GATE 2022 General Aptitude
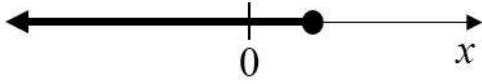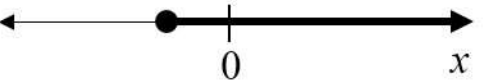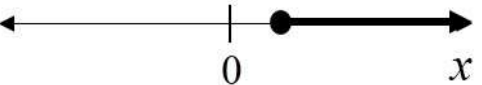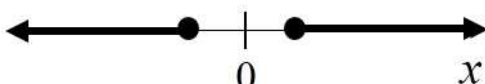
Q.1 – Q.5 Carry ONE mark each.

Q.1	Writing too many things on the _____ while teaching could make the students get _____.
(A)	bored / board
(B)	board / bored
(C)	board / board
(D)	bored / bored
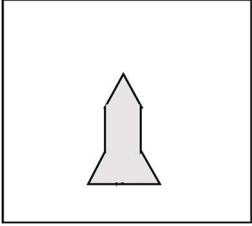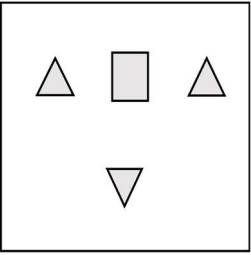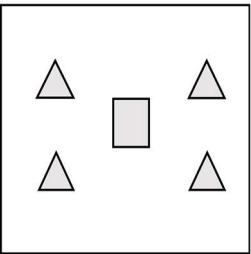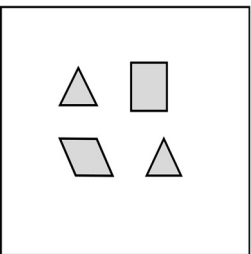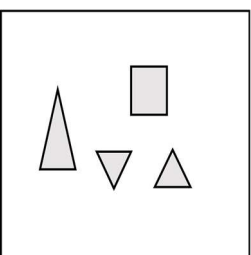
Q.2	Which one of the following is a representation (not to scale and in bold) of all values of x satisfying the inequality $2 - 5x \leq -\dfrac{6x-5}{3}$ on the real number line?
(A)	
(B)	
(C)	
(D)	

Q.3	If $f(x) = 2\ln\left(\sqrt{e^x}\right)$, what is the area bounded by $f(x)$ for the interval $[0, 2]$ on the x-axis?
(A)	$\dfrac{1}{2}$
(B)	1
(C)	2
(D)	4

Q.4	A person was born on the fifth Monday of February in a particular year.
	Which one of the following statements is correct based on the above information?
(A)	The 2nd February of that year is a Tuesday
(B)	There will be five Sundays in the month of February in that year
(C)	The 1st February of that year is a Sunday
(D)	All Mondays of February in that year have even dates

Q.5

Which one of the groups given below can be assembled to get the shape that is shown above using each piece only once without overlapping with each other? (rotation and translation operations may be used).

(A)

(B)

(C)

(D)

Q. 6 – Q. 10 Carry TWO marks each.

Q.6	Fish belonging to species S in the deep sea have skins that are extremely black (ultra-black skin). This helps them not only to avoid predators but also sneakily attack their prey. However, having this extra layer of black pigment results in lower collagen on their skin, making their skin more fragile. Which one of the following is the CORRECT logical inference based on the information in the above passage?
(A)	Having ultra-black skin is only advantageous to species S
(B)	Species S with lower collagen in their skin are at an advantage because it helps them avoid predators
(C)	Having ultra-black skin has both advantages and disadvantages to species S
(D)	Having ultra-black skin is only disadvantageous to species S but advantageous only to their predators

Q.7	For the past m days, the average daily production at a company was 100 units per day.
	If today's production of 180 units changes the average to 110 units per day, what is the value of m?
(A)	18
(B)	10
(C)	7
(D)	5

