**A**
**SET**

**Booklet No. :**

# GG - 15

# Geo Engineering & Geo Informatics

**Duration of Test : 2 Hours** **Max. Marks : 120**

**Hall Ticket No.** | | | | | | | | |

**Name of the Candidate :** _____

**Date of Examination :** _____ **OMR Answer Sheet No. :** _____

_____ _____

**Signature of the Candidate** **Signature of the Invigilator**

## INSTRUCTIONS

1. This Question Booklet consists of **120** multiple choice objective type questions to be answered in **120** minutes.
2. Every question in this booklet has 4 choices marked (A), (B), (C) and (D) for its answer.
3. Each question carries **one** mark. There are no negative marks for wrong answers.
4. This Booklet consists of **16** pages. Any discrepancy or any defect is found, the same may be informed to the Invigilator for replacement of Booklet.
5. Answer all the questions on the OMR Answer Sheet using **Blue/Black ball point pen only.**
6. Before answering the questions on the OMR Answer Sheet, please read the instructions printed on the OMR sheet carefully.
7. OMR Answer Sheet should be handed over to the Invigilator before leaving the Examination Hall.
8. Calculators, Pagers, Mobile Phones, etc., are not allowed into the Examination Hall.
9. No part of the Booklet should be detached under any circumstances.
10. The seal of the Booklet should be opened only after signal/bell is given.

## GEO ENGINEERING & GEO INFORMATICS

**1.** The solution of the equations $x+3y+2z=0$, $x+4y+3z=0$ and $x+5y+4z=0$

(A) $x=y=1, z=-1$ (B) $x=z=1, y=-1$

(C) $y=z=1, x=-1$ (D) none

**2.** The eigen values of an orthogonal matrix are

(A) 0 (B) 1

(C) either -1 or +1 (D) neither 0 nor 1

**3.** If $x=r\cos\theta$ and $y=r\sin\theta$ then $\dfrac{\partial(x,y)}{\partial(r,\theta)}=$

(A) 0 (B) r (C) 1 (D) none

**4.** If $\phi$ is any scalar function then $\nabla\phi$ is

(A) solenoidal (B) irrotational (C) zero (D) a scalar

**5.** If $u(x,y)=\dfrac{x^2y^2}{x^2+y^2}$ then $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}$ is equal to

(A) $2u$ (B) $4u$ (C) $\dfrac{1}{2}u$ (D) $\dfrac{1}{4}u$

**6.** The real and imaginary parts of a complex analytic function are called

(A) even functions (B) odd functions

(C) none of these (D) harmonics

**7.** A complex function $f(z)=u(x,y)+iv(x,y)$ is analytic then

(A) $\dfrac{\partial u}{\partial y}=-\dfrac{\partial v}{\partial x}$ (B) $\dfrac{\partial u}{\partial x}=0$

(C) $\dfrac{\partial u}{\partial y}=\dfrac{\partial v}{\partial x}$ (D) $\dfrac{\partial u}{\partial y}=0$

**8.** If the mean and variance of a binomial distributed random variable are 4 and 3 respectively then the probability distribution is

(A) $C_x^8(1/4)^x(3/4)^{8-x}$ (B) $C_x^8(1/3)^x(2/3)^{8-x}$

(C) $C_x^{16}(1/4)^x(3/4)^{16-x}$ (D) None

**9.** If the number of road accidents during the peak period of a day follow Poisson distribution with 2 accidents on an average, the probability that on a given day there will be atleast one accident is

(A) $\frac{e^{-2}2}{1!}$ (B) $1+\frac{e^{-2}2}{1!}$ (C) $1-e^{-2}$ (D) None

**10.** The variance of a standard normal distribution $\frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}z^2}$ is

