Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Level : B.E.
Year : III
Course : GEOM 317
Semester : I

Exam Roll No. :
Time : 30 mins.
F. M. : 10

Registration No. :
Date FEB 2 4 2019

SECTION "A"
[20 Q × 0.5 = 10 marks]

Average Radius of the Earth=6371 km
Gravitational Constant=6.67×10^{-11} Nm^2/kg^2
Semi-major axis of WGS84 Ellipsoid=6378137.0 m
Inverse flattening of WGS84 Ellipsoid=298.257223663
Inverse flattening of EVS1830 Ellipsoid=300.80172554

Choose and encircle the best alternative among the given choices:

1. The shape of the Earth formed when rotating it around its shorter axis is:
   a. Sphere b. Ellipsoid c. Prolate ellipsoid d. Oblate ellipsoid

2. The reference surface for determining the astronomical latitude and longitude is:
   a. Geoidal surface b. Prolate ellipsoid
   c. Physical Earth surface d. Oblate ellipsoid

3. The shape of ellipsoid is given by:
   a. Semi-major axis b. Flattening
   c. Eccentricity d. Gravitational Potential

4. The point in the orbit of planet at which it is closest to the Sun is:
   a. Winter solstice b. Perihelion c. Aphelion d. Summer Solstice

5. According to Pizzetti, deflection of veritical is formed at:
   a. Surface of the Earth b. Geoid
   c. Ellipsoidal surface d. Sphero-potential surface

6. To determine the quasi-geoid, all the computations are done on:
   a. Sphero-potential surface b. Mean sea level
   c. Ellipsoid d. Telluroid

7. Anamolous potential is _____.
   a. difference between actual gravity potential and normal gravity potential
   b. difference between absolute gravity and relative gravity
   c. difference between potential at the Earth surface and potential at ellipsoidal surface
   d. difference between potential at the Earth surface and potential at geoidal surface

8. The level surface of normal gravity field is:
   a. Equipotential surface b. Spheropotential surface
   c. Ellipsoidal surface d. Telluroid

9. The east-west component of Deflection of Vertical is measured along:
   a. Meridian b. Plumb line c. Zenithal line d. Prime Vertical

10. Reference frame _____.
    a. consists of a set of constant, model and parameter
    b. is the central mathematical element
    c. consists of adopted co-ordinate system
    d. is the library of all data set that is used for defining co-ordinate system

11. The mathematical relationship between arc length (z), radius (b), and angle (Φ) is given as:
    a. Φ=b/z b. Z=b × Φ c. Φ=b × z d. z= Φ/b

12. The volume of Everest 1830 hemi-ellipsoid, where the symbol has usual meaning is:
    a. $\frac{2\pi}{3}b^2a$ b. $\frac{4\pi}{3}a^2b$ c. $\frac{4\pi}{3}b^2a$ d. $\frac{2\pi}{3}a^2b$

13. Molosdensky transformation is applicable when _____.
    a. the co-ordinate axes of source and target datum are not parallel to each other
    b. the co-ordinate axes of source and target datum are parallel to each other
    c. the cosine of small angle is 1
    d. the rotation angle are small in order of 2 or 3 arc second

14. "Challenging Minisatellite Payload" (CHAMP) mission is based on:
    a. Satellite to Satellite high-low tracking system
    b. Ground Satellite tracking system
    c. Satellite to Satellite low-low tracking system
    d. Satellite Gravity Gradiometry system

15. With the usual meaning of all the symbols, the attraction of Bouguer plate is:
    a. AB = ϖρGH b. AB = 2ϖρGH
    c. AB = 4ϖρGH d. AB =-2ϖρGH

16. Among which of these Isostatic reductions consider the regional compensation?
    a. Pratte-Hayford system b. AB =-2ϖρGH
    c. Vening-Meinesz system d. Airy-Hieskanen system

17. The equation $(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}+\frac{\partial^2}{\partial z^2})\Phi(x,y,z) = f(x,y,z)$ will not be regarded as Laplace equation unless _____.
    a. $f(x,y,z)= \Phi(x,y,z)$ b. $(x,y,z) \neq 0$
    c. $f\frac{\partial^2 f(x,y,z)}{\partial \Phi^2}= \nabla^2 \Phi(x,y,z)$ d. $f(x,y,z) = 0$

18. With the usual meaning of symbols, Tesseral harmonic exists when _____.
    a. $m \neq n$ b. $m \neq n; n = 0$ c. $m = 0; n \neq 0$ d. $m = n$

19. The meridian radius of curvature and prime vertical radius of curvature are same when latitude of a place is:
    a. ±45° b. ±60° c. ±30° d. ±90°

20. With the usual meaning of symbols in Geodesy, which of the following relationship is true?
    a. $b = a\sqrt{1+e^2}$ b. $n = \frac{(1+\sqrt{1+e^2})^2}{e^2}$ c. f = 1-$\sqrt{1+e^2}$ d. m=$\frac{e^2}{2-e^2}$

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FEB 2 4 2019

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Semester : I
F. M. : 40

SECTION "B"
[6 Q. × 4 = 24 marks]

Average Radius of the Earth=6371 km
Gravitational Constant=6.67× 10^{-11} Nm^2/kg^2
Semi-major axis of WGS84 Ellipsoid=6378137.0 m
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Attempt *ANY SIX* questions.

1. What is Gravity anomaly? Explain the various types of co-ordinate system used in geodesy. [1+3]

2. What do you mean by deflection of verticals? Derive the expression for determining deflection of vertical by astronomic method. [1+3]

3. A point 'P' in World Geodetic System 1984 is (22°57'29.22"N, 81°41'19.33"E) having ellipsoidal height of 1440 m. Find the co-ordinates of the point in three-dimensional Cartesian co-ordinate system. Also, determine the spherical co-ordinates of the point. [4]

4. Derive the relation for radius of curvature of rotational ellipsoid with appropriate figures. Also, determine meridian arc length and parallel arc length. [4]

5. Define Isostasy. Explain in detail about various method of non-isostatic gravity reduction. [1+3]

6. What are the differences between absolute and relative gravity measurement? State and explain the basic data model for computation of gravity in airborne gravimetry system. [2+2]

7. Justify that the gravitational potential outside the surface of the Earth satisfy Harmonic function both mathematically and analytically. [4]

SECTION "C"
[2 Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. Derive the relation for determining the distance between reciprocal normal sections between two points. [8]

9. Prove that the product of radius of parallel and sine of geodesic azimuth at any point along geodesic is a Constant. [8]

10. Derive the relation for $\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2}$ in spherical co-ordinate system (r, Θ, Φ) where the symbols have usual meaning in Geodesy. [8]