Q.8	Consider the following functions for non-zero positive integers, p and q.
	$f(p,q) = \underbrace{p \times p \times p \times \ldots \ldots \ldots \times p}_{q \text{ terms}} = p^q; \quad f(p,1) = p$
	$g(p,q) = p^{p^{p^{p^{\cdot^{\cdot^{\cdot(\text{up to } q \text{ terms})}}}}}} \qquad ; \quad g(p,1) = p$
	Which one of the following options is correct based on the above?
(A)	$f(2,2) = g(2,2)$
(B)	$f(g(2,2),2) < f(2,g(2,2))$
(C)	$g(2,1) \neq f(2,1)$
(D)	$f(3,2) > g(3,2)$

Q.9	Four cities P, Q, R and S are connected through one-way routes as shown in the figure. The travel time between any two connected cities is one hour. The boxes beside each city name describe the starting time of first train of the day and their frequency of operation. For example, from city P, the first trains of the day start at 8 AM with a frequency of 90 minutes to each of R and S. A person does not spend additional time at any city other than the waiting time for the next connecting train. If the person starts from R at 7 AM and is required to visit S and return to R, what is the minimum time required?
(A)	6 hours 30 minutes
(B)	3 hours 45 minutes
(C)	4 hours 30 minutes
(D)	5 hours 15 minutes
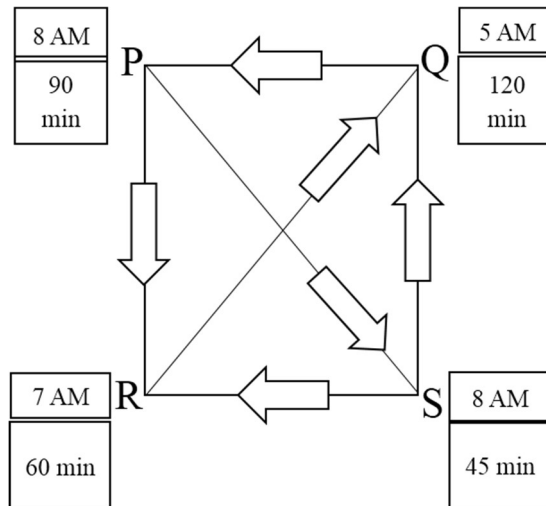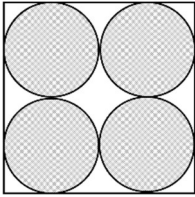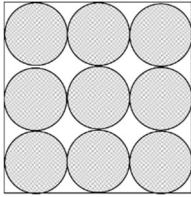
Q.10	Equal sized circular regions are shaded in a square sheet of paper of 1 cm side length. Two cases, case M and case N, are considered as shown in the figures below. In the case M, four circles are shaded in the square sheet and in the case N, nine circles are shaded in the square sheet as shown. What is the ratio of the areas of unshaded regions of case M to that of case N? case M case N
(A)	2 : 3
(B)	1 : 1
(C)	3 : 2
(D)	2 : 1

PART A: Common FOR ALL CANDIDATES

Q.11 – Q .27 Carry ONE mark Each

Q.11	Most probable value of a quantity
(A)	always increases with increase in True value
(B)	always decreases with decrease in True value
(C)	is always equal to True value
(D)	is nearest to True value
Q.12	Two surveyors, **P** and **Q** measured a 20 m distance six times each, as given below (in m): Surveyor **P**: 19.97, 20.02, 20.04, 19.98, 19.96, 20.03 Surveyor **Q**: 20.05, 20.07, 20.05, 20.06, 20.07, 20.07 On the basis of accuracy and precision of the measured values, choose the CORRECT statement.
(A)	Observed values of Surveyor **P** are less precise and observed values of Surveyor **Q** are more accurate.
(B)	Observed values of Surveyor **P** are more precise and observed values of Surveyor **Q** are less accurate.
(C)	Observed values of Surveyor **P** are more accurate and observed values of Surveyor **Q** are more precise.
(D)	Observed values of Surveyor **P** are less accurate and observed values of Surveyor **Q** are less precise.

