choose the correct combination of ore and location of it's deposits.

(GATE GG 2010)

a) uranium-jaduguda
b) Lead-khetri
c) Gold-panna
d) Iron-Malanjkhand

26) The age of the oldest rocks in present-day ocean basins is

(GATE GG 2010)

a) Devonian b) Jurassic c) Eocene d) Permian

27) Silicon to oxygen ratio in the following silicate structure is

(GATE GG 2010)

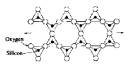

Fig. 1: silicate structure

a) 1 : 2
b) 2 : 5
c) 4 : 11
d) 1 : 3

28) Direct precipitation of uraninite from a mineralizing solution containing UO_2ions can take place due to

(GATE GG 2010)

a) increase in Eh
b) decrease in Eh
c) increase in pH
d) decrease in pH

29) Match the optical properties in Group I with appropriate minerals in Group II.

(GATE GG 2010)

Group I	**Group II**
P. Twinkling	1. Quartz
Q. Pleochroic haloes	2. Nepheline
R. Anomalous interference colour	3. Calcite
S. Uniaxial positive	4. Chloride
	5.Biotite

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

30) Wall-rock alteration producing epidote, albite and chloride around an ore body is called

(GATE GG 2010)

a) argillic alteration
b) propylitic alteration
c) potassium-silicate alteration
d) sericite alteration

31) Match the textures/structures in Group I with appropriate minerals in Group II.

(GATE GG 2010)

Group I	**Group II**
P.Cumulus texture	1. Cavity filling
Q.Spinifex texture	2. Gravity settling
R.Oriented intergrowth	3. Annealing
S.Comb structure	4. Quenching
	5. Coherent exsolution

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

32) An area shows linear erosional depression, sag pond, spring and offset stream along with sub-horizontal slickensides. The prominent structure indicated by these features is

(GATE GG 2010)

a) strike-slip fault
b) horst and graben
c) klippe
d) nappe

33) Match the ore types in Group I with path-finder elements in Group Il
(GATE GG 2010)

Group I	**Group Il**
P. Porphyry Cu ore	1.As
Q. Vein type Au ore	2.Hg
R. Pb-Zn-Ag ores	3.Cr
	4.Mo
	5.Ni

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

34) Match the nature of mass movements listed in Group I with the evidences listed in Group II.

(GATE GG 2010)

Group I	**Group Il**
P. Creep	1.Tounge-shaped mass movement
Q. Earth flow	2. Curved tree trunks
R. Slump	3. Scree formation at the base
	4. Curved surface of rupture

a) P−2, Q−1, R−4
b) P−1, Q−3, R−4
c) P−4, Q−2, R−1
d) P−4, Q−3, R−2

35) Which of the following metamorphic facies is characterized by the pyrope rich garnet+ omphacite assemblage?

(GATE GG 2010)

a) Blueschist
b) Eclogite
c) Greenschist
d) Granulite

36) Match the gemstones in Group I with corresponding minerals in Group II.

(GATE GG 2010)

Group I	**Group Il**
P. Peridote	1. Beryl
Q. Emerald	2. Feldspar
R. Amazonite	3. Corundum
S. Ruby	4. Olivine

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

37) Which of the following statements is NOT correct with regard to a perched water table?

(GATE GG 2010)

a) It is within an area where a local aquiclude occurs within a larger aquifer
b) It lies above the main water table
c) It is found in the main zone of saturation
d) It is occasionally associated with springs

38) The spatial resolution of IRS LISS-III multi-spectral sensor for Near Infra-Red (NIR) band is

(GATE GG 2010)

a) $5.8\text{m} \times 5.8\text{m}$
b) $23.5\text{m} \times 23.5\text{m}$
c) $70\text{m} \times 70\text{m}$
d) $72.5\text{m} \times 72.5\text{m}$

39) Which of the following combinations of extinction events and extinct organisms is NOT correct?