(A) 1 (B) 0 (C) 0.5 (D) $\frac{1}{\sqrt{2\pi}}$

**11.** The shape of the earth is

(A) Sphere (B) Ellipse (C) Spheroid (D) Circular

**12.** The densest central part of the earth which is composed of the inner and outer cores is known as

(A) Hydrosphere (B) Asthemosphere
(C) Lithosphere (D) Barysphere

**13.** The diameter at equator of the earth is

(A) 12713 km (B) 12756 km (C) 6357 km (D) 6371 km

**14.** Mass Density of the whole earth is

(A) 1.03 g/cm$^3$ (B) 2.8 g/cm$^3$ (C) 10.72 g/cm$^3$ (D) 5.52 g/cm$^3$

**15.** Isostasy refers to

(A) Gravitational equilibrium (B) Continental drift
(C) Plate tectonics (D) Volcanic activity

**16.** Which of the following explains the hypothesis of sea floor spreading ?

(A) Earth quakes (B) Thermal convection
(C) Tsunami (D) Gravitation

**17.** The movement of the continents relative to one another is termed

(A) Plate tectonics (B) Diastrophism
(C) Continental drift (D) Seafloor spreading

**18.** The estimate of reasonably reliable age of the earth is based on

(A) Gradual development of earth features
(B) Normal processes of sedimentation
(C) Evolutionary sequence indicated by fossils
(D) Radiometric datings

**19.** An ice sheet that covers mountains and plains of large section of continent is called

(A) Continental Glacier (B) Composite glacier

(C) Calving (D) Cirque

**20.** The causes for cyclonic storm wind circulation to be counter clockwise in the Northern hemisphere and clockwise in the Southern hemisphere is due to

(A) Deflation (B) Bore (C) Gravitation (D) Coriolis effect

**21.** Name the location where the highest seamount is found

(A) Esperance, Australia (B) West coast of India

(C) Tonga trench, New Zealand (D) Near Andaman island

**22.** Vast plains form deep layer of sediment lying 3500 m below sea level

(A) Submarine canyon (B) Abyssal plain

(C) Guyot (D) Trench

**23.** The study of regular pattern of faces and angles between the faces and of the internal structure of the mineral to which it is related, is called

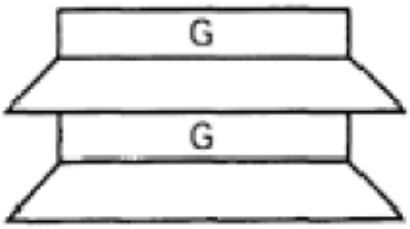
(A) Crystallography (B) Twinning

(C) Tenacity (D) Palaeontology

**24.** The _____ is the colour of the powdered mineral which is most readily seen by scraping the mineral across a plate of unglazed hard porcelain.

(A) Streak (B) Tenacity (C) Cleavage (D) lustre

**25.** The following is a symbolic structure for the clay minerals and its representing structure of




(A) Kaolin (B) Serpentine (C) Illite (D) Montmorillonite

**26.** The relative hardness (H) of quartz as per the arbitrary scale of ten standard minerals, arranged in Mohs' scale of hardness is

(A) 1 (B) 4 (C) 7 (D) 10

**27.** The term reniform used to describe crystal habit means

(A) kidney shaped (B) broad, flat crystal

(C) bunch of grapes (D) long crystals—like fibres

**28.** Minerals with specific gravities between 4.5 and 7.5 include

(A) native metallic elements such as pure copper, gold and silver.

(B) metallic ores such as sulphides and oxides

(C) silicates and carbonates

(D) sulphates and halides

**29.** The dominant agent in dynamic metamorphism is

(A) increased stress

(B) increased temperature

(C) increased temperature or pressure

(D) both, increased temperature and pressure

**30.** Grain size of gneiss is

(A) fine to medium grained (B) fine grained

(C) medium to coarse grained (D) medium grained

**31.** Sum of specific yield and specific retention is equal to

(A) Permeability (B) Hydraulic gradient

(C) Porosity (D) Hydraulic conductivity

**32.** Rocks that are formed by the accumulation and compaction of fragments from pre-existing rocks which have been disintegrated by erosion are called

