

ALL THE QUESTIONS PAPER EXAM - 2068

B.SC. THIRD YEAR

1. Environmental Science (ENV. 331) 2068

Full Marks: 100

Time: 3 hrs.

New Course

Section "A"

1. Attempt any THREE questions. 3x10=30
- 1.1. Describe the effects of primary and secondary air pollutants on vegetation. Discuss how these pollutants can be prevented and controlled.
 - 1.2. What are the major categories of water pollutants? Describe the methods used for treatment of wastewater containing oxygen demanding wastes.
 - 1.3. Describe EIA approval process in Nepal. List out the importance of conducting EIA for developmental projects.
 - 1.4. Define earthquake. Discuss how the earthquake hazard is assessed.

Section "B"

2. Describe briefly any TEN Questions: 10x5=50
- 2.1. Estimation of soil loss
 - 2.2. Guidelines for disposal of hazardous wastes
 - 2.3. Effects of sound pollution on human beings
 - 2.4. Biological factors influencing toxicity
 - 2.5. Residual radiation
 - 2.6. Retaining structures
 - 2.7. Urbanization in developing countries
 - 2.8. Fate of DDT in food chain
 - 2.9. Importance of TOR in EAs
 - 2.10. Environmental problems from ecological point of view
 - 2.11. Desertification
 - 2.12. Origin of concept on sustainable development

Section "C"

3. Attempt ALL the Questions. 10x2=20
- Differentiate between:
- 3.1. Photochemical and industrial smog
 - 3.2. COD and BOD
 - 3.3. Sheet and rill erosion
 - 3.4. Reuse and transformation of solid waste
 - 3.5. Beta and gamma radiation
 - 3.6. Carcinogens and teratogens
 - 3.7. Jute netting and fascines

- 3.8. Internal and external insecticides
- 3.9. Hazard and risk
- 3.10. Preventive and curative measures

OLD COURSE

Section "A"

1. Attempt any THREE questions. 3x10=30
 - 1.1. What are the primary and secondary air pollutants? Describe briefly the natural processes for removal of these pollutants.
 - 1.2. Describe the methods used for treatment of wastewater.
 - 1.3. Describe briefly on EIA processes in Nepal. Why is EIA necessary to be carried out for the developmental projects?
 - 1.4. What is flood? Describe briefly the consequences that may occur due to flood. List out the preventive measures to reduce such consequences.

Section "B"

2. Describe briefly any TEN Questions: 10x5=50
 - 2.1. Soil degradation
 - 2.2. Solid waste collection methods
 - 2.3. Measurement of urban sounds
 - 2.4. Radiation hazard associated with nuclear power plants.
 - 2.5. Earthquake hazard assessment
 - 2.6. Sources of ground water pollution
 - 2.7. Index of air pollution
 - 2.8. Mechanisms to minimize toxic effects
 - 2.9. Classification of mass movement
 - 2.10. Environmental problems associated with urban growth
 - 2.11. Methods for radioactivity measurement
 - 2.12. Baseline data collection in EIA

Section "C"

3. Attempt ALL the Questions. 10x2=20

Differentiate between:

 - 3.1. Indoor and outdoor air pollutants
 - 3.2. Oxygen demanding and organic water pollutants
 - 3.3. Soil erosion and landslide
 - 3.4. Residential and hazardous solid waste
 - 3.5. Threshold and non threshold dose response curves
 - 3.6. U shaped and V shaped valley formations
 - 3.7. Intensity and loudness of sound
 - 3.8. Ecological and economic criteria of urbanization
 - 3.9. IEE and EIA
 - 3.10. Point and line of sources of pollutants

Environmental Science (ENV.332) 2068

Full Marks: 100

Time: 3 hrs.

New Course

Section "A"

1. Attempt any THREE questions. 3x10=30
- 1.1. What are the major food problems, of the world? Describe the health problems associated with food resource consumption.
 - 1.2. What are natural resources? Describe how the natural resources of mountain regions can be managed sustainably.
 - 1.3. Discuss the different types of mining practices. Describe briefly on mine field reclamation techniques.
 - 1.4. Describe the status and opportunities for biodiversity conservation in Nepal.

Section "B"

2. Describe briefly any TEN Questions: 10x5=50
- 2.1. Scope of environmental education
 - 2.2. Socio-economic factors for migration
 - 2.3. New sources of water resources
 - 2.4. Energy resources of Nepal
 - 2.5. Environmental impacts of economic growth
 - 2.6. International treaties for environmental conservation
 - 2.7. Non-metallic minerals of Nepal
 - 2.8. Energy economics and policy
 - 2.9. Drinking water supply and demand in Nepal
 - 2.10. Benefits of organic food products
 - 2.11. National environmental organizations in Nepal
 - 2.12. Human resource management

Section "C"

3. Attempt ALL the Questions. 10x2=20
- Differentiate between:
- 3.1. Ex-situ and in-situ conservation
 - 3.2. Identified and undiscovered resources
 - 3.3. Perpetual and renewable resources
 - 3.4. Traditional subsistence and high input agriculture
 - 3.5. Plateaus and hills
 - 3.6. Tierra Helada and Tierra Caliente
 - 3.7. Speciation and extinction
 - 3.8. GDP and Index of Sustainable Economic Welfare
 - 3.9. Logistic and exponential growth
 - 3.10. CBD and Kyoto Protocol

OLD COURSE

Section "A"

1. Attempt any THREE questions. 3x10=30
- 1.1. What are the major food resources of the world? Describe the problems associated with food production.
 - 1.2. Describe briefly on biological constraints of mountain life. List out the mechanisms and techniques for human adjustment) and adaptability for such constraints.
 - 1.3. Describe briefly on the types of mineral resources in Nepal.
 - 1.4. What is biodiversity? Discuss how the biological resources can be managed.

Section "B"

2. Describe briefly any TEN Questions: 10x5=50
- 2.1. Environmental crisis on earth
 - 2.2. Population parameters
 - 2.3. Hydrological cycle
 - 2.4. Rangeland management
 - 2.5. Mining industry and environmental degradation
 - 2.6. Environmental consequences of fossil fuel consumption
 - 2.7. Nepalese agricultural policies and practices
 - 2.8. Benefits of ecotourism
 - 2.9. Factors affecting limits to growth model
 - 2.10. Approaches of teaching environmental education
 - 2.11. Alternative energy resources
 - 2.12. Attitude towards nature

Section "C"

3. Attempt ALL the Questions. 10x2=20
- Differentiate between:
- 3.1. Fertility and fecundity
 - 3.2. Peat and anthracite
 - 3.3. Total and reliable runoff
 - 3.4. First and second green revolution,
 - 3.5. Polyvarietal cultivation and intercropping
 - 3.6. Hills and mountains
 - 3.7. National park and conservation area
 - 3.8. GDP and gross world product
 - 3.9. Seed tree cutting and clear cutting
 - 3.10. Under nutrition and malnutrition

2. Meteorology (MET. 331) 2068

Full Marks: 100

Time: 3 hrs.

New Course - Applied Meteorology

Attempt any three questions from Group A Two from Group B, Three from group C and Two from Group D.

Group A: Agriculture Meteorology

1. Define influence of weather on agricultural. Why meteorology is important for agricultural meteorology with reference to Nepal. [3+7]
2. Discuss general effect of radiation on plant growth. Explain the basic process of photosynthesis. [5+5]
3. Define the role of temperature and wind on plant growth. [5+5]
4. What is agricultural climate? Which type of agricultural climate is important for tea and coffee? [4+6]

Group B: Aviation Meteorology

5. Define the importance of aviation meteorology and write down the meteorological elements. [5+5]
6. Define PANSMET and write down the meteorological aspects of flight planning. [6+4]
7. Write short notes on any TWO of the following:
 - a. Very short range forecasting
 - b. Objective technique in local forecasting
 - c. Gravity waves
 - d. Surface and slant visibility [5+5]

Group C : Air Pollution Meteorology

8. Define air pollution. Explain sources and emission of air pollutants. [5+5]
9. What do you understand by pollution monitoring? Describe the environmental monitoring of Network design. [5+5]
10. Explain the effect of air pollutants on plants and materials. [10]
11. Write short notes on any TWO of the following:
 - a. Ekman spiral
 - b. Boundary layer scaling
 - c. Effect stack height
 - d. Plum rise [5+5]

Group D : Satellite and Radar Meteorology

12. Explain the characteristic of solar radiation with an illustrative diagram. [3+7]
13. What is radar? Describe its physical principal and usefulness in meteorological research. [3+7]
14. Explain different type of satellite images (e.g. visible, IR, microwave etc.). Describe the image enhancement technique of satellite imageries. [5+5]

Old Course : Hydrology

Attempt any SIXTEEN questions where Q. No. 1 and Q. No.2 are compulsory.

1. (a) Differentiate between infiltration capacity and infiltration rate. Write the formula of an equation, expressing the relation between infiltration capacity and time, as suggested by Horton. [2+6]
(b) Explain how the catchment boundary can be obtained from topographic map. [7]
2. (a) What is current meter and what are its types? Discuss how it can be used for determining the discharge in a shallow river. [2+6]
(b) Describe 'Double mass curve technique' to determine the constancy of precipitation record. [7]
2. Explain the two practical applications of hydrology. [5]
3. What is evaporation? Discuss the factor affecting evaporation. [5]
4. What is meant by runoff? How is it produced? [5]
5. Define unit hydrograph. Mention the limitations and applications of unit hydrograph. [5]
6. Explain the coefficient of transmissibility along with its important. [5]
7. Explain the important application of hydrometry in engineering field. [5]
8. Describe with neat sketches how the river stage can be measured with the help of staff gauges [5]
9. Explain the mean-section method of computing discharge in a stream. [5]
10. Describe the site selection criteria for discharge measurement in river. [5]
11. Discuss heat exchange and snow pack characteristics of snow melt process. [5]
12. What do you mean by runoff forecasting in river regulation? [5]
13. What is glacial level? Explain snow line. [5]
14. Define mass balance phenomena of glacier. [5]
15. What is glacier lake outburst flood? Explain the mechanism of outburst from Glacier Lake. [5]
16. Mention the important factor to be considered for site selection of a hydrometry station. [5]
17. Explain "hydrologic cycle is an unending process." [5]
18. Discuss the importance of hydrology in Nepal. [5]
19. Explain various types and forms of precipitation. [5]

Meteorology (MET. 332) 2068

Bachelor Level / III Year / Sc. & Tech.