Q.13	Identify the error, which has all the following characteristics:
	(i) Caused by observer's misunderstanding and carelessness
	(ii) Reading an angle counter-clockwise, but recording it as clockwise angle
	(iii) Sighting the wrong target
	(iv) Poor judgment by the observer
(A)	Mistake
(B)	Cumulative error
(C)	Probable error
(D)	Accidental error
Q.14	Electromagnetic Spectrum can be broadly divided as (in order of increasing wavelength)
(A)	X-rays, Gamma rays, Infrared, Ultraviolet, Visible, Radiowave, Microwave
(B)	Gamma rays, X-rays, Radiowave, Microwave, Ultraviolet, Infrared, Visible
(C)	X-rays, Gamma rays, Microwave, Radiowave, Ultraviolet, Infrared, Visible
(D)	Gamma rays, X-rays, Ultraviolet, Visible, Infrared, Microwave, Radiowave

Q.15	The relationship between wavelength (λ), frequency (ν), and velocity (c) of electromagnetic wave is
(A)	$c = \nu^2 / \lambda$
(B)	$c = \nu / \lambda$
(C)	$c = \nu \lambda$
(D)	$c = \nu \lambda^2$
Q.16	Spectral signature of an object in a satellite image does NOT depend on the
(A)	season of the year
(B)	wavelength of electromagnetic spectrum
(C)	swath width of the satellite
(D)	reflectance value from the object

Q.17	Component of GPS signal that gets deciphered by all types of GPS receivers is
(A)	Coarse-Acquisition code
(B)	Precision code
(C)	Link-1 frequency
(D)	Link-2C frequency
Q.18	For 3D-positioning, Global Navigational Satellite System (GNSS) requires a minimum of _____ satellites.
(A)	3
(B)	4
(C)	5
(D)	2

Q.19	Basic objective of NAVSTAR GPS is to provide services for
(A)	Positioning, Velocity and Timing
(B)	Positioning, Navigation and Timing
(C)	Velocity, Navigation and Timing
(D)	Positioning, Velocity and Navigation
Q.20	A satellite image with 6-bit radiometric resolution has _____ gray levels.
(A)	16
(B)	32
(C)	64
(D)	128

Q.21	Thermal Infrared images are provided by
(A)	LANDSAT MSS and IRS LISS-II sensors
(B)	SPOT and CARTOSAT
(C)	IKONOS and QUICKBIRD
(D)	LANDSAT TM and NOAA AVHRR sensors
Q.22	Which of the following gets mitigated in DGPS positioning?
(A)	Atmospheric error
(B)	Multi-path error
(C)	Cycle-slip error
(D)	Topographic error

Q.23	In GIS database, which type of attribute may be used to represent area?
(A)	Nominal
(B)	Interval
(C)	Ratio
(D)	Ordinal
Q.24	What is attribute uncertainty?
(A)	Error due to imprecision in coordinate registration
(B)	Error due to incorrect labelling or quantification of features
(C)	Error in the source document due to cartographic bias
(D)	Error associated with displacement of the object from its true location

Q.25	In GIS, _____ triangulation is a proximal method that satisfies the requirement that a circle drawn through the three nodes of a triangle contains no other node.
(A)	Dalhousie
(B)	Delaunay
(C)	David
(D)	Davenport
Q.26	In GIS, reclassification is performed to
(A)	group ranges of values into a single value within a data layer
(B)	segment a data layer into multiple data layers
(C)	combine multiple data layers to a single data layer
(D)	classify a data layer using many attributes
Q.27	For the following observation equation $2\alpha = 124° \ 52' \ 22''$ weight 4, the weight of $\left(\frac{\alpha}{3}\right)$ is _____ (*in integer*).