(A) Igneous rocks (B) Metamorphic rocks

(C) Extrusive rocks (D) Sedimentary rocks

**33.** What are spectral bands useful for rock type mapping ?

(A) Visible and short wave infrared bands

(B) Thermal infrared data

(C) Radar data

(D) Near infrared data

**34.** The type of rock which can be readily identified in Arial photography

(A) Sedimentary rock (B) Igneous rock

(C) Metamorphic rock (D) Lime stone

**35.** Which of the following is more strong and impervious ?

(A) Granite (B) Mica schist's

(C) Lime stones (D) Shale

**36.** The angle between two plane mirrors of an optical square is

(A) 30° (B) 60° (C) 45° (D) 90°

**37.** Reciprocal ranging is adopted when the following is encountered

(A) a dense forest (B) a hillock (C) a river (D) a tall building

**38.** An instrument used for measuring the angle of a slope is

(A) Planimeter (B) Clinometer

(C) Tacheometer (D) Omnimeter

**39.** The instrument used to reproduce plans to a different scale is called

(A) Planimeter (B) Clinometer (C) Ghat tracer (D) Pantograph

**40.** The method which is most commonly used in triangulation survey

(A) Repetition (B) Reiteration

(C) Both A and B (D) None

**41.** The contours which are parallel and equidistant of an area, then that area should be

(A) Flat (B) Steep slope (C) Gentle slope (D) Uniform slope.

**42.** The most rapid method of orientation by the three-point method of plane tabling is the

(A) Tracing paper method (B) Graphical method

(C) Trial and error method (D) Both A and B

**43.** Geodetic surveying is different from plane surveying because of

(A) The curvature of the earth

(B) The large difference of elevations between various points

(C) Coverage is large

(D) Undulations of the topography

**44.** If the R.L. of a B.M. is 100.00 m, the back sight is 1.215 m and the foresight is 1.870 m, the R.L. of the forward station is

(A) 99.345 m (B) 100.345 m (C) 100.655 m (D) 101.870 m

**45.** The process of revolving the telescope through 360° about its transverse horizontal axis is known as

(A) Setting (B) Focusing (C) Transiting (D) Centering

**46.** Systematic errors in survey works is known as

(A) Natural errors (B) Personal errors

(C) Compensating errors (D) Cumulative errors

**47.** The ratio of map distance to the corresponding ground distance is called

(A) Graphical scale (B) Engineer's scale

(C) Representative fraction (D) Numerical scale

**48.** Which among the following is large scale map ?

(A) Cadastral map (B) Atlas

(C) Wall map (D) Globe

**49.** SOI Toposheets are of _____ map projection.

(A) Conic (B) Polyconic (C) UTM (D) Cylindrical

**50.** Spatial relationships between features is called

(A) Topology (B) Topography

(C) Photo-geology (D) DEM

**51.** Triangulated Irregular Network is

(A) Land use / land cover classification

(B) Consists of elevation data with x, y coordinates

(C) Vector model of elevation

(D) Steroscopic view of an image

**52.** The process of filling each cell of a new grid with the value of the corresponding cell or cells in an original grid is termed as

(A) Resampling (B) Affine

(C) Rubber sheeting (D) Stretching

**53.** Relational database is

(A) A database that is organized at different levels and uses the one-to-many association between levels.

(B) A database that contains all data in a large table.

(C) A database that consists of a collection of tables and uses keys to connect the tables.

(D) A database that is based on the built-in-connections across tables.

**54.** Conformal Projection is

(A) One type of map projection that uses a cylinder as the projection surface.

(B) One type of map projection that uses a polyconic as the projection surface.

(C) One type of map projection that preserves local shapes.

(D) One type of map projection that retains certain accurate directions. It uses a plane as the projection surface.

**55.** Contour interval is equal to

(A) the value of a contour

(B) difference of value between consecutive contours

(C) horizontal shortest distance between consecutive contours

(D) slope of the contour line

**56.** Flow direction grid is

(A) the directional measure of slope

(B) the vertical distance between contour lines

(C) a graphic method which simulates how the land surface looks with the interaction between sunlight and landform features.