Full Marks: 100

Time: 3 hrs.

New Course Applied Hydrology

Attempt any SIX questions where Q.No.1 and Q. No.6 are compulsory.

1. (a) Explain the scope and application of hydrology in engineering field. [5+5]
(b) A drainage basin is found the following data: 2

Area of the basin = 200 km²; Length of the main stream = 75 km; the perimeter of the basin = 250 km.

Determine the form factor, circulatory ratio, elongation ratio and the compactness coefficient for the basin. [6]

2. (a) Define double mass curve. Explain the procedure to check the consistency of the rainfall data obtained from any station. [2+8]
 (b) A hydro-electric plant is proposed at a site on a stream which has the following mean monthly discharge.

Month	J	F	M	A	M	J	J	A	S	O	N	D
Discharge M ³ /s	6.5	6.0	7.3	10.1	12.6	35.4	50.5	60.5	38.8	17.0	10.4	7.9

If the net head is 500 m, calculate the theoretical power potential of dependable 0.65 discharge of the river. [6]

3. (a) What is time of concentration? Describe the river system of Nepal. [4+6]
 (b) Discuss factor affecting the shape of hydrograph. [6]
4. (a) What is water quality? Describe the water quality requirements for domestic use. [2+8]
 (b) Define about the aquifer and its types. Derive the Darcy's law and its range validity. [6]
5. (a) What is water loss? Describe the method of reducing evaporation. [4+6]
 (b) Derive an expression for Thornthwaite equation for estimation of PET. [6]
6. (a) Explain the principle of discharge measurement in the electromagnetic induction ultrasonic methods. Point out the ideal location of hydrometric site. [6+4]
 (b) Define the Unit hydrograph. Explain the use and application of unit hydrograph. [2+4]
7. (a) Explain source of sediment and describe the factor affecting sediment yield. [4+6]
 (b) Explain about the stage discharge relationship. Discuss different methods which can be applied for interpolation and extrapolation of rating curve. [2+4]
8. Write short notes on any FOUR of the following:
 a. Hydrological cycle
 b. Errors in measurement of rainfall
 c. Rainfall - runoff correlation
 d. Glacier mass balance
 e. Water equivalent of snow
 f. Snow survey [4+4+4+4]
9. (a) Define the classification of glacier. Explain snow observation and measurement technique of glacier. [2+8]
 (b) Calculate the net shortwave radiation on a dirty snow surface based on the given data.

Time	Snow surface albedo	Incoming solar radiation (Wm ⁻²)
10.00	0.10	545
11.00	0.14	588

12.00	0.18	614
13.00	0.24	721
14.00	0.26	654
15.00	0.28	538
16.00	0.32	350

10. (a) How does a glacial lake form? What are the causes of glacial lake outburst flood? [4+6]
- (b) Calculate the actual vapour pressure of air at a glacier surface at Different conditions of air temperature and relative humidity. [6]

Air Temperature (T)	Relative humidity (%)
10	50
11	60
12	70
13	80
14	90
15	100

Old Course Applied Meteorology

Attempt any SIXTEEN questions where Q. No. 1 and Q. No. 2 are compulsory.

- How the general circulation is formed in the atmosphere? Explain its major characteristics showing the diagram of Hadley and Ferrel cells. [7+4+4]
- What is thermal wind? Prove that $V_T = (1/f) K^{XV} ((D)_l - (D)_A)$ Derive continuity equation. Explain each of terms of the equation. [4+6+5]
- What is the prime source of energy to the earth's surface? How does the solar radiation affect the soil moisture in the surface? Discuss about the stability of the air in the atmosphere. [2+2+1]
- What is jet stream? Discuss its role for wind circulation. [5]
- What do you know about trade wind and trade wind inversion? Explain shortly. [2+3]
- Discuss about the turbulence phenomena in the atmosphere and write down the scaling of the atmospheric boundary layers. [3+2]
- State and discuss the principle of conservation of energy in atmospheric process and write down the role of thermal energy for wind speed. [3+2]
- How the tropical disturbances develop and describe about their locations. [5]
- Describe the life cycle of the thunderstorm cell with a clear diagram. [5]
- Write short notes on barotropic atmosphere and high pressure system. [5]
- Define air pollution. Describe the role of terrestrial radiation on it. [5]
- Write down the sources of emission for air pollution of the atmosphere. [5]
- Explain how the air pollutants are transferred to mountains in Nepal. [5]
- [6] Describe about the gradient wind flow with its equation and state its role for low pressure systems. [3+2]
- What are the fundamental and apparent forces? Write their importance for atmospheric motions. [5]

16. Describe shortly about the Green's criteria of air pollution indices. [5]
17. Write short notes on mixing depth and ventilation coefficient. [5]
18. Explain briefly about the meteorological stations for monitoring the air pollution. [5]
19. What is atmospheric diffusion? Derive the Fick's law of turbulent diffusion in one dimensional case with advection if the medium is stationary. [5]
20. Discuss your views for the impacts of air pollution to the health and environment. [5]

3. Stratigraphy and Sedimentology, Palaeontology and Economic Geology (GEO.331) 2068

Full Marks: 100

Time: 3 hrs.

New Course

Attempt NINE questions, selecting THREE from each Group.

Group "A"

1. (a) What is correlation? What are the non-paleontological criteria for correlation and their limitations?
(b) Explain briefly the different methods of radiometric dating.
2. (a) Explain the methods to establish the lithostratigraphy of a new area? Why the paleomagnetism is considered as the best way of determining the age of the Siwalik rocks? Justify your answer.
(b) How can the biostratigraphy of an area be established on the basis of abundance of fossil? It is impossible to establish the biostratigraphy in the Lesser Himalaya and Higher Himalaya of Nepal, why?
3. (a) Describe sedimentation processes in lake with their characteristic deposit.
(b) What are the criteria for recognition of ancient sedimentary environments?
4. Describe short notes on (any two):
(a) Reynolds Number
(b) Tidal bedding
(c) Longitudinal bar

Group "B"

5. (a) Describe the evolutionary trends of class Trilobite of phylum Arthropods.
(b) Define index fossil with suitable examples explaining the main criteria to be an index fossil.
6. (a) What are principles of Taxonomy? Write short note on type specimen.
(b) Describe the morphology and geological distribution of the class foraminifers of the phylum protozoa with neat diagram.
7. (a) Explain the trend in the evolution of the modern man.
(b) Explain briefly on the class Anthozoa of the phylum coelenterate with a neat sketch.
8. (a) Justify the statement that all the index fossils are fossils but all the fossils are not index fossils.

- (b) Mention the evolutionary trend of the modern horse.

Group "C"

9. (a) List the forms of mineral bodies. Define and describe tabular ore bodies.
(b) How economic types of gold deposits are formed? Add a note on uses of gold.
10. (a) What is economic mineral deposit? Describe the process of early magmatic concentration.
(b) Describe the sources of hydrothermal solutions. Explain briefly the fissure vein deposits.
11. (a) Give the ore minerals, tenor and uses of copper. Explain the economic and genetic types of copper deposits.
(b) What is zone of oxidation? Describe in brief the mechanism of formation of supergene enrichment deposits with mineral examples.
12. (a) What do you mean by texture? Describe the texture of sedimentary ores.
(b) Write short notes on:
(i) Oil pool (ii) Gem stones

OLD COURSE

Attempt NINE questions, selecting THREE from each Group.

Group "A"

1. (a) What is biostratigraphy? Describe briefly on the methods of establishment of the biostratigraphy in new terrain.
(b) Mention the importance of correlation and limitations of the non-paleontological and paleontological criteria of the correlation.
2. (a) What is geochronology? Describe the different methods and limitations of radiometric dating.
(b) What is stratification? Write briefly the sedimentary cycle and sedimentary process.
3. (a) Mention the sedimentological criteria for recognizing of the deep marine and glacier deposits.
(b) Short notes on (any two):
i. Playas deposits
ii. Intertidal deposits
iii. Importance of sedimentology
4. Differentiate between (any two):
(a) Fluvial and Delta deposits
(b) Marker Horizon and Homotaxial
(c) Lithification and diagenesis

Group "B"

5. (a) What are principles of Taxonomy? Write short on type specimen.
(b) Describe the morphological, geological distribution of the phylum Branchiopoda with neat diagram.
6. (a) Mention the origin of the vertebrates.

- (b) Write briefly the class foraminifers of the phylum protozoa with neat sketch.
7. Differentiate between (any two):
- Evolutionary trends of trilobite of arthropod and cephalopod of the mollusc
 - Acme and Assemblage zone of the biostratigraphy
 - Isometric and anisotropic growths
8. (a) What are fundamental rules of binomial nomenclature of fossils? Write down two examples of index fossils of the Triassic, Jurassic and Cretaceous periods of Mesozoic era.
- (b) Short notes on (any two):
- Multivariate analysis
 - Shell form of gastropod and cephalopod
 - Phyletic transition

Group "C"

9. (a) What is texture? Describe the texture of magmatic and sedimentary ores.
- (b) Describe the metasomatism. Write briefly on the dolomitization and sericitization.
10. (a) What do you mean by hypogene and supergene ore minerals? Describe the mechanism of formation of residual deposits, supergene sulphide enrichment.
- (b) What are hydrothermal solutions? Describe the criteria to recognize the replacement deposits.
11. (a) Mention the morphology of ore bodies. Describe the various types of vein.
- (b) Describe the ore minerals, tenor, and utilization of lead. Add a short note on the economic and genetic types of the lead deposits.
12. Write short notes on:
- Metamorphic deposits
 - Ore and gangue minerals
 - Tenor

Engineering, Exploration and Environmental Geology (GEO.333), 2068

Full Marks: 100

Time: 3 hrs.