Q.28 – Q .46 Carry TWO marks each

Q.28	Following observation equations are obtained in a survey task.
	$x + y = 3$
	$2x + y = 6$
	$x + 2y = 4$
	Using least square method, the most probable values of x and y will be
(A)	x = 2.10, y = 0.90
(B)	x = 2.64, y = 0.64
(C)	x = 2.51, y = 0.51
(D)	x = 2.75, y = 0.75

Q.29	The internal angles P, Q, R of a triangle are observed in degree minute second (° ′ ″) using a Total Station. The angles along with their probable errors are given below.
	P = 40° 30′ 01″ ± 02″
	Q = 60° 00′ 02″ ± 03″
	R = 79° 30′ 05″ ± 04″
	The corrected values of the angles P, Q and R are
(A)	P = 40° 30′ 01″, Q = 60° 00′ 02″, R = 79° 30′ 05″
(B)	P = 40° 29′ 59.6″, Q = 59° 59′ 59.5″, R = 79° 30′ 0.9″
(C)	P = 40° 29′ 59.9″, Q = 59° 59′ 59.5″, R = 79° 30′ 0.6″
(D)	P = 40° 29′ 59″, Q = 59° 59′ 59″, R = 79° 30′ 02″
Q.30	How many number of cells of a 30 m spatial resolution DEM would be required to cover a 1:50,000 topographic map of Survey of India, assuming that 1 minute = 1.85 km?
(A)	855,625
(B)	855,525
(C)	855,425
(D)	855,325

Q.31	Choose the CORRECT statement(s)
(A)	True Color Composite is produced by superimposing Red band in Red, Green band in Green, and Blue band in Blue color.
(B)	True Color Composite is produced by superimposing Blue band in Red, Green band in Green, and Red band in Blue color.
(C)	Standard False Color Composite is produced by superimposing Near Infrared band in Red, Red band in Green, and Green band in Blue color.
(D)	Standard False Color Composite is produced by superimposing Green band in Red, Green band in Green, and Near Infrared band in Blue color.
Q.32	Choose the CORRECT statement(s) in case of visual image interpretation.
(A)	Tone/Color is a primary element while Size, Shape and Texture are secondary elements.
(B)	Size, Shape and Texture are primary elements while Tone/Color is a secondary element.
(C)	Texture refers to the frequency of tonal changes in an area of image.
(D)	Tone/Color is a primary element while Pattern and Association are secondary elements.

Q.33	The spatial resolution of a satellite image **P** is 80 m and another satellite image **Q** is 20 m; each of 512×512 pixel size. Choose the CORRECT option(s).
(A)	Image **P** will cover four times the area of image **Q**.
(B)	Image **P** will cover sixteen times the area of image **Q**.
(C)	Minor details will be more clear in image **Q** as compared to image **P**.
(D)	Image **P** is higher resolution and image **Q** is lower resolution.
Q.34	Which statement(s) is/are CORRECT for Hyperspectral images?
(A)	Bandwidth is large.
(B)	Bandwidth is narrow.
(C)	Number of bands are more.
(D)	Bands are contiguous.

Q.35	Satellite-Based NAVSTAR GPS Augmentation System(s) is/are
(A)	EGNOS
(B)	WAAS
(C)	GAGAN
(D)	DGPS
Q.36	Identify the CORRECT statement(s)
(A)	NAVSTAR GPS consists of minimum 24 satellites.
(B)	Precision of GPS positioning is being defined by its standard deviation.
(C)	DGPS method provides more accurate 3D-position than Relative Static post-processing method.
(D)	GPS observations from geodetic GPS receiver provide less accurate position than GPS code receiver.

Q.37	Identify the CORRECT statement(s).
(A)	For accurate GPS positioning, Geometric Dilution of Precision should be as large as possible.
(B)	Integer ambiguity is associated with carrier frequency observation of GPS signal.
(C)	GPS is one way ranging system for user.
(D)	GPS is two way ranging system for user.
Q.38	During GPS Surveying, initialization of rover receiver is required for
(A)	Relative Static method
(B)	Relative Kinematic method
(C)	Stop and Go method
(D)	Kinematic On Fly method