(GATE GG 2010)

a) Cretaceous end Dinosaurs
b) Triassic end-Conodonts
c) Permian end - Trilobites
d) Miocene end - Ammonites

40) In India, marine fossili ferous rocks of lower Paleozoic age are mainly found in the
(GATE GG 2010)

a) Gondwana
b) Higher Himalaya
c) Outer Himalaya
d) Tethys Himalaya

41) Which of the following pairs of rock formations and characteristic fossils is correct?
(GATE GG 2010)

a) Raniganj-*Elephas*
b) Pinjor-*Titanosaurus*
c) Lameta-*Glossopteris*
d) Subathu-*Nummulites*

42) Which of the following groups of rock formations is NOT arranged from older to younger?
(GATE GG 2010)

a) Uttatur Trichinopoly Ariyalur - Niniyur
b) Paicham-Katrol-Chari - Urmia
c) Talchir-Damuda Panchet - Mahadev
d) Semri-Kaimur-Rewa-Bhander

43) Choose the correct combination of geological agents and associated features
(GATE GG 2010)

a) River - Spit
b) Glacier Yardang
c) Longshore current - Esker
d) Wind-Ventifact

44) A sedimentary sequence dominated by large scale (5-10 m thick) cross beds, well-sorted and well-rounded quartz-rich sand with no fine matrix is most likely to be a
(GATE GG 2010)

a) deltaic deposit
b) lagoonal deposit
c) colian deposit
d) outer shelf deposit

45) An invertebrate in which the plane of symmetry bisects the shell through the mid-point of the hinge is a
(GATE GG 2010)

a) Pelecypod
b) Brachiopod
c) Gastropod
d) Caphalopod

46) The oldest mamals and birds are known ,respectively from,
(GATE GG 2010)

a) Creataceous and paleocene
b) Silurian and Devonian
c) Triassic and Jurassic
d) Oligocene and Miocene

47) Allochems in a limestone consist of
(GATE GG 2010)

a) micrite only
b) spar only
c) ooids only
d) bioclasts and ooids

Common Data Questions

Common Data Questions 48 and 49
The following geological map exposes three beds, of which the bed P is the oldest and the bed R the youngest.
(GATE GG 2010)

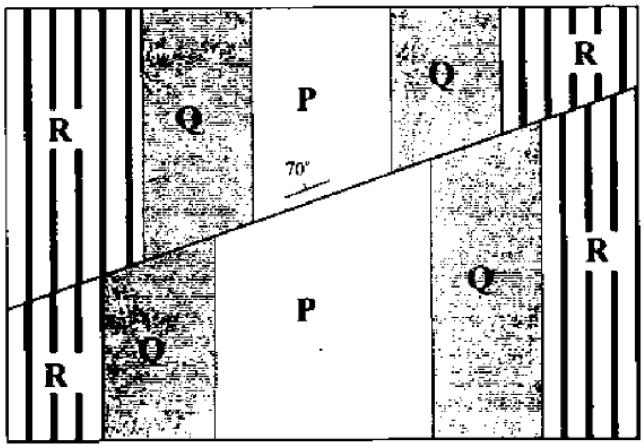

Fig. 2

48) What type of structure does the map depict?

(GATE GG 2010)

a) Faulted anticline
b) Folded strike-slip fault
c) Faulted syncline
d) Folded normal fault

49) Why is bed P wider in the area south of fault?

(GATE GG 2010)

a) Erosion has removed most of bed P to the north of fault
b) Folding has caused thinning of bed P to the north of fault
c) Deeper level of bed P is exposed due to faulting and erosion to the south of fault
d) Bed P had a variable thickness prior to faulting

Common Data Questions 50 and 51

A sequence of shale and limestone is intruded by an igneous pluton. Metasomatic interaction between the pluton and the country rocks involves introduction of Si and Al isto dolomitic limestone.

50) Which pair of rock types best describes the products of metamorphism in the contact aureole?

(GATE GG 2025)

a) Slate and schist
b) Schist and skarn
c) Schist and bornfels
d) Hornfels and skarn

51) The mineral which is NOT expected in assemblages in the metamorphosed dolomitic limestone is

(GATE GG 2010)

a) coarse
b) anorthite
c) diopside
d) andalusite

Linked Answer Questions

statement for Linked Answer Questions 52 and 53:

A pluton of iron-poor basic magma containing trace concentrations of Ni, Rb, Sr and V undergoes crystallization upon cooling

52) The first mineral to crystallize will be

(GATE GG 2010)

a) augite
b) hornblende
c) olivine
d) oligoclase

53) The trace element that will be preferentially incorporated in the correct mineral in Q. 52 is

(GATE GG 2010)

a) Ni
b) Rb
c) Sr
d) V

Linked Answer Questions 54 and 55:

54) Silica-undersaturated minerals are

(GATE GG 2010)

a) nepheline and albite
b) olivine and enstatite
c) leucite and orthoclase
d) olivine and leucite

55) The Hermann-Mauguin symbols of crystallographic notation for the correct minerals in Q. 54 are

(GATE GG 2010)

a) 2/m2/m2/m and 4/m
b) 2/m2/m2/m for both
c) 4/m and 2/m
d) 6 and I

END OF SECTION 1 OF PART B

PART B (SECTION 2): FOR GEOPHYSICS CANDIDATES ONLY

26) The gravity value measured at the base of a 10 m tall building is 40 mGal. The value at the top of the building ignoring its mass is close to

(GATE GG 2010)

a) 20 mGal
b) 37 mGal
c) 40 mGal
d) 43 mGal

27) Upward continuation technique filters their wavelength anomalies and amplitudes.

(GATE GG 2010)

a) short. reduces
b) long, enhances
c) long, reduces
d) short, enhances

28) The relative intensities of induced and remanent magnetization are commonly expressed in terms of

(GATE GG 2010)

a) susceptibility
b) gyromagnetic ratio
c) Poisson's ratio
d) konigsberg ratio

29) In electrical resistivity method, which among the following is correct with reference to Geometric Factor(GF)?

(GATE GG 2010)

a) varies for profiling and remains constant for sounding
b) GF remains constant for both profiling and sounding
c) GF remains constant for profiling and varies for sounding
d) GF varies for both profiling and sounding

30) If in a magnetic dipole $'m'$ represents poles of equal strength and $'l'$ represents the distance between the two poles, then the magnetic moment of dipole is

(GATE GG 2010)

a) lm
b) $\frac{l}{m}$
c) $2lm$
d) $\frac{lm}{2}$

31) Energy in radioactive decay with respect to time follows

(GATE GG 2010)

a) normal distribution
b) Poisson distribution
c) chi-squared distribution
d) binomial distribution

32) The logging technique that uses non-conductive drilling fluids is

(GATE GG 2010)

a) SP logging
b) Resistivity logging
c) Induction logging
d) Radiometric logging

33) Unguided random-walk inversion technique signifies

(GATE GG 2010)

a) Genetic algorithm
b) Simulated annealing
c) Monte Carlo inversion
d) Metropolis algorithm

34) The compressional wave velocity Vp within a solid with adiabatic bulk modulus Kγ rigidity modulus G and density ρ is given by

(GATE GG 2010)

a) $\mathrm{v}p = \sqrt{\frac{k\gamma+(5/3)G}{\rho}}$
b) $\mathrm{v}p = \sqrt{\frac{k\gamma+(2/3)G}{\rho}}$
c) $\mathrm{v}p = \sqrt{\frac{k\gamma+(1/3)G}{\rho}}$
d) $\mathrm{v}p = \sqrt{\frac{k\gamma+(4/3)G}{\rho}}$

35) The number of independent elements of the $4th$ order stiffness tensor required to characterize general elastic media is

(GATE GG 2010)

a) 2 b) 21 c) 36 d) 81

36) The seismic energy released in an earthquake of magnitude Ms = 7.0 is about _ times that released in an earthquake of Ms = 6.0. times that

(GATE GG 2010)

a) 10 b) 32 c) 64 d) 100

37) In the figure given below "-" represents dilatation and "+" represents compression. The fault plane solution of an earthquake with strike-slip mechanism is represented by

(GATE GG 2010)

Fig. 3

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

38) The anelastic attenuation of seismic energy depends on

(GATE GG 2010)

a) quality factor
b) particle acceleration
c) stress drop
d) particle velocity

39) The seismic wave travelling in low velocity layer and critically incident at the discontinuity between low and high velocity layers

(GATE GG 2010)

a) will be diffracted
b) will be reflected
c) will propagate along the discontinuity
d) will be absorbed

40) An input signal $\{-1, 1, 0, 2\}$, after passing through a delay operator z,will be

(GATE GG 2010)

a) $-z^2 + z^3 + 2z^5$
b) $\{0, -1, 1, 0, 2\}$
c) $\{0, 2, 0, 1, -1\}$
d) $-z + z^2 + 2z^4$