(D) that shows the direction that water will flow out of each cell of a DEM.

**57.** A map projection preserves the following

(A) Area (B) Shape

(C) Direction (D) One of the above

**58.** The instrument for plotting planimetry is

(A) Digital photogrammetry (B) Theodolite

(C) Stereometer (D) Altimeter

**59.** Buffering in GIS analysis refers to

(A) An overlay method that preserves only those features that fall within the area extent common to the input and overlay maps.

(B) A GIS operation, in which each point of a point map is assigned attribute data of the polygon within which it falls.

(C) A GIS operation in which areas that are within a specified distance of selected map features are separated from areas that are beyond.

(D) A polygon –on-polygon overlay method that preserves all features from the input and overlay maps extent defined by the input map

**60.** If 'f' is the focal length of an Aerial camera lens and 'H' is the flying height above the mean terrain then f/H is equal to

(A) Tilt (B) Relief

(C) Vertical exaggeration (D) Scale

**61.** _____ measures (in geometric transformation) the deviation between the actual location and the estimated location of the tie (control) points.

(A) Mean (B) Mode

(C) Root Mean Square (RMS) (D) Chi square

**62.** Slivers defined as

(A) Overshoot arcs

(B) Undershoot arcs

(C) Very small polygons found along the shared boundary of the two input maps in map overlay, often resulted from digitizing

(D) A polygon –on-polygon overlay method that preserves all features from the input and overlay maps

**63.** Hill shade or Shaded relief or shading is

(A) The directional measure of slope

(B) The vertical distance between contour lines

(C) A graphic method which simulates how the land surface looks with the interaction between sunlight and landform features.

(D) A grid that shows the direction water will flow out of each cell of a DEM.

**64.** The raster data analysis operation that involves a focus cell and a set of its surrounding cells

(A) Band ratioing (B) NDVI

(C) Neighbourhood operation (D) Classification

**65.** Geo-referencing is

(A) The process of filling each cell of a new grid with the value of the corresponding cell or cells in an original grid

(B) The process of using a set of control points to convert images from image coordinates to real–world coordinates

(C) Selecting Bench Mark

(D) Referring to astronomical survey

**66.** Flat file is defined as

(A) A database that is organized at different levels and uses the one-to-many association between levels

(B) A database that contains all data in a large table

(C) A database that consists of a collection of tables and uses keys to connect the tables

(D) A database that is based on the built-in-connections across tables

**67.** The Scattering process which explains about blue sky, red sunset etc. is known as

(A) Rayleigh (B) Mie (C) Non-selective (D) Selective

**68.** Atmospheric windows are present in

(A) only visible part

(B) visible part and infrared regions of EM spectrum

(C) only infrared regions of EM spectrum

(D) Ultraviolet region

**69.** The average spectrum reflectance values of an object observed for distinct wavelength bands will indicate

(A) Mean spectral reflectance (B) Spectral characteristics

(C) Spectral signature (D) Spectroradiation

**70.** Thermal IR imagery is usually obtained in the wavelength regions of

(A) less than 0.7 micrometre (B) 3 to 5.5 and 8 to 14 micrometre

(C) 3 to 35 micrometre (D) above 35 micrometre

**71.** At Nadir point, geometrical distortion is

(A) zero (B) highest

(C) average (D) varies with focal length of camera lens

**72.** For a stereoscopic coverage, Aerial photography is normally flown with

(A) 25% forward slope and 60% side lap

(B) 30% overlap

(C) 60% forward overlap and 25% side lap

(D) No overlap is required

**73.** Aspect is defined as

(A) The directional measure of slope

(B) The vertical distance between contour lines

(C) A graphic method which simulates how the land surface looks with the interaction between sunlight and landform features.

(D) A grid that shows the direction water will flow out of each cell of a DEM.