New Course

Attempt NINE questions, selecting THREE from each Group.

Group "A"

- Differentiate between soil and rock. How do you measure shear strength of a soil sample?
- Describe Unified Soil Classification System (USCS):
- Differentiate between intact rock and rock mass. Explain with examples at what circumstances intact rock properties are important.
- Describe briefly how the orientation of discontinuities play role in crating

instability in a rock slope.

3. (a) Describe the subsurface exploration methods of engineering geological investigations in short.
(b) Discuss the basic elements of GIS.
4. (a) What are active and passive sensors? Describe their usefulness.
(b) Describe the various sources of GIS data and methods of GIS data capturing.

Group "B"

5. (a) Describe the working mechanisms of percussion drilling and rotary drilling.
(b) Define reserve. Describe the methods of reserve estimation.
6. (a) Describe geological and geochemical prospecting methods.
(b) Describe the sampling technique and spacing used in mining, in i ng.
7. (a) Write short notes on any TWO of the following:
(D Dispersion haloes
(D Open cast and underground mining
(b) Describe geological prospecting criteria for ore mines in detail.
8. (a) What are the typical features of timbering, rock bolting and metal supports?
(b) What is the importance of ore dressing? Describe the possible beneficiation process in short.

Group "C"

9. (a) Describe briefly the fundamental concepts of environmental geology.
(b) What are the causes of landslide occurrence and methods of landslide risk reduction?
10. (a) Explain briefly the environmental impacts of earthquake hazards.
(b) Define water budget and describe impacts of groundwater overdraft.
11. (a) What are the essential components of groundwater occurrence? Discuss the soil properties that affect groundwater yield.
(b) Describe briefly the methods of minimizing the environmental degradation caused by the mineral resource sectors.
12. (a) What are volcanic hazards and how they are predicted?
(b) What are the factors that control damage caused by flooding in Terai? Mention briefly about community response to flood hazard.

OLD COURSE

Attempt NINE questions selecting THREE from each Group.

Group "A"

1. (a) What are engineering properties of soil? How do you measure shear strength of soils?
(b) Describe the roles of discontinuities on slope stability.
2. (a) What is the hydraulic gradient? Describe the pore water pressure.
(b) Describe briefly the electric resistivity methods.

3. (a) Describe the role of engineering geologist in engineering projects.
(b) Describe the intact rock classification.
4. (a) Describe the various imageries used in remote sensing.
(b) Write short notes on:
a. Gravity Dam
b. Point Load Test

Group "B"

5. (a) What is dispersion haloe? Describe various types of dispersion haloes.
(b) Describe magmatogenic, popular and stratigraphic criteria of prospecting.
6. (a) What support is required for underground mining? Explain in brief different types of mining supports.
(b) What do you mean by drilling? What are the main purposes of drilling?
7. (a) How do you define mineral reserve? Describe the different methods of reserve estimation.
(b) Why sampling is necessary for exploration? Describe the various methods of sampling.
8. Write short notes on:
i. Geophysical and geochemical prospecting methods
ii. Explosives

Group "C"

9. (a) What are the reasons for major environmental problems in the world? Describe in brief.
(b) Describe the methods to control landslides. Can human activities trigger landslides? Justify your answer.
10. (a) What is river flooding? Describe the mitigation measures of flood hazard.
(b) What is the relation between ground condition and seismicity? What are the main control measures of seismic hazards in Nepal? Justify.
11. (a) Define tsunami. Describe the mitigation works for costal hazard.
(b) What are the effects of volcanic activity? Describe the mitigation works of volcanic hazard.
12. (a) Describe briefly the reasons for surface water and groundwater pollution.
(b) Write short notes on:
i. Energy resource
ii. Smelting of minerals

4. Solid State Physics, Nuclear Physics, Mechanics (Phy.331) 2068

Full Marks: 100

Time: 3 hrs.

New Course

Attempt ALL the Questions.

1. Obtain an-expression for lattice heat capacity of a solid on the basis of Einstein's model. Compare the result with those from Debye's result with figure. [10]

OR

Explain the term 'density of states.' Develop an expression for the density of states for electrons in metal.

2. Explain the assumptions of shell model of the nucleus and explain how it is used to interpret the magic numbers on the basis of this model. [9]

OR

Explain the classification scheme of elementary particles and discuss the quark model with an example of its interaction with lepton.

3. What is Lagrangian? Obtain Lagrange's equation of motion from D'Alembert's principle. [9]

OR

Explain Galilian and Lorentz transformation. Obtain relation for length contraction.

4. What is Miller indices? Explain and 100 and 200 planes of a cubic crystal geometrically. [6]

OR

What is Meissner effect? Explain how this effect gives an insight into the understanding of super conducting behaviour of material.

5. Derive Euler's equation of motion of a rigid body. [6]

OR

Show that the generalised momentum conjugate to cyclic coordinate is conserved.

6. Explain the problem of the ground state of deuteron and discuss its significance. [6]

OR

Describe the basic theory and essential components of a fission chain reactor.

7. Answer All the questions: [6x3=18]

- Explain how a two body problem be solved by reducing it as a single body problem.
- Explain Hall effect.
- Explain the concept of parity in Physics.
- Explain Kepler's, law of planetary motion.
- Explain what is meant by a free electron Fermi gas.
- Explain what is meant by the term 'Q' value of a nuclear reaction.

8. NaCl has its principle planes spaced at, 2.82Å. The first order Bragg reflection is located at 10° . Find the angle for the second order reflection. [6]

9. The resistivity of intrinsic germanium at 300 K is 47 ohm-cm. Calculate 'the intrinsic carrier 'density' of Germanium at the 'same temperature, give that the electron and hole mobilities are

$0.39 \text{ m}^2 \text{ v}^{-1} \text{ s}^{-1}$ and $0.19 \text{ m}^2 \text{ V}^{-1} \text{ S}^{-1}$ respectively.

(charge of electron = $1.6 \times 10^{-19} \text{ C}$)

[6]

10. What is the time period of earth rotation on its axis so that a non standing on the surface of earth at 45° latitude has zero weight. [6]

11. Deuterons are accelerated to an energy of 5 MeV in 70cm cyclotron machine: What magnetic field does his cyclotron require to keep the deuterons in an orbit of diameter 70 cm?
(Mass of deuteron = 3.24×10^{-27} kg) [6]
12. Calculate the relativistic velocity of electrons accelerated by a potential of one million volts. [6]
13. A particle describes a conic $r = \frac{p}{1 + E \cos \theta}$ where p and E are constants. Show that the force, f , varies at the inverse square of r .

Quantum Mechanics, Mathematical Physics (Phy.332) 2068

Full Marks: 100

Time: 3 hrs.

New Course

Attempt ALL the Questions.

1. Explain the differences between a covariant and a contravariant tensor. Show that a symmetric tensor is symmetric in all coordinate systems.
OR [10]
Find the expression for curl in spherical polar system.
2. Describe the Davisson and Germer experiment and discuss its conclusions. How does this experiment justify the de Broglie wave?
OR [9]
Derive expressions for the reflection and transmission coefficients, for a potential step $0 < E < V_0$.
3. What are Bessel's functions? State and prove the orthogonality of Bessel's functions.
OR [9]
Solve the harmonic oscillator problem and explain the zero point energy.
4. Show that the eigen values are invariant under a similarity transformation.
OR [6]
Explain the concept of orthogonal curvilinear coordinates in vector analysis.
5. What is meant by degeneracy in quantum mechanical solutions? Explain.
OR [6]
Discuss the tunnelling effect.
6. Explain the Stoke's theorem of vector analysis.
OR [6]
Explain the odd even effect of nuclides.
7. Answer ALL questions: [6x3=18]
- Find the Laplace transform of e^{iat}
 - Explain contraction in tensor operation.
 - What are solenoidal and irrotational vectors?
 - Explain normalization of a wave function.
 - What is the significance of commutation relations?

f. Explain the parity operator.

8. Find the Fourier series of

$$f(x) = x \sin x \quad (-\pi < x < \pi). \quad [6]$$

9. Find the D'Alembert's solution of the one dimensional wave equation. [6]

10. Determine the eigenvalues and eigenvectors of a 2×2 matrix. [6]

11. Evaluate $\int_{x_1}^{x_2} L_{x_1} L_{x_2}$ [and] $L_{x_1} L_{x_2}$ [6]

12. Estimate the average value of r^{-1} for a 1s electron in the H - atom. [6]

13. Normalize the wave function $\psi = Ae^{-x^2/2}$ and discuss the result. [6]

5. Ecology, Wildlife & Fishery (Zol.331) 2068

Full Marks: 100

Time: 3 hrs.

New Course

Group "A"

Attempt any TWO questions

2x 12.5=25

A.1. What is ecosystem? Describe energy flow in an ecosystem.

A.2. Write an essay on "Energy crops and energy production."

A.3. Give a brief account of National Parks and Wildlife Reserves of Nepal.

Group "B"

Attempt any TWO questions

2x 12.5=25

B.4. Describe the structure and functions of electric organs in fishes.

B.5. What is a fish farm? Describe the layout of construction of fish ponds and their management.

B.6. Explain how the temperature, light & water current becomes, the limiting factors for fish survival in water.

Group "C"

Attempt ALL questions

8x5=40

C.7. Give an account of implementation of EIA in Nepal.

C.8. Discuss the factors affecting the density of population.

OR

Discuss the intrinsic model of population growth in nature.

C.9. How can Carbon Trade minimise the global warming? Discuss.

C.10. Describe the parental cares in mammals.

C.11. Give the distribution and morphology of Tor pituitora.

C.12. Discuss the potential development of Tilapia culture in Nepal.

OR

Discuss briefly fish resources in Nepal.

C.13. Describe different types of caudal fins in fishes.

C.14. Describe setting and maintenance of an aquarium.

