UNIVERSITY OF THE PUNJAB

Part-II A/2018
Examination:- M.A./M.Sc.

Roll No. .....

Subject: Space Science **TIME ALLOWED: 3 hrs.**
PAPER: I (Astrophysics and Cosmology) **MAX. MARKS: 100**

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

Section-I

Q1. (a) Write a comprehensive note on main sequence stars. [10]
(b) Explain different types of variable stars. [10]

Q2. (a) Write a note on white dwarf. [10]
(b) Explain CNO and P-P cycle for the energy generation in stars. [10]

Q3. (a) Explain structure and characteristics of red giants. [10]
(b) Explain the process of star formation. [10]

Q4. (a) Write a note on neutron star. [10]
(b) What are supernovae? Explain type-I and type-II supernovae. [10]

Section-II

Q5. What is cosmological principle? Explain three possible geometries of the Universe in detail. [20]

Q6. Derive the Friedmann equation in Newtonian form.

Q7. Derive the fluid equation and equation of state for the Universe. [20]

Q8. (a) State and explain Hubble's law. [10]
(b) Write a note on Cosmic Microwave Background. [10]

Q9. Write notes on any two of the following: [10+10]

(i) Schwarzchild metric
(ii) Gravitational red shift
(iii) Nucleosynthesis

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Examination:- M.A./M.Sc.

Roll No. .....

Subject: Space Science **TIME ALLOWED: 3 hrs.**
PAPER: II (Electrodynamics and Space Plasma) **MAX. MARKS: 100**

NOTE: Attempt any 5 questions by selecting at least 2 questions from each section. Try to be focused and give only precise answers, of the asked questions.

SECTION-I

Question No 1 **(15+5=20)**

a) Find the value of intrinsic impedance when neither conductivity nor dielectric constant is ignored. Also prove that in case of conducting media the attenuation is directly proportional to square root of frequency.

b) In free space,

$$E(z, t) = 70 \text{ Cos } (\omega t - \beta Z)\ \mathbf{a}_x \text{ V/m}$$

Calculate the average power crossing a circular area of radius 2.5 meters in the plane z-component.

Question No 2 **(20)**

What is mean by depth of penetration & discuss Qualitative measurement also find a relationship between wavelength and depth of penetration.

Question No 3 **(20)**

Explain the concept of scalar potential and vector potential and explain how wave equations can be expressed in terms of scalars potential and vector potential?

Question No 4 **(20)**

What is Poynting Theorem? Prove that net inward power flux supplied by the field over the surface S must equal to the time rate of increase of electromagnetic energy inside the volume V plus total ohmic losses within the volume.

SECTION-II

Question No 5 **(20)**

What is mean by Orbit Theory? Prove that when grad B field is parallel to B then magnetic moment is invariant. Also define mirror point also discuss under which condition charge particle will not trap.

Question No 6 **(20)**

Prove that drift velocity in case of varying electric field is directly proportional to Larmour radius.

Question No 7 **(20)**

State and explain fluid equation of motion and discuss stress tensor.

Question No 8 **(20)**

Prove that phase velocity and group velocity are same for an Ion Acoustic wave.

Question No 9 **(20)**

Find an expression for upper hybrid frequency when electrostatic oscillations are perpendicular to magnetic field.

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Part-II A/2018
Examination:- M.A./M.Sc.

Roll No. .....

Subject: Space Science
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.

Section-I

Question No. 1: **(20 Marks)**

a) What is multiplexing? Explain FDM and TDM [10]

b) Calculate total attenuation if 0.3 is loss stage, 0.7 is loss circuit and 0.05 is loss component. Find output voltage if the input voltage is 5V. [10]

Question No. 2: **(20 Marks)**

a) Explain in brief following terms with the help of diagram

I. Simplex/Duplex [10]

II. AM/FM

b) Briefly explain and compare different transmission media types. [10]

Question No. 3: **(20 Marks)**

a) Describe principles of analog to digital conversion. [10]

b) Elaborate Synchronous and Asynchronous Transmission techniques. [10]

Question No. 4: **(20 Marks)**

a) Discuss briefly why it is common to use modulated high-frequency carriers to broad cast radio and TV signals, rather than sending the signals directly. [10]

b) Describe sidebands in time and frequency domains. [10]

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Section-II

Question No. 5: **(20 Marks)**

Compute the unknown parameters

Orbit Type	Elliptical	Circular
Orbital Velocity, v		
Orbital Period, T		
Mean Motion, n		
Escape Velocity, V_{esc}		