**74.** Map overlay is

(A) A distance tolerance used to force points and lines to be snapped together if they fall within the specified distance

(B) A GIS operation that combines the geometry and attributes of two digital maps to create the output

(C) A GIS operation in which areas that are within a specified distance of selected map features are separated from areas that are beyond

(D) An overlay method that preserves only features that fall within the area extent defined by the input map

**75.** The basic assumptions of unit hydrograph theory are

(A) Linear response and non linear time variance

(B) Linear response and time variance

(C) Non-linear response and time variance

(D) Linear response and linear time variance

**76.** Specific capacity of a confined well under equilibrium conditions and within the working limits of drawdown

(A) Is constant at all drawdowns

(B) Decrease with the increasing drawdown

(C) Increases with drawdown

(D) Increases with decreasing drawdown

**77.** For unconfined aquifers, the storage coefficient

(A) Is essentially same as the specific yield

(B) Is essentially same as the specific retention

(C) Is essentially same as the porosity

(D) Doesn't exist

**78.** A 6 hour storm had 6 cm of rainfall and 3 cm of runoff. If the infiltration index ($\varphi$) remains at the same value, a rainfall excess 12 cm in a 15 hour storm produces a runoff in this catchment of

(A) 3 cm (B) 4.5 cm (C) 6 cm (D) 7.5 cm

**79.** The rain gauge station density as per BIS recommendation for plains is approximately equal to one station per _____ sq.km.

(A) 130 (B) 260 (C) 390 (D) 520

**80.** The recording type rain-gauge gives

(A) Mass curve of rainfall (B) Rainfall per second

(C) Total rainfall of 24 hours period (D) Hourly rainfall

**81.** The hyetograph is related to

(A) Runoff curve

(B) Hourly rainfall of a storm

(C) Line joining points of equal rainfall

(D) Hydrograph

**82.** Time taken for the runoff to be equal to rainfall in urban catchments is known as

(A) Basin time lag (B) Rainfall duration

(C) Equilibrium time (D) Peak flood time

**83.** The best method of estimating runoff is

(A) Unit Hydrograph (B) Runoff-Coefficient Method

(C) Rational formula (D) Infiltration index method

**84.** If K is permeability coefficient and d is depth of aquifer, the transmissibility coefficient is equal to

(A) d/K (B) K/d (C) K+d (D) K∗d

**85.** The amount of water in soil mass not useful to plant's growth is

(A) Available moisture (B) Readily available moisture

(C) Hygroscopic water (D) Capillary moisture

**86.** The capillary fringe is

(A) Above the channel bed (B) Below HFL

(C) Below water table (D) Above water table

**87.** The permeability coefficient of an aquifer can be determined by

(A) Pumping test (B) Soil test

(C) Topographical surveying (D) All the above

**88.** In Duipt's theory, the assumption made that the aquifer is

(A) Unconfined (B) Confined (C) Isotropic (D) Anisotropic

**89.** The cone of depression is related to

(A) Reservoir (B) River intake (C) Aquifer (D) Hydrograph

**90.** The drawdown is increasing towards

(A) Nearest observation well (B) Testing well

(C) Farthest observation well (D) Spring

**91.** The solid part of the earth's crust is known as

(A) Atmosphere (B) Hydrosphere (C) Lithosphere (D) Biosphere

**92.** Blue Planet is the name given to the earth due to the presence of

(A) Ice (B) Ocean

(C) Water vapour (D) Ice, water and water vapour

**93.** Which of the following refers to life zone on earth ?

(A) Hydrosphere (B) Biosphere (C) Atmosphere (D) Lithosphere

**94.** Which of the following is not an abiotic component of earth's environment ?

(A) Soil (B) Calcium (C) Humus (D) Microbes

**95.** Which of the following depends on autotrophs for both energy and raw materials to make complex organic molecules ?