15. Write short notes on any TWO:

2x5=10

- (a) Oriental realm and its fauna
- (b) CITES and WWF
- (c) Fish diseases

OLD COURSE

Attempt any TWO questions each from Group A & B and 12 from Group C.

Group "A"

2x10=20

1. Describe how the germinal layers in chick are formed.
2. What is biodiversity? Describe the approaches of wildlife management in Nepal.
3. What is zoo-geography? Describe boundaries and general fauna of the oriental region.
4. Describe how the evolution of horse has, proceeded to the present horse.

Group "B"

2x 10=20

5. Describe diagnostic characters and, distribution of Dipnoi.
6. What is migration? Describe its importance in the fish fauna.
7. What are different water resources? Explain how different water bodies are used in fish culture in Nepal.
8. Discuss different biotic factors important in exotic fish culture.

Group "C"

12x5=60

9. Explain how learning behaviour differs from innate behaviour in general.
10. What is food chain? Explain how it differs from the foodweb.
11. Define the term ecosystem. Describe the common practice of ecosystem management.
12. What is bio-geochemical cycle? Describe phosphorus cycle in nature.
13. What is pollution? Describe water pollution and its control measures.
14. Describe endangered species of mammalian fauna in Nepal.
15. What functions does wildlife reserve have? List down the wildlife reserves of Nepal.
16. Give a brief account of any one evidence of evolution.
17. Describe general morphology of Catka and Channa.
18. What are the economic importances of fishes? Explain.
19. Differentiate reservoir and lake and their importance in fish culture.
20. Describe briefly exotic fishes in Nepal.
21. How fish ponds are constructed and prepared for fish culture? Explain in briefly.
22. What is oogenesis? Describe it in animals.
23. Write notes on placenta.
24. Describe the roles of dissolved oxygen and carbon dioxide in fish culture.

Medical Zoology & Applied Entomology (Zol.332) 2068

Full Marks: 100

Time: 3 hrs.

New Course

Group "A"

Attempt any TWO questions

2x12.5=25

- A.1. Write an account of life history and mode of infection of *Schistosoma haematobium*.
- A.2. Give the life-history, mode of infection and pathogenicity of *Acanthamoeba*.
- A.3. Give an account of *Pediculus humanus capitis* (the head louse) and louse borne diseases.

Group "B"

Attempt any TWO questions

2x 12.5=25

- B.4. Discuss the habit & habitat, morphology, and short life cycle of pulse pest *Callasobruchus chinensis*.
- B.5. Discuss why there is requirement of safe storage of food grains. Explain storage at different periods.
- B.6. Give an account of Apiculture practice in Nepal. Also enumerate the economic importance of honey bee.

Group "C"

Attempt ALL questions

8x5=40

- C.7. Differentiate between B-Cells and T-Cells.
- C.8. Give a brief account on insect collection and reservation.
- C.9. What is the prophylaxis against avian influenza?
- C.10. Explain Sterile male technique for pest management.

OR

Mention origin and role of immune system.

- C.11. What are the mode of infection and pathogenicity of *Trypanosoma parvum*?
- C.12. Give an account on Cash crop pests.

OR

Mention the histo-pathological changes in the tissues due to Nephrosis.

- C.13. Explain what is the role of Dendritic cells in the immune response. How do they differ with Macrophages?
- C.14. Mention the habitat, morphology and the role as a disease vector of *Xenopsylla*.

15. Write short notes on any TWO:

2x5=10

- (a) Entomopathogenic nematodes
- (b) Systemic Lupus Erythromatus (SLE)
- (c) Zoonotic diseases

OLD COURSE

Attempt ALL questions from Group A & B and 12 questions from Group C.

Group "A"

(Medical Zoology)

2x10=20

1. Describe the structure and life-cycle of *Trypanosoma gambiense*. Mention the symptoms of disease caused by this organism.

OR

Write a short description of structure of the helminth parasites you studied and different diseases caused by them.

2. Discuss the histo-pathological changes of related organs in nephrosis and cirrhosis caused in man.

Group "B"

(Entomology + Wild Life)

2x 10=20

3. Discuss the values of wild animals to man. Mention their conservation and management systems adapted in Nepal.

OR

Write an essay on "Prey and Predator relationships" occurring in nature.

4. Give an account of the structure and life-cycle of a paddy pest *Tryporhiza incertulus*. Mention its control methods.

Group "C"

(Medial, Entomology and Wildlife)

12x5=60

5. Compare and contrast the modes of transmission of pathogens by the mosquitoes and body lice.
6. What is immunity? Discuss the method of cellular mode of immune response.
7. Write a note on pathogenic values of bacteria or *Rickettsia*.
8. What is rabies? Mention its mode of transmission and control method.
9. What are the types of lymphocyte cells in human body? Give their roles in immunity.
10. "Heterorhabditis is a useful nematode." Give your comments.
11. What is the basis of insect classification? Discuss in brief.
12. How is insect pest controlled by a sterile male technique? Discuss.
13. Explain the method of culture of silk-worm (*Bombyx Mori*) larva in the laboratory.
14. Discuss the values of sandflies and houseflies as household pests.
15. Write a note on habit and habitat of the wild elephants and give its distribution in Nepal.
16. What is competition? Explain giving examples.
17. Give the meanings of vulnerable and threatened species with examples from Nepal.
18. Enlist different National Parks of Nepal and mention important fauna in Rara National park.

6. Agricultural & Food Microbiology (MB.331) 2068

Full Marks: 100
New Course

Time: 3 hrs.

Group "A"

(Long Answer Questions)

Attempt ALL FIVE questions each of ten full (or break down) marks.

1. Define soil and describe its composition. Mention the characteristics of soil actinomycetes. [2+4+4]
2. List out the major components of agricultural waste. Describe the microbial degradation of hemi starch. [3+7]
3. Differentiate microbial infections and intoxications with examples. Describe the role of botulinum toxin to cause botulism. [5+5]
4. Outline the principles of food preservation? Describe chemical methods of food preservation. [5+5]
5. Explain safe food handling. Briefly describe microbial spoilage of beer. [3+7]

OR

Define biopesticides. Briefly describe mode of action of bacterial biopesticides used in pest control.

Group "B"

(Short Answer Questions)

Attempt any FIVE questions each of seven full marks.

6. Describe role of mycorrhiza as potential biofertilizer in crop production.
7. Briefly describe characteristics of methanogenic organism.
8. Briefly describe intrinsic parameters affecting the microbial growth on food.
9. Describe the indicators of sanitary quality of food products.
10. Mention the applications of Lactic Acid Bacteria in food industries.
11. Describe microbial spoilage of canned, foods.

Group "C"

Attempt ALL FIVE questions each of three full marks.

12. Very Short Answer Questions.
 - a. Explain on xenobiotics.
 - b. Point out the significance of Rs ratio in soil fertility.
 - c. List the chitinolytic microorganisms.
 - d. Define HACCP.
 - e. Give characteristics of vibrio, spp;
 - f. Enlist the bacteria used as probiotics

OLD COURSE

Attempt ALL the questions.

1. Describe the mechanism of soil formation. Enlist major constituents of soil. [8+6]

2. Describe the effects of any four extrinsic factors in the growth of bacteria in food. [14]
3. Enlist methane producing bacteria. Describe the mechanism of methane production. [4+10]

OR

Describe the general properties of Staphylococcus aureus. Explain staphylococcal food poisoning in human. [4+10]

4. Answer any Four questions: 4x4=16
- Describe the role of microorganism, in fresh fruit spoilage.
 - Mention the principle of food preservation.
 - Explain in brief the primary source of contamination of raw
 - meat.
 - Briefly describe nitrification and denitrification.
 - Briefly describe the spoilage of egg.
5. Justify any Four statements: 4x4=16
- Pour plate technique is the suitable technique for viable count of microorganism,
 - Ammonification is the crucial step of nitrogen cycle.
 - Water activity is also an indicator of food spoilage.
 - Cynobacteria helps in crop production.
 - E. Qoli is the indicator of water pollution.
6. Answer any four questions: 4x4=16.
- Distinguish between food borne infection and intoxication.
 - Describe briefly the methods of check standards of milk.
 - Briefly explain clostridial food poisoning.
 - Describe briefly the role of Rhizobium in nitrogen fixation.
 - Enlist the physical factors of soil formation.
7. Answer ALL the questions: 5x2=10
- Define humus
 - HACCP
 - Mycorrhiza
 - Actinomycetes
 - Mold contamination in food

Medical and Environmental Microbiology (MB.333) 2068

Full Marks: 100
New Course

Time: 3 hrs.

Group "A"

5x10=50

(Long Answer Questions)

Attempt ALL FIVE questions each of ten full (or break down) marks.

1. Describe principle and applications of Bio-typing and general procedure of phage typing of bacteria. [5+5]

2. Describe pathogenesis and laboratory diagnosis of rabies virus. [10]
3. 'Describe' medical importance, morphological characteristics and pathogenesis of Salmonella enterica serova. Typhi. [10]
4. Explain microbial ecology. Briefly compare and contrast mutualism, symbiosis and ammensalism with suitable examples. (10)
5. Define non specific immunity. Mention principle, procedure and applications of agglutination test. [3+7]

OR

Mention composition of domestic sewage. Describe waste water treatment methods. [3+7]

Group "B"

5x7=35

(Short Answer Questions)

Attempt any FIVE questions each of seven full marks.

6. Mention morphological and biochemical characteristics of E. Coli.
7. Briefly explain on mode of action of antibiotics.
8. Explain briefly on concept of Biosafety level.
9. Explain survival mechanism of microorganism in thermophilic environment.
10. Explain sulphur cycle and role of microorganisms in it.
11. Briefly describe steps of methods of drinking water treatment.

Group "C"

5x3=15

Attempt ALL FIVE questions each of three full marks.

