



# UNIVERSITY OF THE PUNJAB

Part-II A/2017  
Examination:- M.A./M.Sc.

Roll No. ....

Subject: Space Science (New Course)  
PAPER: I (Astrophysics and Cosmology)

TIME ALLOWED: 3 hrs.  
MAX. MARKS: 100

*NOTE: Attempt any FIVE questions selecting at least TWO questions from each section. All questions carry equal marks.*

## Section I

- 1 a. Write a comprehensive note on Cepheid and RR Lyrae stars.  
b. Explain the H-R Diagram for the classification of stars.
- 2 a. What do you mean by Nova and Super Nova?  
b. Distinguish the white dwarf, black dwarf and brown dwarf.
- 3 a. Write a note on Pulsating Variable stars.  
b. What is planetary nebula? Explain its formation.
- 4 a. What are the main sequence stars? Explain open and globular clusters of stars.  
b. Explain structures and characteristics of red giants.

## Section II

- 5 a. State and Explain Hubble's law.  
b. What is CMBR? How it is measured?
- 6 Explain the possible geometries, age and evolution of the Universe.
- 7 Discuss Black holes in detail, write a good paragraph on latest research findings on Black holes.
- 8 Explain the following
  - a. Big Bang Theory
  - b. The Acceleration equation
- 9 State and Explain Cosmological Principle. Write Cosmological Constant with Equation.

# UNIVERSITY OF THE PUNJAB



Part-II A/2017  
Examination:- M.A./M.Sc.

Roll No. ....

Subject: Space Science (Common)  
PAPER: II Electromagnetic Waves and Space Plasma (Old Course)  
Electrodynamics and Space Plasma (New Course)

TIME ALLOWED: 3 hrs.  
MAX. MARKS: 100

**NOTE: Attempt any FIVE questions, at least TWO questions from each section. All questions carry equal marks.**

## SECTION -I

- Q-1 By using Electromagnetic Field Tensor, Prove that anytwo Maxwell's Equations are Lorentz invariant ? 20
- Q.2. Discuss the characteristic of an Electromagnetic Wave when propagating in Conducting Medium. 20
- Q.3. Discuss the concept of conductors and dielectric in electromagnetic field theory also discuss the concept of penetration depth. 20
- Q.4 a) Discuss Electromagnetic Wave equations by involving the concept of scalar potential and vector potential. 15
- b) In free space,  $E(z,t) = 500\cos(\omega t - \beta z) \hat{i}$  v/m and  $H(z,t) = 2.77\cos(\omega t - \beta z) \hat{j}$
- Calculate time average Poynting vector. 5

## SECTION-II

- Q.5. a) Define Plasma and discuss concept of temperature in plasma. 6
- b) Discuss Debye Shielding and calculate Debye length . 14
- Q.6. Prove that drift velocity in varying electric field is given by 20
- $$V_E = \frac{E \times B}{B^2} \left( 1 - \frac{\kappa^2 r_L^2}{4} \right) \quad \text{where } \kappa \text{ is wave vector and } r_L \text{ is larmour radius.}$$
- Q.7. Discuss in detail the classical treatment of dielectric material and calculate the value of dielectric for a plasma. 20
- Q.8 Discuss briefly only two topics 10,10
- a) Electron Plasma Oscillation b) Sound waves in plasma c) Cutoff and Resonances for X-wave
- d) Drift velocity due to curved B field.



# UNIVERSITY OF THE PUNJAB

Part-II A/2017  
Examination:- M.A./M.Sc.

Roll No. ....

Subject: Space Science (Old & New Course)  
PAPER: III (Telecommunication and Satellite Communication)

TIME ALLOWED: 3 hrs.  
MAX. MARKS: 100

**NOTE: Answer any FIVE questions at least TWO questions from each section.  
All questions carry equal marks. Draw diagrams where necessary.**

Question No. 1: Section 1 (20 Marks)

- a) What is the benefits of Parabolic Antenna, what is its Gain formula? [5]
- b) What is the impact of Noise bandwidth on the overall performance of a communication system? [5]
- c) What is meant by 3-dB Bandwidth? What is its significance? [5]
- d) What are the techniques of Frequency re-use being applied in modern communication systems [5]

Question No. 2: (20 Marks)

- a) Define Spread Spectrum Technique with its various Types and applications [10]
- b) Write a brief note on Synthetic Aperture Radar? [5]
- c) What is Signal encoding and why it is done? [5]

Question No. 3: (20 Marks)

- a) What is the difference between Manchester coding and differential Manchester coding [10]
- b) Write a detailed note on different propagation effects on mobile communication [10]

Question No. 4: (20 Marks)

- a. Write a note on FM, PM modulation schemes [6]
- b. What are the MESH and STAR network topologies, their block diagrams and usage? [8]
- c. Draw a comparison between Satellite communication and optical fiber communication [6]

Question No. 5: Section-II (20 Marks)

- a) Explain the sub satellite point. [4]
- b) What is SFD and Effective SFD? What is its effect on communication [8]
- c) What is the TT&C subsystem of a Satellite, write its function with diagram [8]