41) If m represents the number of model parameters, d the number of data points and p the rank of matrix to be inverted, then which of the following defines an underdetermined system? (GATE GG 2010)

a) m <d and p= d
b) m>d and p=d
c) m=d and p=d
d) m<d and p≠d

42) A unit amplitude of an electromagnetic wave at thrice the skin-depth will be reduced to

(GATE GG 2010)

a) $-3e$ b) $\frac{3}{e}$ c) $\frac{e}{3}$ d) e^{-3}

43) The Hilbert transform of a function $f(t)$ is denoted by H$(f(t))$. If $f(t)=\sin t$, then H$\{H(f(t))\}$ is

(GATE GG 2010)

a) $-\sin t$ b) $-\cos t$ c) $\sin t$ d) $\cos t$

44) The rectangular function $\pi(t)$ is defined as $\pi(t)= 1 \quad |t| \leq \frac{1}{2}$
$= 0 \quad |t| > \frac{1}{2}$

The convolution of $\pi(t)$ with itself will be

(GATE GG 2010)

a) a triangular function $\triangle(t)$
b) again $\pi(t)$
c) a unit-step function u(t)
d) a delta function $\delta(t)$

45) Given A= $e^{-y}\left(\cos x a_x - \sin x a_y\right)$,where a_x and a_y denote the unit vectors in x-,y- directions respectively.Then $\nabla \cdot (\nabla \times A)$ =

(GATE GG 2010)

a) e^{-y} b) 0 c) $e^{-y}\cos x$ d) $e^{-y}\sin x$

46) Match the items in Group I with those in Group II.

(GATE GG 2010)

Group I	**Group II**
P. convolution in time domain	1. $\frac{1}{2\triangle t}$
Q. Nyquist frequency	2. Flat spectrum
R. Aliasing	3. Multiplication in frequency domain
S. White noise	4. Frequency folding
	5. Autocorrelation function

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

47) In magnetic materials, the relation between magnetic permeability μ and susceptibility K (in Sl units) is

(GATE GG 2010)

a) $\mu = 1/k$
b) $\mu 1 - k$
c) $\mu = 1 + k$
d) $\mu = 1 - 2\pi k$

Common Data Questions
Common Data Questions 48 and 49

The terrain correction in gravity method accounts for topographic relief in the vicinity of the observation point. The Bouguer slab assumes the topography around the observation point to be flat. In the figure below, the Bouguer slab thickness is and the hollow portion P lies within the Bouguer slab. Q and R are parts of the topography.

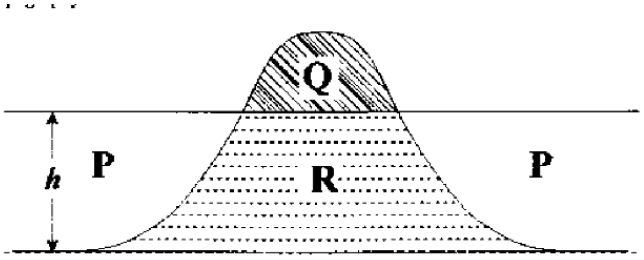

Fig. 4

48) In the region P, the terrain correction is

(GATE GG 2010)

a) half of that in R
b) negative
c) zero
d) positive

49) In the region Q, the terrain correction is required to account for

(GATE GG 2010)

a) hollow portion P
b) reduced gravity due to excess mass in portion Q
c) increased gravity due to excess mass in portion Q
d) over-correction of Bouguer slab

Common Data for Questions 50 and 51: For an input x_n the output of a digital filter y_n is given by $y_n = 1.5x_n - 2x_{n-1} + 2.5y_{n-2}$

50) The order of the digital filter is

(GATE GG 2010)

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

51) The transfer function of the digital filter is

(GATE GG 2010)

a) $\frac{y_n}{x_n} = \frac{1.5-2z}{1-2.5z}$
b) $\frac{y_n}{x_n} = \frac{1.5-2z}{1-2.5z^2}$
c) $\frac{y_n}{x_n} = \frac{1-2.5z^2}{1.5-2z}$
d) $\frac{y_n}{x_n} = \frac{1.5-2z}{1+2.5z^2}$

Linked Answer Questions Statement for Linked Answer Questions 52 and 53: In a two-layer earth model, the values of seismic velocity and density of first and second layers, respectively, are Vρ1 = 4000m/s.ρ1 = 2500kg/m^3,and Vρ2 = 4500m/s.ρ2 = 2600kg/m^3.