12. Very Short Answer Questions.

- a. Differentiate between antigen immunogen and hapten
- b. Enlist medically important fungi with causal disease.
- c. Outline general procedure of phage typing of bacteria
- d. Outline laboratory diagnosis of dengue.
- e. Enlist safe disposal techniques of municipal solid waste.
- f. Enlist indicator organism of air pollution.

OLD COURSE

Attempt ALL the questions.

1. Explain specific defence mechanism against an infection. [14]
2. Define antibiotics- Classify common antibiotics on the basis of their chemical structure and mention mode of action of each class. [4+10]
3. Describe different methods of drinking water treatment. [14]

OR

Describe principle and process of primary, secondary and tertiary, treatments of industrial effluents. [14]

4. Write short answers questions: (any four) [4x4=16]
 - a) Define epidemic, endemic and pandemic diseases.
 - b) Briefly describe structure and general characteristics of measles virus.
 - c) Explain general protocol of sandwich ELISA.

- d) Describe proper method, of urine, sample collection for culture.
e) Define water borne diseases with examples.
5. Justify the statement (any Four): [4x4=16]
a) Most human viral disease do not reoccur but common cold reoccur frequently.
b) Presence of microorganism in blood or CSF is an indication of disease state.
c) Urine is presumed to be sterile. However, voided urine normally contains upto 10³ bacteria per ml.
d) E. Coli is considered as the indicator of fecal contamination of water.
e) Presence of lower dissolved oxygen concentration in a river is indicative of pollution.
6. Short Answer Questions (any FOUR): [4x4=16]
a) Define dimorphic fungi.
b) Briefly explain pathogenesis of HIV.
c) Describe control measures of common air borne diseases.
d) Mention safety precautions to be taken in microbiology laboratory.
e) Briefly describe general composition and microbiology of domestic sewage.
7. Answer all questions (short notes): [5x2=10]
a) Define immunization
b) Define capsid
c) Enumeration of coliform by MPN technique
d) Principle of Gram staining
e) Contribution of Louis Pasteur in medical microbiology

7. Environment & Biodiversity (Bot.333) 2068

New Course

Section "A"

Give explanatory answers to the following (any TWO) 2x10=20

1. What do you understand by climate change? Discuss major causes and effects of climate change and also suggest mitigation measures to solve it.
2. Why do you think sustainability in energy use is the present day challenge to the world? Describe the potentiality in developing various types of sustainable energy sources for Nepal.
3. 'Healthy ecosystems are very important in providing various ecosystem services.' Justify this statement by providing suitable example in context to mountain communities of Nepal.

Write short notes on any FOUR of the following: 4x5=20

4. Tundra Biome
5. Indicator Species
6. EIA methodology
7. Bio fuel

- Toxins of biological origin
- National Wetlands Policy

Give short answers for the following: (any FOUR)

4x2.5=10

- Discuss the effects of pesticide abuse on ecosystem services.
- Outline the problems associated with urbanization in Nepal.
- Summarize the effects of acid rain on plants.
- Write down the role of WWF in biodiversity conservation in Nepal.
- Future of wind energy in Nepal.

Section "B"

Give explanatory answers to the following : (any Two)

2x10=20

- Discuss major factors which tend to increase and decrease biodiversity and describe various ways to reduce biodiversity loss.
- Why do you think various stakeholders should be involved in biodiversity conservation initiatives rather than imposing strict government rules and regulations? Discuss with examples.
- How do you think conservation activities are associated with livelihood opportunities of rural communities in Nepal? Discuss with the examples of NTFPs of Nepal.

Write short notes on FOUR of the following :

4x5=20

- Biodiversity prospecting.
- Traditional knowledge
- Role of Herbaa
- Biodiversity hotspot centers
- Plant germplasm
- National biodiversity strategy 2002, Nepal

Give short answers for the following: (any FOUR)

4x2.5=10

- Role of ecotourism in conservation
- Contribution of the resource conservation in community development
- Importance of Botanical gardens in plant conservation
- Agrobiodiversity as a sustainable way to support livelihood of rural communities.
- Role of climate change in species extinction in Nepal Himalayas

8. CHEMISTRY (CHEM.333) 2068

Bachelor Level / III Year Sc. & Tech.

Full Marks: 100

Time: 3 hrs.

Use separate answer-book for each woup.

The *Comprehensive Question* of each group is compulsory.

Attempt EIGHT questions of Short Answer Questions in each Group.

New Course

GROUP "A" (INORGANIC)

Comprehensive Question

- What are metallocene? Write any two methods that can be used to prepare ferrocene. Discuss the structure of ferrocene. [1+2+6]

OR

Describe the important features of Crystal Field Theory. How is the colour and magnetic properties of complex compounds explained using this theory. Point out any one limitation of this theory. [4+2+2+1]

Short Answer Questions

8x3=24

- 2.1. Point out the difference between associative mechanism and dissociative mechanism in the ligand substitution reaction of octahedral complexes.
- 2.2. Give three examples of the importance of chelates in biological system.
- 2.3. Point out the difference between thermodynamic stability and kinetic stability of coordination compounds.
- 2.4. How spin tetrahedral complexes are not common. Explain.
- 2.5. What types of isomer is the following pair of compound?
 $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$, $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Br}$
How would you identify these compounds?
- 2.6. Trans effect is useful in the synthesis of geometrical isomers of Square Planar Complexes. Illustrate.
- 2.7. Why is that the Ion Exchange method is a very effective method for the separation of lanthanides? Give an example of the application of this method.
- 2.8. Write any three different type of synthetic method applicable for the synthesis of organometallic, compounds.
- 2.9. $\text{Ni}(\text{CO})_4$ is a stable carbonyl compound where as $\text{Pt}(\text{CO})_4$ is not stable. Explain.
- 2.10. Give three examples of the use of metals and its complexes as therapeutic agents.
- 2.11. What is meant by essential and trace elements in biological. system? What criteria is used to classify an element as an essential element?

Group "B" (ORGANIC)

Comprehensive Question

3. What do you mean by retro 'synthetic analysis'? Define retron and synthon. Discuss the advantages of retrosynthetic analysis giving examples. [1+4+4]

OR

How is Sanger method used for N - terminal, amino acid determination? Draw the structure) formula for each of the following peptides and indicate the C - terminal and N - terminal amino acids. (a) Glu - Ala - Gly (b) Gly - Ala - Phe

[5+2+2]

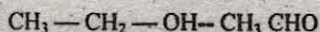
Short Answer Questions

8x3=24

- 4.1. How would you inter convert (-)-arabinose to (+) - man nose?
- 4.2. What chair conformation of anomeric D (+) - glucose is more stable? Answer giving reasons.
- 4.3. What is the secondary structure of the protein? Describe giving example.
- 4.4. What is the difference between soap and detergent? How does detergents cleanse the dirty objects?
- 4.5. What is the structure of cell membrane?
- 4.6. Define isoelectric point. The isoelectric point of lysine is 9.74 whereas that of

glycine is 5.97. What conclusion can you draw from these observations?

- 4.7. What is genetic code?
- 4.8. Show your acquaintance with organic chemistry of vision.
- 4.9. Write the mechanism of the following reaction that occurs in the biological system



- 4.10. Give one synthetic equivalent of the following synthous
a. $\text{R}-\text{C}=\text{O}$ b. CH_2-OH c. $\text{R}-\text{c}=\text{O}$
- 4.11. What is phosphoglyceride? What are its hydrolysis products?

GROUP "C" (PHYSICAL)

Comprehensive Question

5. What is reversible reaction? Derive an expression for the integrated form of rate constant for the first order reversible reaction. Point out the differences between reversible, consecutive and parallel reactions. [2+5+3]

OR

What do you mean by third law of thermodynamics? Derive an equation that permits the calculation of entropy change for a reaction involving solids, liquids or gases at any temperature.

Calculate the entropy change for the surroundings and the universe for the reaction $\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) = \text{H}_2\text{O}(\text{l})$ at 25°C .

[Given, the enthalpy change for the reaction in the standard state is -285.8 KJ/mol ; -absolute entropies in the standard state for $\text{H}_2\text{O}(\text{l})$, $\text{SO}_2(\text{g})$ and $\text{H}_2(\text{g})$ are $70,248$ and 131 J/K. mol , respectively. [1+5+4]

Short Answer Questions

8x3=24

- 6.1. What is Gibbs - Helmholtz equation? Derive an equation which shows the variation of the Helmholtz free energy with temperature at constant volume.
- 6.2. Why entropy of ice even at OK will not be zero? Explain.
- 6.3. One mole of hydrogen and nine mole of nitrogen are mixed at one atmospheric pressure and 25°C . Calculate the entropy of mixing of ideal gases per mole of the mixture formed.
- 6.4. Point out some significances of equilibrium constant of thermodynamics.
- 6.5. Point out the differences between collision theory and transition state theory of reaction rates.
- 6.6. Write short note on the effect of temperature on a reaction rate.
- 6.7. What is photochemical reaction? How do they differ from thermal reaction?
- 6.8. How X-ray diffraction is used to determine the crystal structure of NaCl ? Explain.
- 6.9. What are seven crystal systems? Mention the names with an example for each system.
- 6.10. The bond length of the CO molecule is determined from the rotational spectrum to be $1.13 \times 10^{-10} \text{ m}$. Calculate the reduced mass and the moment of inertia.
- 6.11. What are stokes and anti-stokes lines of Raman spectra?

9. Elective English 2068

Full Marks: 100

Time: 3 hrs.

New Course

Attempt ALL the questions.