Q.39	Centroid of a polygon is
(A)	geometric center of the polygon.
(B)	arithmetic mean position of all its vertices in two coordinate directions.
(C)	the point at which a cutout of the polygon could be perfectly balanced on the tip of a pin.
(D)	center of polyline.
Q.40	The area of a buffer of 50 m around a proposed 1 km straight road segment to restrict any future construction is _____ sq. m. (*in integer*). (Take the value of $\pi = 3.14$)
Q.41	The Degree of Accuracy of a traverse having error of closure of 0.5 m and perimeter of 100 m is _____ (*round off to 3 decimal places*).
Q.42	Using the following regression equations, the correlation coefficient between two survey quantities x and y will be _____ (*round off to 2 decimal places*). $2x - 5y + 98 = 0$ $6x - 7y + 114 = 0$

Q.43	If population variance is 14.8, sample variance is 15.4 and the number of degrees of freedom is 10, then Chi-square value is _____ (*round off to 2 decimal places*).
Q.44	Height of a station determined by Global Navigational Satellite System (GNSS) is 284.097 m and the geoid height of the station is –30.052 m. The elevation of the station is _____ m (*round off to 3 decimal places*).
Q.45	Number of cells required to cover an area of 9 sq. km of ASTER-GDEM are _____ (*in integer*).
Q.46	If a 1:50,000 scale map is digitized to an accuracy of ± 0.5 mm, the level of error that might be expected in ground is ± _____ m (*in integer*).

PART B: FOR Section I CANDIDATES ONLY

Q.47 – Q.54 Carry ONE mark Each

Q.47	The main principle of Surveying is to work from
(A)	whole to part
(B)	part to whole
(C)	higher elevation to lower elevation
(D)	lower elevation to higher elevation
Q.48	The type of survey carried out to define the property boundaries for transfer of land property is called
(A)	city survey
(B)	cadastral survey
(C)	municipality survey
(D)	geodetic survey

Q.49	Departure of a line of a traverse is obtained by multiplying its length by the _____ of the reduced bearing of the line.
(A)	Sine
(B)	Cosine
(C)	Tangent
(D)	Cotangent
Q.50	The multiplying constant of a Tacheometer, where f is the focal length and i is the distance between the stadia hairs, is
(A)	i/f
(B)	f^2/i
(C)	f/i
(D)	$f \times i$

Q.51	The camera axis of an aerial camera is defined as
(A)	the line joining the optical centres of the objective and eyepiece lens.
(B)	the perpendicular line between the photographic centre and optical centre of the objective lens.
(C)	the line passing through the centre of the camera lens and perpendicular to the camera plane and the photo plane.
(D)	the line perpendicular to the plumb line.
Q.52	Bowditch rule for adjusting a closed traverse of perimeter 'l' is based on the assumption that the probable error is proportional to
(A)	l
(B)	$\sqrt{l}$
(C)	l^2
(D)	$1/\sqrt{l}$

Q.53	Select the INCORRECT statement:
(A)	Scale of a tilted photograph is uniform throughout its extent.
(B)	The relief displacement of any point will be radial from nadir point of the tilted photograph.
(C)	The bisector of the angle of tilt intersects the tilted photograph at a point known as isocentre.
(D)	A line perpendicular to the principal line and passing through the isocentre is known as the axis of tilt.
Q.54	A topographic map prepared by Survey of India covers 1 degree by 1 degree area on a single map. The minimum ground distance which can be represented on this map is _____ m (*round off to 2 decimal places*).

Q.55 – Q .65 Carry TWO marks Each

Q.55	In a closed traverse, the sum of the latitudes is 1.39 m and the sum of the departures is 2.17 m. The Length and Whole Circle Bearing of the closing error are
(A)	Length = 2.57 m, Whole Circle Bearing = 58°
(B)	Length = 2.57 m, Whole Circle Bearing = 57°
(C)	Length = 2.67 m, Whole Circle Bearing = 58°
(D)	Length = 2.67 m, Whole Circle Bearing = 57°
Q.56	In surveying, an odometer is used for measuring
(A)	azimuth
(B)	horizontal angle
(C)	vertical angle
(D)	distance