52) The acoustic impedance of the first layer in SI units at normal incidence is

(GATE GG 2010)

a) 10^3 b) 10^4 c) 10^5 d) 10^7

53) he transmission coefficient for a wave at normal incidence at the boundary of first and second layer is

(GATE GG 2010)

a) 0.46 b) 0.58 c) 0.92 d) 1.07

Statement for Linked Answer Questions 54 and 55:
Consider a magnetotelluric (MT) field set up. A plane electromagnetic wave with a time dependence factor $e^{(-i\omega t)}$ is travelling vertically downwards (z-direction) into the Earth with an angular frequency ω The electric field is polarized in the x-direction (strike).

54) The electromagnetic field components considered in this mode are

(GATE GG 2010)

a) E_x, H_x, H_z b) E_z, H_x, H_z c) E_x, H_x, E_z d) E_z, H_x, H_z

55) Which of the following equations represents the above mode?

(GATE GG 2010)

a) $E_z = \frac{-1}{i\omega t}\frac{\partial H_z}{\partial z}$ b) $H_x = \frac{-1}{i\omega t}\frac{\partial E_z}{\partial z}$ c) $H_x = \frac{-1}{i\omega t}\frac{\partial E_x}{\partial z}$ d) $H_z = \frac{-1}{i\omega t}\frac{\partial E_x}{\partial z}$

END OF SECTION 2 OF PART B

General Aptitude (GA) Questions

56) His rather casual remarks on politics his lack of seriousness about the subject.

(GATE GG 2010)

a) masked
b) belied
c) betrayed
d) suppressed

57) Which of the following options is the closest in meaning to the word below:
Circuitous

(GATE GG 2010)

a) cyclic
b) indirect
c) confusing
d) crooked

58) If we manage to our children. our natural resources, we would leave a better planet for

(GATE GG 2010)

a) uphold
b) restrain
c) cherish
d) preserves

59) 25 persons are in a room. 15 of them play hockey, 17 of them play football and 10 of them play both hockey and football. Then the number of persons playing neither hockey nor football is:

(GATE GG 2010)

a) 2 b) 17 c) 13 d) 3

60) The question below consists of a pair of related words followed by four pairs of words. Select the pair that best expresses the relation in the original pair. **Unemployed: Worker**

(GATE GG 2010)

a) fallow: land
b) unaware: sleeper
c) wit: jester
d) renovated: house

61) If 137 + 276 = 435 how much is 731 + 672?

(GATE GG 2010)

a) 534 b) 1403 c) 1623 d) 1513

62) Hari (H), Gita (G), Irfan (I) and Saira (S) are siblings ($i.e. brothers and sisters$). All were born on 1^{st} January. The age difference between any two successive siblings (that is born one after another) is less than 3 years. Given the following facts:
i. Hari's age+ Gita's age > Irfan's age + Saira's age.
ii. The age difference between Gita and Saira is I year. However, Gita is not the oldest and Saira is not the youngest.
iii. There are no twins
In what way they were born($oldest first$)?

(GATE GG 2010)

a) HSIG b) SGHI c) IGSH d) IHSG

63) **Modern warfare has changed from large scale clashes of armies to suppression of civilian populations. Chemical agents that do their work silently appear to be suited to such warfare; and regretfully, there exist people in military establishments who think that chemical agents are useful tools for their cause.** Which of the following statements best sums up the meaning of the above passage:

a) Modern warfare has resulted in civil strife.
b) Chemical agents are useful in modern warfare.
c) Use of chemical agents in warfare would be undesirable.
d) People in military establishments like to use chemical agents in war.

64) 5 skilled workers can build a wall in 20 days: 8 semi-skilled workers can build a wall in 25 days: 10 unskilled workers can build a wall in 30 days. If a team has 2 skilled. 6semi-skilled and 5 unskilled workers, how long will it take to build the wall?

(GATE GG 2010)

a) 20 days b) 18 days c) 16 days d) 15 days

65) Given digits $2, 2, 3, 3, 3, 4, 4, 4, 4$ how many distinct 4 digit numbers greater than 3000 can be formed?

(GATE GG 2010)

a) 50 b) 51 c) 52 d) 53

END OF THE QUESTION PAPER