1. Sketch briefly the character of Max Kelada. (Mr. Know All)
OR [10]
Summarize the major ideas of Dethier's "To Know a Fly."
2. Circle two synonyms for the words in bold types in the following [5]
 - a. **Put Off**: avoid, delay, postpone
 - b. **tough**: easygoing, strong, difficult
 - c. **reckless**: strict, careless, irresponsible
 - d. **compassion**: pity, love, concern
 - e. **strain**: injure, harm, differentiate
3. Apply four levels of meanings to Devkota's "The Lunatic" or Tagore's "The Cabuliwallah." [15]
4. State the main ideas presented by Anuradha Chaudhary in her essay "How Sane Are We?" [10]
5. Write an essay - **Television Can be a Good Parent.** [10]
6. Write a paragraph on **Your Little Aunt.** [5]
7. Write a five-paragraph essay on "Electronic Communication Today." [15]
8. Why do the debates over cloning now have new importance? Why does choosing the traits of a child scare some people? [10]
9. Write a newspaper article on "Benefits and Fears of Readymade Fast Food." [15]
10. What is a thesis statement? Illustrate it with an example. [5]

OLD COURSE

Attempt ALL the questions.-

1. Apply four levels of interacting with texts to "Swansong" or "The Lunatic." [15]
2. Summarize the major ideas of Russell's "Keeping Errors at Bay." [10]
3. Give the central idea of the poem "To His Coy Mistress." [5]
4. Describe the role of culture in "Marriage is a Private Affair." [10]
5. Edit the following sentences: [5]
 - a. I love adoring and cherish him.
 - b. She smiles as she sing.
 - c. I should have went to Dharan.
 - d. I would have rather been a hammer then a nail.
 - e. Chandra likes to reads books.
6. Sketch the character of Prakriti. (Chandalika)
7. Why does the protagonist in this brief drama curse his luck? (Eight O'clock)[5]

8. Write a precis of the following extract: [10]

I want to put the case clearly before you. I will show you what I mean by another familiar example. I will suppose that one of you finds that a teapot and some spoons which had been left in the room on the previous evening are gone - the window is open, and you observe the mark of a dirty hand on the window frame, and perhaps in addition to that, you notice the impress of a hobnailed shoe on the gravel outside. All these phenomena have struck your attention instantly, and before two seconds have passed you say, "Oh, somebody has broken open the window, entered the room and ran off with the spoons and the teapot." That speech is out of your mouth in a moment. And you probably add: "I know he has: I am quite sure of it!" you mean to say exactly what you know; but in reality you are giving expression to what is, in all essential particulars, an hypothesis. You do not know it at all; it is nothing but hypothesis rapidly framed in your own mind. And it is a hypothesis framed on a long train of inductions and deductions.

9. What does Golding mean by three grades of thinking? (Thinking as a Hobby) [15]

In Huxley's views, are some hypotheses better than others? Why or why not? (We Are All Scientists)

10. Earth Hazard Control - Optional Paper 2068

Full Marks: 100

Time: 3 hrs.

Attempt FIVE Questions from each Group.

Group "A"

1. Write down physiographic subdivision of Nepal Himalaya. And discuss the common types of mass movement, in the Higher Himalaya.
2. Differentiate between hazard and risk. Explain the external factors that influence the landslide hazards.
3. What is the rock strength? Explain the controlling factors of rock strength.
4. What is effective stress? Describe stresses in a soil mass.
5. What do you understand by mass movement? Describe the prevention and mitigation measures of landslide.
6. What is meant by magnitude of an earthquake? Discuss the earthquake hazard assessment.

Group "B"

7. Describe the mechanism, assessment and prediction of debris flows.
8. What do you understand by glacier? Discuss the glacial landforms.
9. For what purposes retaining structures are made? Describe different types of retaining structures.
10. What is a contour line? Draw a hill and a valley with the help of contour lines. Describe the main uses of topographic maps.
11. Describe briefly the river valley morphology. Discuss the importance of remote sensing techniques for flood hazard assessment.
12. Write short notes on any TWO:

- a. Global warming
- b. Different types of erosion
- c. Importance of ethno-botanical plants

11. Sample Surveys and Design of Experiments (Stat.331) (New+Old) 2068

Bachelor Level /III Year/ Science & Tech. + Humanities

Full Marks: 100

Time: 3 hrs

Group "A"

1. (Compulsory) Attempt any SIX questions. 6x5=30
- a. Discuss the techniques in controlling errors in experimental designs.
 - b. Describe a procedure to estimate a missing value in randomized block design.
 - c. Explain 2^3 factorial design with the help of an illustrative example.
 - d. Discuss how data is analyzed in the single factor experimental design.
 - e. Compare complete enumeration with sampling under different circumstances.
 - f. In simple random sampling without replacement, which form of the sample variance is an unbiased estimate of population variance?
 - g. Differentiate between sampling and non-sampling errors in sample surveys.
 - h. Point out the importance of systematic sampling. Describe a method of selecting a systematic sample.

Group "B"

Attempt any FIVE questions. 5x7=35

2. Give the layout and analysis, of Latin square design. Obtain its relative efficiency as compared to randomized block design.
3. Obtain the expectations of sum of squares for randomized block design.
4. What do you mean by analysis of covariance and how does it differ from analysis of variance? Describe a procedure to carry out the analysis in completely randomized design.

A manufacturer of television sets is interested in the effect on tube conductivity of three different types of coating for colour picture tubes. The following data on conductivity is obtained.

Coating Type 1	Coating Type 3	Coating Type 3
143	152	129
141	149	127
150	140	132
147	143	138
145	150	135

Test whether there is a significant difference in conductivity due coating type.

[Tabulated value of $F_{0.05k}^1(2, 12) = 3.89$]

- Describe completely randomized design. Obtain the least of effects square estimates and sum of squares for the design.
- Distinguish between complete and partial confounding. Illustrate the layout and analysis of a partially confounded 2^3 design in two blocks and 'r' replicates.

Group "C"

Attempt any FIVE questions.

5x7=35

- Let the population consists of units 2, 5, 3, 7, 9. If we draw simple random sample of size 3 without replacement show that sample mean is an unbiased estimate of population mean. Also verify that the standard error of the sample mean is equal to $\sqrt{\frac{a^2 (N-n)}{n (N-1)}}$ where a is population standard deviation, N is the size of the population and n is the size of the sample.
- Show that the simple random sampling without replacement sample mean square is an unbiased estimate of population mean square.
- What are the advantages of stratification in sample surveys? Describe the procedure of optimum allocation of sample sizes for different strata in stratified random sampling.
- Obtain an unbiased estimate of population mean in systematic sampling and also find the relative efficiency of systematic sampling with respect to simple random sampling without replacement.
- Define regression method of estimation. Obtain the variance of the regression estimate.
- What do you mean by probability proportional to size sampling? Describe the cumulative total method of selecting units in this sampling method.

Applied Statistics (Stat.332) (New + Old)2068

Bachelor Level/III Year/Sc. & Tech. + Humanities

Full Marks: 100

Time: 3 hrs.

- (Compulsory) Attempt any SIX questions. 6x5=30
 - Compare crude death rate with standardized death rate. Which one is better and why?
 - Define mean length of generation and net reproduction, rate. Derive a relation between them.
 - What is a life table? What are its components?
 - Describe compound interest population growth model. If growth rate (r) = 0.019, find the time period for a given population to double in its size.
 - Describe national income and its components.
 - Distinguish between control charts for attributes and variables.
 - Explain the method of moving averages in time series analysis. Also specify its drawbacks.

- h) Distinguish between un-weighted and weighted aggregate methods in the construction of index numbers.

Group "A"

Attempt any FIVE questions.

5x7=35

2. What are the sources of demographic data in Nepal? Describe about the information usually collected in population census of Nepal.
3. Which population model do you think is appropriate for short period population projection and why? Also derive the model.
4. Describe how abridged life table is constructed using census or demographic sample survey data.
5. Compute net reproduction rate (NRR) from the following data assuming sex ratio at birth is 101 males per 100 females.

Age group Children born to 1000 women Mortality rate per 1000

15-19	80	12
20-24	205	16
25-29	140	15
30-34	82	20
35-39	39	22
40-44	20	25
45-49	8	30

6. Distinguish between crude birth rate (CBR), age specific birth, rate. (ASBR) and total fertility rate (TFR).
7. Write short notes on:
 - a. Whipple's index
 - b. Age dependency ratio
 - c. Exponential model

Group "B"

Attempt any FIVE questions.

5x7=35

8. What do you mean by control charts? Describe how Y and R charts are
9. Explain process control in industrial statistics. In sampling inspection plans discuss (a) consumers risk (b) producers risk and, (c) average sample number (ASN).
10. Define index number. Compare between fixed based and chain based index numbers.
11. Construct the cost of living index number for the year 2009 taking base year as 2007.

Item	Unit	Price (2007)	Price (2009)	Weight in %
A	Kg.	0.6	0.75	10
B	Litre	0.8	0.90	25
C	Dozen	2.0	2.50	20
D	Kg.	0.7	0.95	40
E	One pair	9.0	11.0	5

12. Distinguish between ratio to moving average and ratio to trend methods for analyzing seasonal fluctuations in time series data.
13. Discuss what you know about coverage, sources and limitations of official statistics in Nepal.

12. Mathematical Analysis (Math. 331)

Bachelor Level/Sc. & Tech. + Huma./III Year

Full Marks: 75

Mathematical Analysis (Math. 331)

Time: 3 hrs.

Attempt All the questions.

Group "A"

5×7=35

1. Define absolute and conditional convergence of a series. Prove that absolute convergence of $\sum a_n$ implies the convergence. Let $\sum a_n$ be a given series with real-valued terms and define.

$$p_n = \frac{|a_n| + a_n}{2}, \quad q_n = \frac{|a_n| - a_n}{2} \quad (n = 1, 2, \dots)$$

Then prove that if $\sum a_n$ is conditionally convergent, both $\sum p_n$ and $\sum q_n$ diverge.

2. Prove that every Cauchy sequence in \mathbb{R}^n is convergent. Show that if a real sequence $\{a_n\}$ is given by

$$|a_{n+2} - a_{n+1}| \leq \frac{1}{2} |a_{n+1} - a_n| \text{ for all } n \geq 1 \text{ then it converges.} \quad [5+2]$$

OR

State and prove the sign preserving property of a continuous function.

Let $f: [a, b] \rightarrow \mathbb{R}$ be continuous on $[a, b]$. Prove that

(i) If $f(a)f(b) \leq 0$, then \exists a point $c \in (a, b)$ such that $f(c) = 0$.