Question No. 6: **(20 Marks)**

a) A satellite is in a circular orbit at an altitude of 250 km. It needs to move from its current inclination of 43° to 52°. What delta-V does this transfer require? [8]

b) Explain any four perturbations with diagrams and detail their impact on different orbits. [12]

Question No. 7: **(20 Marks)**

a) A geostationary satellite carries a C-band transponder which transmits 15 watts into an antenna with a gain of 32 dB. An earth station is in the center of the antenna beam from the satellite, at a distance of 38,500 km. For a frequency of 4.2 GHz, calculate the power flux density at the earth station. [10]

b) Elaborate ground station parameters and VSAT. [10]

Question No. 8: **(20 Marks)**

a) Elaborate time division and frequency division multiple access techniques. [10]

b) Describe On-board Data Handling (OBDH) subsystem. [10]

Question No. 9: **(20 Marks)**

a) Elaborate satellite look angles in satellite visibility. [8]

b) Indicate all six orbital elements using diagrams. What is the main purpose of each element in the determination of an object's location in a specific orbit? [12]

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Part-II A/2018
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Roll No. .....

Subject: Space Science
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)	What is the basic architecture of the SYSTEM PROGRAM of a satellite?	10
(b)	Write a brief description of SATELLITE COMPOSITION?	10
Q-2 (a)	What is SOLAR RADIATION PRESSURE. How a communication satellite is affected by it. Discuss all the factors?	10
(b)	Describe the various CRITICAL STRUCTUTAL PHASES of a communication satellite?	10
Q-3 (a)	Differentiate between Launch and Orbital window of a satellite?	10
(b)	What is Atmospheric Drag Force. Discuss various factors on which ATMOSPHERIC DRAG depends?	10
Q-4	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-5 (a)	What is the importance of ESTIMATING the mass of a SATELLITE. Calculate the mass of a typical satellite system?	10
(b)	Write advantages and disadvantages of a LIQUID PROPELLED rocket?	10

PTO

Q-6	Explain the full working of GPS calculating the position. What are its different segments?	20
Q-7 (a)	What is the concept of bulk-head in a MULTI STAGE ROCKET?	10
(b)	What are the salient features of BADR-B?	10
Q-8	Write in detail the overall working of Geosynchronous Meteorological System (GMS)?	20
Q-9	Write notes on any TWO of the following i. Significance of Satellite Orbits ii. Satellite Mission Control Activities iii. Strategic Defense Initiative (SDI)	20

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Subject: Space Science **TIME ALLOWED: 3 hrs.**
PAPER: V (Geographic Information System) **MAX. MARKS: 100**

Attempt any FIVE questions. All questions carry equal marks.

1. What are benefits of Land Ownership records and Utility services information system? Explain how GIS can assist in urban planning of existing and future developments in Pakistan. (10, 10)

2. Describe types of Map Projections on the basis of developable surface. Discuss UNIVERSAL TRANSVRESE MERCATOR (UTM). How UTM is different from the TRANSVRESE MERCATOR Projection. (10,10)

3. What are GPS and DGPS ? Explain working of DGPS and GPS error sources. Describe three applications of DGPS. (6,8, 6)

4. What is GEOGRAPHICAL INFORMATION SYSTEM (GIS)? Explain Geographic data formats. Explain Primary and secondary geographic data capturing. .(3,5,12)

5. What is Topology? How does it stores area boundaries and reduces the chances of error in data? Write down the improvement in Topology for Object Oriented Data Model. (3,8,9)

6. What is Generalization and explain methods of Generalization . Explain the methods of VECTORIZATION and RASTERIZATION . What is metadata and Explain basic elements of metadata standards (7,8,5)

7. Explain Project Planning and Aero triangulation process in detail.. What is Stereoscopic Parallax? How Parallax is measured using two Overlapping Photographs? (6, 4,10)

8. What is GEODATIC DATUM? Write a detailed note on Map Scales and MAP COMPONENTS . Explain MAP PROJECTION PARAMETERS. (3, 10,7)

9. **Write a comprehensive note on any TWO of the followings:** (10,10)

   1. Triangulated Irregular Network (TIN)
   2. Role of Location based services in GIS
   3. Overlay and Neighbored Analysis
   4. Enterprise GIS in Urban planning and Management
   5. Internet GIS