Q.57	Choose the CORRECT statements(s).
(A)	The spheroid is a mathematical surface of the Earth.
(B)	Geoid is an equipotential reference surface of the Earth.
(C)	True shape of the Earth is perfect spheroid.
(D)	The WGS-84 datum varies from country to country.
Q.58	Choose the CORRECT statement(s).
(A)	Latitude of a place varies from 0 degree to 90 degree North or South, and Longitude varies from 0 degree to 180 degree East or West of Greenwich Meridian.
(B)	Latitude of a place varies from 0 degree to 180 degree East or West of Greenwich Meridian, and Longitude varies from 0 degree to 90 degree North or South.
(C)	Longitude of a point is the angle between the Greenwich Meridian and the meridian passing through that point.
(D)	Latitude and Longitude of a place are subject to change with time.

Q.59	A map projection is
(A)	a systematic representation of latitude and longitude lines on a plane (paper) map.
(B)	a representation of 3D shape of Earth on 2D plane.
(C)	dependent on the location of area on the Earth.
(D)	required for taking theodolite observations of horizontal angles.
Q.60	Face Left and Face Right observations using a vernier theodolite will eliminate
(A)	index error
(B)	graduation error
(C)	eccentricity error
(D)	atmospheric error
Q.61	The parallax of a point 'a' on a pair of successive overlapping photographs is 73.22 mm and the micrometer reading of a parallax bar of point 'a' is 12.10 mm. Similarly, the micrometer reading of the parallax bar of point 'b' is 9.65 mm, then the parallax of the point 'b' is _____ mm (*round off to 2 decimal places*).

Q.62	The scale of an aerial photograph is 5 mm = 100 m. The size of the photograph is 23 cm × 23 cm. If the longitudinal overlap is 65% and sidelap is 20%, the number of photographs required to cover an area of 12.5 km × 8 km is _____ (*in integer*). Given that the flight line is along the longer dimension.
Q.63	An instrument is set up at a station P and the angle of depression to a vane, 1.20 m above the foot of the staff held at Q is 5°. The horizontal distance PQ is observed to be 300 m. The R.L. of point Q is _____ m (*round off to 3 decimal places*). Given that the staff reading at a BM (Elevation 436.050 m) is 2.865 m.
Q.64	A staff is held vertical at a distance of 100 m and 300 m, respectively. Observations are taken with a Tacheometer and staff intercepts, with the telescope kept horizontal, are 0.990 m and 3.000 m, respectively. The theodolite is set over a station having a RL of 950.500 m and the height of instrument is 1.425 m. The multiplicative constant of the Tacheometer is _____ (*round off to 2 decimal places*).
Q.65	Survey of India topographic sheet is 53G/12. At this scale, the numbers of toposheets that would cover a land area equivalent to 4 degree by 4 degree is _____ (*in integer*).

PART B: FOR Section II CANDIDATES ONLY

Q.66 – Q.73 Carry ONE mark Each

Q.66	The correlation coefficient between two bands of remote sensing data that would yield good classification is
(A)	close to one
(B)	close to zero
(C)	close to ten
(D)	between one to ten
Q.67	In a covariance matrix, the main diagonal shows the _____ of each band.
(A)	standard deviation
(B)	variance
(C)	mean
(D)	median

Q.68	Choose the INCORRECT statement about image segmentation in digital image processing.
(A)	Segmentation divides an image into different regions.
(B)	Image segmentation does not help in image classification.
(C)	Segmentation helps to identify objects or boundaries.
(D)	Segmentation is a process of partitioning an image into multiple sets of similar pixels.
Q.69	When the histogram of an image is non-Gaussian in nature, the type of linear contrast enhancement preferred to be used is
(A)	Piece-wise Linear Contrast Stretching
(B)	Min-max Linear Contrast Stretching
(C)	Percentage Linear Contrast Stretching
(D)	Standard Deviation Contrast Stretching