(ii) If $f(a) \neq f(b)$, then f takes every value between $f(a)$ & $f(b)$ in (a, b) .

[3+3+1]

3. Define directional derivative and total derivative at a point. Obtain the relation between total and directional derivative.
4. Define Riemann - Stieltjes sum of bounded function.

If $f \in R(\alpha)$, $g \in R(\alpha)$ on $[a, b]$, then $c_1 f + c_2 g \in R(\alpha)$ on $[a, b]$, where c_1 and c_2 are two constants and also we have

$$\int_a^b (c_1 f + c_2 g) d\alpha = c_1 \int_a^b f d\alpha + c_2 \int_a^b g d\alpha$$

5. Define primitive of f and hence state and prove second fundamental theorem of integral calculus. [1+6]

OR

Define a function of bounded variation on $[a, b]$. Prove that if f is of bounded variation on $[a, b]$ and $c \in (a, b)$, then f is of bounded variation on $[a, c]$ and on $[c, b]$ and we have

$$V_f(a, b) = V_f(a, c) + V_f(c, b) \quad [1+6]$$

Group "B"

10×4=40

6. Assume that $f_n \rightarrow f$ uniformly on S and that each f_n is bounded on S . Prove that $\{f_n\}$ is uniformly bounded on S . [4]

OR

Define an open set in \mathbb{R}^n .

Prove that the intersection of a finite collection of open sets is open. [1+3]

7. Define a compact subset in \mathbb{R}^n .

Let X be a closed subset of a compact metric space M . Then prove that X is compact.

8. What do you mean by Cauchy sequence in \mathbb{R} ? Show that the sequence in Euclidian metric \mathbb{R} . [1+3]

9. Let f be a function of bounded variation on $[a, b]$. Let V be defined on $[a, b]$ as follows:

$V(x) = V_f(a, x)$ for $a < x \leq b$ and $V(a) = 0$. Then

(i) V is increasing function on $[a, b]$

(ii) $V - f$ is an increasing function on $[a, b]$. [2+2]

OR

Determine whether or not the function

$$f(x) = x^2 \sin\left(\frac{1}{x}\right) \text{ if } x \neq 0$$

$f(x) = 0$ is of bounded variation on $[0, 1]$. [4]

10. Let α on $[a, b]$. If $f \in R(\alpha)$ on $[a, b]$, then prove that $f^2 \in R(\alpha)$ on $[a, b]$. [4]

11. State and prove first mean value theorem for Riemann - Stieltjes integrals.

OR

[4]

State and prove first fundamental theorem of integral calculus.

12. Prove that if $\sum a_n = S$, then every series $\sum b_n$ obtained from $\sum a_n$ by inserting parentheses also converges on S . Illustrate with an example that removing parentheses may destroy the convergence.

13. Define the term "absolutely convergent." Show the integral $\int_0^{\infty} \frac{\sin x}{x} dx$ does not converge absolutely.

[1+3]

14. Let $f: \mathbb{R}^n \rightarrow \mathbb{R}^m$ be differentiable at an interior point c on S , where $S \subseteq \mathbb{R}^n$. If $V = V_1 u_1 + \dots + V_n u_n$, where, u_1, \dots, u_n are the unit coordinate vectors in \mathbb{R}^n , then prove that

$$f'(c)(u) = \sum_{k=1}^n V_k D_k f(c)$$

OR

[4]

State limit comparison test for convergence of an improper integral.

Hence, show that $\int_0^{\infty} e^{-x^2} dx$ converges but $\int_0^{\infty} \frac{1}{\sqrt{1+2x}} dx$ diverges.

Let $f: S \rightarrow T$ be a function from one metric space (S, d_S) to another (T, d_T) . Prove that f is continuous on S if and only if, for every open set Y in T , the inverse image $f^{-1}(Y)$ is open in S .

Group "A"

5×7=35

1. Solve : $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - y = 4$, by variation of parameter method. [7]
2. Define curvature and torsion at a point on the space. Prove that for curve $r = r(t)$ and $r = r(s)$

$$k = \frac{|\dot{r} \times \ddot{r}|}{|\dot{r}|^3} \quad \text{and} \quad \tau = \frac{|\dot{r} \cdot (\ddot{r} \times \dddot{r})|}{|\dot{r} \times \ddot{r}|^2} \quad [2+5]$$

OR

Define osculating plane. Find the equation of the osculating plane at the point t for the curve $\vec{r} = (3t, 3t^2, 2t^3)$.

3. State Gauss's divergence theorem for Cartesian form and evaluate $\iiint_S [x^2 dy dz + y^2 dz dx + 2z(xy - x - y) dx dy]$ where S is the surface of the cube, $0 \leq x \leq 1, 0 \leq y \leq 1, 0 \leq z \leq 1$. [2+5]
4. Define harmonic function, harmonic conjugate and Cauchy-Riemann conditions. Show that $V(x, y) = 3x^2y - y^3$ is harmonic and find the conjugate $u(x, y)$. [1+1+1+2+2]
5. Define Fourier cosine and sine series. Find a series of sines and cosines of multiples of x which will represent $f(x) = x$ in $-\pi \leq x \leq \pi$. [2+5]

OR

Define Fourier series and its coefficients. Expand $f(x) = x^2$ for $\pi \leq x \leq \pi$ in a Fourier series. [2+5]

Group "B"

10×4=40

6. Solve $\frac{d^2y}{dx^2} - a \left(\frac{dy}{dx}\right)^2 = 0$.
7. Solve : $4x^2 \frac{d^2y}{dx^2} + 4x^2 \frac{dy}{dx} + (x^3 + 6x^4 + 4)y = 0$, by removing the first derivative.

OR

$$\text{Solve : } (x + a) \frac{d^2y}{dx^2} - 4(x + a) \frac{dy}{dx} + 6y = x$$

8. Solve : $yz \log z dx - zx \log z dy + xydz = 0$

OR

Find the general solution of $(y - z)p + (x - y)q = z - x$

9. Find the equation of the integral surface of the differential equation: $2y(z - 3)p + (2x - z)q = y(2x - 3)$, which passes through the circle $z = 0, x^2 + y^2 = 2x$.

OR

Solve the Charpit's method $p^2x + q^2y = z$

10. Solve : $z(qs - pt) = pq^2$, by Monge's method.

OR

Solve : $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 12(x+y)$

- Show that the principal normal at consecutive points do not intersect unless $T = 0$.
- Evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = x\vec{i} - xy\vec{j}$ from the origin to the point (1, 1) along the parabola $y^2 = x$.
- Evaluate $\int_V (2x+y) dV$, where V is the closed region bounded by the cylinder $z = 4 - x^2$ and the planes $x = 0, y = 0, y = 2$ and $z = 0$.
- If $f(z) = \frac{x^3 y (y - ix)}{x^6 + y^2}$, $z \neq 0$, $f(0) = 0$, prove that $\frac{f(z) - f(0)}{z} \rightarrow$ as $z \rightarrow 0$ along any radius vector, but not as $z \rightarrow 0$ in any manner.

OR

Value of z , show that function $z = e^{-y}(\cos u + i \sin u)$, $w = u + iv$ ceases to be analytic.

- Find the Fourier series for the function $f(x) = |x|$, $-\pi \leq x \leq \pi$.

Bio-Statistics (Electives) 2068

Full Marks: 100

Time: 3 hrs.

Attempt any TEN questions where Q. No. 12 is compulsory.

- Define statistics. What are the functions of statistics in biological science? Explain the purpose of learning biostatistics. Also, discuss sources of information in such studies.
- Random samples of size 45 were drawn from a consignment of a new product. The (in gm) of the samples shown as:

33	29	31	32	30	20	26	29	31
31	34	33	27	30	28	32	30	31
29	34	30	31	32	28	27	34	32
27	28	30	26	27	30	28	30	34
29	26	33	33	27	28	34	30	30

Make a discrete frequency table of the above data and compute mean, s.d., C.V., and coefficient of skewness.

- What is contingency table? Give an example of 2×2 contingency table.
In a survey of 70 households exposed to cholera, 60% of the inhabitants were attacked, 30% of the population were inoculated and of these 9 were attacked. Find the person (i) inoculated, not attacked (ii) not inoculated, attacked and (iii) not inoculated but riot attacked.
- The following table shows the age (x) and systolic blood pressure of 10 men
Age (x) (in year) 38 40 42 42 45 47 48 50 50 52
Blood pressure (y) 115 120 125 140 130 128 130 130 140 148

Find the correlation coefficient, the regression line of y on x and obtain the expected systolic blood pressure of a man at age 55.

5. What is principle of least square?

The following table gives the number of bacteria y per unit volume in a culture after x hours.

No. of hours(x)	0	1	2	3	4	5
No. of bacteria per unit volume (y)	32	47	65	92	132	190

Fit a least square curve $y = ab^x$ to the above data and estimate the value of y when $x = 7$.

6. What do you mean by partial correlation and multiple correlation coefficients?

The simple correlation coefficients between yield (X_1), temperature (X_2) and rainfall (X_3) are as:

$r(X_1, X_2) = 0.59$; $r(X_1, X_3) = 0.46$; $r(X_2, X_3) = 0.77$. Calculate (i) the partial correlation coefficient between yield and temperature keeping the effect of rainfall constant (ii) the multiple correlation coefficients with the yield and the linear effect of temperature and rainfall.

7. What do you understand by probability of an event? Give it's a priori and empirical definitions. Among the three groups, A, B, and C of children: A contains 3 boys and 1 girl, B contains 2 boys and 2 girls and C contains 1 boy and 3 girls. One child is selected from each group; find the probability of selecting 1 boy and 2 girls.

8. What do random and non-random sampling mean? Discuss the different types of random sampling.

9. The quality control manager at light bulbs factory needs to estimate the average life of large shipment of light bulbs. The process standard deviation is known to 100 hours. A random sample of 64 light bulbs indicated a sample average life of 350 hours. (i) Calculate the standard error of mean (ii) set up a 95% confidence interval of the true average life of light bulbs in the sample.