Question No. 6: (20 Marks)

- a) What is n-body problem? Describe any three perturbations with diagrams, their impact on orbits and housekeeping mechanism to address such problems. [10]
- b) For the location determination of a satellite, how elevation and azimuth angles are calculated? [10]

Question No. 7: (20 Marks)

- a. Define space division multiple access. [5]
- b. Determine the symbol rate that can be carried in a 24 MHz transponder. Assume a roll off factor of 0.2 [5]
- c. Give the application of Iridium satellite systems [5]
- d. Explain TT&C Subsystem of a communication satellite with block diagrams [5]

Question No. 8: (20 Marks)

- a) Explain the calculation of combined uplink and downlink C/N ratio [8]
- b) Give a brief account of VSAT systems [6]
- c) Explain the objectives, principles and applications of GPS Satellites System [6]

Question No. 9: (20 Marks)

- a) Distinguish mean anomaly and true anomaly [8]
- b) Distinguish geostationary and geosynchronous satellite. [6]
- c) What is meant by Hohmann transfer orbit? [6]



# UNIVERSITY OF THE PUNJAB

Part-II A/2017  
Examination:- M.A./M.Sc.

Roll No. ....

Subject: Space Science (Old & New Course)  
PAPER: IV (Space Systems and their Applications)

TIME ALLOWED: 3 hrs.  
MAX. MARKS: 100

**NOTE: Attempt any FIVE questions. All questions carry equal marks.**

- |         |   |    |
|---------|---|----|
| Q-1 (a) | Give an overview of Aerospace System and discuss the role of AEROSPACE MANAGEMENT in aerospace industry.  | 10 |
| (b)     | What do you understand by PRE-LAUNCH activities. Discuss the series of tests involved in it?  | 10 |
| Q-2 (a) | What is an ORBITAL SLOT. What are the basic requirements for the acquisition of orbital slot?   | 10 |
| (b)     | Define CRITICAL STRUCTURAL PHASES of a satellite. How a satellite undergoes its different phases?   | 10 |
| Q-3 (a) | How the communication of a satellite is affected by SUN'S INTERFERENCE.   | 10 |
| (b)     | How a satellite is injected into its FINAL ORBIT?   | 10 |
| Q-4 (a) | How a satellite is affected by SOLAR RADIATION PRESSURE?  | 10 |
| (b)     | State and prove KEPLER's Second law?  | 10 |
| Q-5     | What do you understand by ORBITAL PERTURBATION. What are the different types of perturbations and what are the Main causes for orbital perturbations? | 20 |
| Q-6     | Prove mathematically how the EXHAUST VELOCITY of a rocket is related to the combustion temperature and molecular weight of the propellant.            | 20 |
| Q-7 (a) | What is a SPACE PROBE. Describe its different modules and components?   | 10 |
| (b)     | Write down the CIVIL and MILITARY applications of a satellite?  | 10 |
| Q-8     | Write in detail the overall working of FENGYUN Meteorological satellite?  | 10 |
| Q-9     | Write notes on any TWO of the following   | 20 |
|         | i. BADR-B   |    |
|         | ii. Launch Vehicles   |    |
|         | iii. Attitude and Orbital Control Subsystem (AOCS)  |    |



# UNIVERSITY OF THE PUNJAB

Part-II A/2017  
Examination:- M.A./M.Sc.

Roll No. ....

Subject: Space Science (Old & New Course)  
PAPER: VI (Geographic Information System)

TIME ALLOWED: 3 hrs.  
MAX. MARKS: 100

**NOTE: Attempt any FIVE questions. All questions carry equal marks.  
Draw diagrams where necessary.**

1. What is Topology ? Explain different Topological errors in a GIS. Explain components and architectural design of GIS .  
(2, 8, 10)
2. What is a Decision Support System? Explain map components of GIS. Why are Customization software and automation process becoming popular?  
(5, 7, 8)
3. How GIS can help in Urban Planning in Pakistan ? What is the role of Enterprise GIS in urban planning and Management ?  
(10, 10)
4. What are Ortho-photographs?. Explain the working of stereoscopic plotting instruments. Explain data collection phases in GIS,  
(4, 4, 12)
5. What is the difference in working of GPS and DGPS? Explain different error sources in GPS..  
(10, 10)
6. What is Land Tenure System and Land Registration process? Explain Khasra Number., Mouza, Patwar circle , Qanoon Goi, Mussavie and Latha..  
(8, 12 )
7. What are coordinate systems and Projection System? Discuss UNIVERSAL TRANSVERSE MERCATOR (UTM) projection. How UTM is different from the TRANSVERSE MERCATOR Projection?  
(5, 5, 10)
8. Explain Network and Object Oriented Model. What is RELATIONAL DATA MODEL? Discuss techniques of NORMALIZATION in RELATIONAL DATA MODEL.  
(10, 2, 8)
9. Write a comprehensive note in TWO of the followings:  
(10, 10)
  - (a) GOID and DATUM
  - (b) Stereoscopic parallax and Aero triangulation
  - (c) Internet GIS
  - (d) Geometric Dilution of precision (GDOP)