Q.70	Spinning of the Earth, as viewed from the North pole, appears to be from
(A)	West to East in anti-clockwise direction
(B)	West to East in clockwise direction
(C)	East to West in anti-clockwise direction
(D)	East to West in clockwise direction
Q.71	In case of Principal Component Analysis (PCA), the variance of a single variable expresses the spread of its values about the
(A)	Mode
(B)	Median
(C)	Mean
(D)	Standard Deviation

Q.72	Select the CORRECT sequence for supervised classification of satellite image (i) Classification (ii) Training (iii) Accuracy assessment (iv) Radiometric/geometric correction
(A)	(i), (ii), (iii), (iv)
(B)	(iv), (ii), (i), (iii)
(C)	(iv), (iii), (ii), (i)
(D)	(i), (iv), (ii), (iii)
Q.73	The sum of all the values of a normalized histogram is equal to _____ (*in integer*).

Q.74 – Q.84 Carry TWO marks Each

Q.74	In a Landsat-8 scene, digital number (DN) values of a pixel in band-4, band-5 and band-10 are 80, 100 and 30, respectively. What would be the NDVI value for the same pixel (*round off to 3 decimal places*)?
(A)	0.111
(B)	0.222
(C)	0.556
(D)	0.889
Q.75	For a given set of radiance values, which amongst the following is/are unitless?
(A)	Skewness
(B)	Kurtosis
(C)	Mean
(D)	Standard Deviation

Q.76	Identify the CORRECT statement(s).
(A)	External geometric errors in satellite images can be corrected using GCPs and an appropriate mathematical model.
(B)	During rectification, transformation coefficients are used to rectify remote sensing images to a standard datum and map projection.
(C)	Spatial interpolation models take care of four kinds of distortions in the remote sensing images.
(D)	Registration is done between a satellite image and field data.
Q.77	Choose the CORRECT statement(s).
(A)	Higher frequencies in an original image predominantly appear around the center of its Fourier Spectrum.
(B)	Higher frequencies in an original image predominantly appear progressively along the outer edge of its Fourier Spectrum.
(C)	Horizontal features in an original image appear as vertical components in its Fourier Spectrum.
(D)	Vertical features in an original image appear as vertical components in its Fourier Spectrum.

Q.78	Match the CORRECT option(s) for the types of filters given in (I), (II), (III), and (IV) with their kernels given in (P), (Q), (R) and (S).
	(I) Low Frequency Filter (II) High Frequency Filter (III) Laplacian Filter (IV) Sobel Operator Filter

(P)
1	1	1
1	1	1
1	1	1

(Q)
−1	−2	−1
0	0	0
1	2	1

(R)
1	−2	1
−2	5	−2
1	−2	1

(S)
0	1	0
1	−4	1
0	1	0	
(A)	I - P and II - Q
(B)	III - R and IV - S
(C)	I - P and IV - Q
(D)	II - R and III - S
Q.79	Band ratio in satellite images interpretation is applied to
(A)	enhance the spectral separation
(B)	reduce the effects of topography
(C)	enhance the effects of topography
(D)	increase spatial differences between bands

Q.80	The decorrelation stretch enhances colour differences and removes inter-band _____.
(A)	decorrelation
(B)	contradiction
(C)	correlation
(D)	relationship
Q.81	The overall image classification accuracy (in percentage) calculated from the following error matrix is _____ (*in integer*).

		Ground Truth Classes			Total
		SOIL	WATER	CROP	
Thematic Map Classes	SOIL	40	1	4	45
	WATER	7	25	3	35
	CROP	1	2	17	20
Number of ground truth pixels		48	28	24	

Q.82	Number of bytes required to store an 8-bit uncompressed image of size 512 × 512 pixels is _____ (*in integer*).
Q.83	The minimum and maximum Digital Number (DN) values of an image are 30 and 55, respectively. If the input DN value of a pixel is 35, the output DN value after linear contrast stretch of an 8-bit data is _____ (*in integer*).
Q.84	The FOV of a sensor (for a scene) placed at a nadir height of 6 km is 90 degree. The ground swath width of the scene is _____ km (*in integer*).