10. Ten items chosen at random from the large population and their weights are found to be (in gm) 63, 63, 64, 65, 69, 69, 70, 71, 73, and 73. In the light of these data, discuss the suggestion that the mean weight in population is 65 gm. Use 5% level of significance. [Given that, $t_{0.05, 9} = 2.263$]

11. In an experiment on breeding of peas, out of 640 breeding, a botanist obtained the following result.

Round and yellow = 300, round and green = 140,
angular and yellow = 160, angular and green = 40.

According to genetic theory, such peas should be in the ratio 9 : 3 : 3 : 1.

Are the experimental results comparable with the experimental result?

[Given that, $\chi^2_{0.05, 3} = 7.815$ and $\chi^2_{0.01, 3} = 11.346$]

12. What is meant by the change in gene frequencies? Discuss how systematic processes such as migration, mutation and selection change the gene frequencies.

[15]

Mathematics for BIO (Electives)
(OPT. 311D) 2068

Full Marks: 100

Time: 3 hrs.

Attempt All the questions.

Group "A"

4x 10=40

1. Define second derivative of the function $y = f(x)$. What are the criteria for the function $y = f(x)$ to have the maximum value? Find the second derivative of $y = 3 + 2x - x^4$.

In an auto-catalytic reaction one substance is converted into a new substance, the product, in such a way that the product catalyzes its own formation. We assume that the reaction rate is proportional to the amount x of the product at time t and also proportional to the still available amount of the original substance. If a denotes the original amount of the substance, it decreases to $a - x$ at time t . Therefore

$$\frac{dy}{dx} = kx(a-x) > 0, a \text{ constant.}$$

Find the particular value of x which maximize the reaction rate. [1+1+3+5]

OR

Define derivative of a function $y = f(x)$. How does $\frac{dy}{dx}$ interpret?

Find the derivative of $y = ax^2 + b\sqrt{x} + \int x^c$, a, b, c are constants.

X

with respect to x .

In a metabolic experiment the mass M of glucose decreased according to the formula:

$$M = 4.5 - (0.03)t^2 \quad (t \text{ in hours})$$

- (i) Find the average reaction rate in the interval $t = 0$ to $t = 2$
(ii) Find the reaction rate at $t = 2$. [1+1+3+5]
2. Define anti-derivative, what is the fundamental theorem of integral calculus?

Using this theorem, evaluate $\frac{d}{dx} \int \frac{au-1}{u-1} du$

A substance is distributed continuously over the interval $[0, 3 \text{ cms}]$ of the x -axis, the concentration is given by the function

$$C = 5 + 2x - \frac{1}{2}x^2, \quad (C \text{ is measured in mg/cm}). \text{ What is total mass?}$$

[1+1+3+5]

3. What are independent event? What is the probability of the independent events? At a locus of a certain pair of chromosomes the alleles A and a may occur. The genotypes AA, Aa , as have the probabilities

$$P_{AA} = 0.11, P_{Aa} = 0.37, P_{aa} = 0.52$$

At a locus of another pair of chromosomes the alleles B and b may occur.

The genotypes BB, Bb, bb have the probabilities

$$P_{BB} = 0.35, P_{Bb} = 0.25, P_{bb} = 0.40$$

Find the probabilities of the gene combination (a) AA together with bb (b) Aa together with Bb. [1+1+8]

OR

Define probability of an event. What are the probabilities for impossible and certain event?

In a human population 35 are of blood group A, 47 of blood group B, 21 of blood group AB and 4 of blood group B⁺. What is the probability that a randomly selected individual is of (i) blood group A (ii) blood group B⁺ (iii) blood group AB? [1+2+7]

4. Define differential equation. What is the general solution of a differential equation? Solve the differential equation

$$\frac{dM}{dt} = -aM$$

where M(t) is the number of individuals present at time t and a a constant.

Salt decompose in water into sodium [Na⁺] and chloride [Cl⁻] ions at the rate proportional to its mass. Suppose there are 25 kg of salt initially and 15 kg after 10 hours. How much salt is left after one day? [1+1+3+5]

Group "B"

10x6=60

5. Define a set A and its complement A'. If A and B are two sets, then prove that $(A \cup B)' = A' \cap B'$. [2+4]

OR

Define conjunction of two statements. If p and q be two statements, then present a truth table for $p \wedge q$, the conjunction of p and q. [2+4]

6. Fifteen rabbits were numbered as 1, 2, 3, 15 and they were treated with a drug. We associated a card 'yes' to a rabbit if it reacts to the drug and the card 'no' if it does not react. Is this association a function? Determine the range and the domain. [4+2]

7. Define. Find the limiting value of $\lim_{n \rightarrow \infty} \left(1 + \frac{1}{2x}\right)^x$ [1+5]

8. Show that the series $1 + \frac{d}{1!} + \frac{d^2}{2!} + \frac{d^3}{3!} + \frac{d^4}{4!} + \dots$ converges $\forall d \in \mathbb{R}$.

OR

[6]

Define convergence sequence. Find $\lim_{h \rightarrow 0} \frac{(3h-1)(3h+1)+1}{(3h-1)(h-2)-2}$ [1+5]

9. Find the derivative of $y = \sin x$, by the first principle method. [6]

10. Find the antiderivatives of the functions

$$(i) \int_0^{10} \frac{du}{(u+3)^2} \quad (ii) \int \left(\frac{1}{\sqrt{x}} + x^{\frac{3}{2}} \right) dx. \quad [3+3]$$

11. Find the half-life of the radioactive substance ^{18}F whose decay constant is 0.371 h^{-1} where $h = \text{hour}$. [6]

OR

Consider the function $y = C(e^{-at} - e^{-bt})$ with positive parameters a, b, c and domain $t \geq 0$. Assume that $b > a$, show that (i) $y = 0$ for $t = 0$ (ii) $\lim_{t \rightarrow \infty} y = 0$. [6]

12. For $m = 5$, show that the terms $p(x = 4)$ and $p(x = 5)$ of the poisson distribution are exactly equal. [6]
13. Given the three dimension vectors $\vec{u}, \vec{v}, \vec{w}$ by $\vec{u} = (3, -1, 0), \vec{v} = (-2, 3, 1)$ and $\vec{w} = (5, 2, 4)$ Are any two of the three vectors orthogonal? [6]
14. Solve the differential equation $\frac{dy}{dx} - \frac{3}{x}y = x^3$. [6]

OR

In the bimolecular reaction $2\text{NO}_2 \rightarrow \text{N}_2\text{O}_4$, the concentration $C = [\text{NO}_2] = C(t)$ satisfies the different equation. $\frac{dC}{dt} = -kC^2, k > 0$, a constant, Let $C(0) = C_0$. Find the solution of the differential equation. [6]

ALL THE QUESTIONS PAPER EXAM 2069

Tribhuvan University, 2069

Bachelor Level / III Year / Science

Full Marks: 100

Research Methodology

Time: 3 hrs.

Attempt any TEN questions.

1. What do you understand by 'scientific research process'? Explain various steps involved in the scientific research process.
2. What is review of literature? Explain important aspects of review of literature.
3. What is research design? What consideration should be made to select appropriate research design?
4. Discuss the meaning of research problem. How are they stated? Also discuss the pitfalls of problem stating.
5. Distinguish between a questionnaire and a schedule. Describe different types of schedules, Also discuss the contents of schedules.
6. What is reliability? How is it measured? The reliability coefficient of a test is found as 0.65; mean score as 50 with standard deviation 5. Mr. A obtains a score of 40 on the test. What is his true score? Also compute 95% confidence interval for the true mean.
7. What is sampling? What are the steps to be followed in sampling. It has been estimated by cable companies that 60% of all households of Kathmandu Valley are wired to receive cable TV. You would like to test the claim with 5% error and 95% level of confidence. How large a sample would you require?
8. What is scale? Discuss different types of scale. Also discuss the method of constructing T - scale.
9. Write about the reference citing. Discuss different approaches used in quoting 'Journals', 'Books' and 'Articles'.

10. What is case study? What are its types? Write the sources of data in case study?
11. What is research proposal and what are the major steps in preparing research proposal?
12. What are the basic features of a thesis? Write down the basic steps followed in thesis writing? Also discuss the pitfalls in choosing topics of a thesis Work.

Tribhuvan University, 2069

Bachelor Level / III Year / Sc. & Tech.

Full Marks: 100

Meteorology (MET 331)

Time: 3 hrs.

New Course - Applied Meteorology

Attempt any Three questions from Group A, Two from Group B, Three from group C and Two from Group D.

Group A: Agriculture Meteorology

1. Define plant physiology and animal physiology. Why agriculture meteorology is important for plant physiology. [3+7]
2. Discuss briefly the basic process of photosynthesis. Give the chemical equation of photosynthesis and discuss the effect of temperature and carbon dioxide concentration on photosynthesis. [3+3+4]
3. Describe the role of soil moisture and wind on plant growth. [10]
4. What is agricultural climate? Which type of agricultural climate is important for apple and sugarcane product? [6+4]

Group B: Aviation Meteorology

5. What are the factors affecting horizontal visibility? Write its importance in aviation meteorology. [5+5]
6. Explain the importance of meteorological phenomena in aviation. Write briefly the meteorological aspects of ICAO. [6+4]
7. Write short notes on any TWO of the following:
 - a. Cautionary meteorological reports
 - b. Meteorological aspects of flight planning
 - c. PANSMET
 - d. Microburst [5+5]

Group C: Air Pollution Meteorology

8. What is air pollution? Describe the sulphur and nitrogen containing compounds in the air pollutants. [2+3+5]
9. What do you understand by pollution monitoring? Describe the effect of air pollutants on plants. [2+4+4]
10. Describe the effect of air pollutants on human beings, animals, plants and materials. [10]
11. Write short notes on any TWO of the following:
 - a. Ekman spiral
 - b. Turbulence of boundary layer
 - c. Atmospheric diffusion