(A) Fungi and Bacteria (B) Bacteria and Protozoa

(C) Only Bacteria (D) Fungi, Bacteria and Protozoa

**96.** Which of the following are consumers ?

(A) Herbivores (B) Carnivores

(C) Decomposers (D) All the above

**97.** Now-a-days, to monitor and control the environment pollution, an increasing threat to be considered is

(A) Ozone layer depletion (B) Global warming

(C) Air pollution (D) Water pollution

**98.** World environment day is observed on

(A) 1$^{st}$ December (B) 5$^{th}$ June (C) 17$^{th}$ July (D) 22$^{nd}$ September

**99.** The biotic components of environment are

(A) Autotrophs (B) Heterotrophs

(C) Autotrophs and Heterotrophs (D) Petrophs

**100.** The optimum moisture content for clay will be

(A) 14-20% (B) 12-16% (C) 8-12% (D) 6-10%

**101.** The void ratio of a soil sample is 0.5, then porosity of the sample is

(A) 0.5 (B) 1.0 (C) 0.33 (D) 0.25

**102.** The swelling nature of black cotton soil is primarily due to the presence of

(A) Kaolinite (B) Illite

(C) Montmorillonite (D) Vermiculite

**103.** The liquid limit and plastic limit of a soil sample is 45% and 25% respectively. In the liquid limit test of the soil sample, its water content varied from 5% to 25%. When the number of blows increased from 10 to 100, the toughness index of the soil is

(A) 1.0 (B) 0.75 (C) 0.50 (D) 2.0

**104.** The useful moisture of a soil is equal to its

(A) Field capacity

(B) Saturation capacity

(C) Moisture content at permanent wilting point

(D) Difference between field capacity and permanent wilting point within the root zone of plants

**105.** Texture of a soil is largely reflected by the particle

(A) Size (B) Shape

(C) Size and Shape (D) Size, Shape and Gradation

**106.** The Critical void ratio is the void ratio at which volume change is

(A) Constant (B) Zero (C) Maximum (D) Minimum

**107.** The optimum moisture content is the water content at which the dry density is

(A) Zero (B) Minimum (C) Constant (D) Maximum

**108.** During liquefaction, soil will have

(A) Gain of shear strength (B) Loss of shear strength

(C) Erosion (D) Sedimentation

**109.** Soils that are formed by disintegration of rocks in place under various actions are known as

(A) Residual soils (B) Alluvial soils

(C) Aeolian soils (D) Colluvial soils

**110.** According to Darcy's law, as porosity (n) of soil sample increases, the seepage velocity ($V_s$)

(A) increases (B) constant

(C) decreases (D) independent of porosity

**111.** The function that defines the entry point and exit point of a C program is

(A) printf (B) scanf (C) main( ) (D) float c

**112.** In C, 'for', 'while', 'do-while' are types of

(A) Errors (B) Loops (C) Data types (D) Library functions

**113.** A collection of similar elements stored in adjacent locations are called

(A) Functions (B) Structures (C) Arrays (D) Pointers

**114.** The structure elements are accessed using _____ operator.

(A) (.) Dot operator (B) (? :) Conditional operator

(C) (!) OR operator (D) (&) AND operator

**115.** Which of the following is a decision control structure ?

(A) scanf (B) else (C) char (D) switch-case

**116.** Which of the following is not a type of storage class in C ?

(A) stack (B) register (C) extern (D) auto

**117.** A pointer is generally notated as

(A) a[ ] (B) *a (C) &a (D) %a

**118.** int, char and float are

(A) Library functions (B) Loops

(C) Operators (D) Data types

**119.** Which of the following is not a library function ?

(A) clrscr( ) (B) add(a,b) (C) getch( ) (D) scanf( )

**120.** Fuzzy tolerance

(A) Distance tolerance used to force points and lines to be snapped together if they fall within the specified distance.

(B) A GIS operation that combines the geometry and attributes of two digital maps to create the output.

(C) Very small polygons found along the shared boundary of the two input maps in map overlay, often resulted from digitizing.

(D) An overlay method that preserves only features that fall within the area extent defined by the input map.

**SPACE FOR ROUGH WORK**