UNIVERSITY OF THE PUNJAB

Roll No. .....

M.A./M.Sc. Part – II Annual Examination – 2020

Subject: Space Science (New Course) Paper: I (Astrophysics and Cosmology) Time: 3 Hrs. Marks: 100

NOTE: Attempt only FIVE questions in all by selecting at least TWO questions from each section. All questions carry equal marks.

SECTION I

1. (a) Explain the interstellar medium and formation of stars. (10 marks)
   (b) What are red giant star. Explain. (10 marks)

2. (a) Explain different phases of star life. (10 marks)
   (b) Describe the formation of thin shell in the cut and paste technique of wormholes. (10 marks)

3. (a) Explain different types of stellar energy. (10 marks)
   (b) Describe various types of stellar structures through H-R diagram. (10 marks)

4. (a) Explain binary stars and their evolution. (10 marks)
   (b) Write atleast one method to find the distance between stars and galaxies. (10 marks)

SECTION II

5. Write a note on the uses of cosmological constant. Also explain Newtonian cosmology. (20 marks)

6. (a) Solve exactly the Friedmann equations for the de Sitter universe. (10 marks)
   (b) How spectroscopic binaria came into being. Explain (10 marks)

7. (a) How the evolution of our cosmos occurs during early time expansion. (10 marks)
   (b) Explain postulates of relativity. Hence write the uses of equivalence principle. (10 marks)

8. Explain the pre main sequence phase. Hence write an expression for the proper time. (20 marks)

9. Understanding the nature of dark energy and dark matter is the main open question of today cosmology. Write down a small list of other open problems of cosmology. (20 marks)

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M.A./M.Sc. Part – II Annual Examination – 2020

Roll No. .....

Subject: Space Science (New Course)

Paper: II (Electrodynamics and Space Plasma)

Time: 3 Hrs. Marks: 100

NOTE: Attempt only FIVE questions in all by selecting at least TWO questions from each section. All questions carry equal marks.

SECTION –I

Q-1 State Maxwell's Equations and explain how he introduced the concept of displacement current. What is the outcome of Maxwell's equations? 20

Q.2. Prove that any two Maxwell's equations are Lorentz invariant by using Electromagnetic field Tensor. 20

Q.3. Discuss the concept of conductors and dielectric in electromagnetic field theory and discuss propagation of an electromagnetic wave for good conductors. 20

Q.4 State and prove Poynting theorem and explain the terms involve in it. 20

SECTION-II

Q.5. Prove that magnetic moment is invariant in time varying magnetic field and also discuss physical significance. 20

Q.6. Discuss the behavior of plasma particle in Uniform electric and magnetic field. 20

Q.7. Under what condition the charge particle may not trap. Also find an expression for magnetic moment. 20

Q.8 Prove that $\omega^2_h = \omega^2_c + \omega^2_p$ 20

Q.9 Discuss cutoff and resonances for right handed and left handed circularly polarized wave when electromagnetic waves are perpendicular to Bo. 20

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M.A./M.Sc. Part – II Annual Examination – 2020

Roll No. .....

Subject: Space Science (New Course)

Paper: III (Telecommunication and Satellite Communication) **Time: 3 Hrs. Marks: 100**

NOTE: Attempt only FIVE questions in all by selecting at least TWO questions from each section. All questions carry equal marks.

Section – I

Q.1. a) What is communications system? Briefly explain elements of a communications system? **(10)**

b) Discuss the following with examples: **(10)**
   i. Simplex
   ii. Full/Half Duplex

Q.2. a) Define modulation and why this is important? **(4)**

b) Discuss the Amplitude modulation of digital signals? **(6)**

c) To achieve 85 % modulation of a carrier of V_C 50 V, what amplitude of the modulating signal V_m is needed? **(10)**

Q.3. a) Draw the block diagram of SSB transmitter and explain the function of all of its elements. **(4+6)**

b) An FM transmitter has an 8.6-MHz carrier oscillator and frequency multipliers of 2, 3, and 4. What is the output frequency? **(10)**

Q.4. a) Briefly explain pulse amplitude modulation (PAM)? **(10)**

b) Write a note on pulse code modulation (PCM)? **(10)**

Q.5. a) What should be the minimum length of an antenna? What is the relation of antenna length with the frequency? **(2+2)**

b) Calculate the length of a dipole antenna for a frequency of 18MHz? **(6)**

c) Explain three ways of radio wave propagation? **(10)**

Section – II

Q.6. a) Define following **(2×5=10)**
   i. Period of satellite
   ii. Perigee and apogee
   iii. Angle of inclination
   iv. Angle of elevation
   v. Sub-satellite point (SSP)

b) What is 2-body problem? Explain **(10)**

Q.7. What are classical orbital elements? Explain all of them with the help of diagram. **(20)**

Q.8. a) A Satellite orbiting earth with pericenter at 200 km altitude and apocenter at 2000 km calculate the semi major axis a and eccentricity e **(10)**

b) Derive vis-viva equation? **(10)**

Q.9. a) What is multiple access technique? Explain TDMA? **(10)**

b) What is the transponder capacity in terms of 64 kbit/s speech channels? How many channels can each earth station transmit? **(10)**

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M.A./M.Sc. Part – II Annual Examination – 2020

Roll No. .....

Subject: Space Science (New Course)
Paper: IV (Space Systems and their Applications)

Time: 3 Hrs. Marks: 100

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

Q-1 (a)	Discuss the ground support earth segment that is needed to perform tests for pre-launch of a satellite?	**10**
(b)	What is the role of an operational management for the working of a communication satellite?	**10**
Q-2 (a)	What do you understand by pre-launch activities of a satellite. Discuss various tests conducted in that level for a satellite?	**10**
(b)	How atmospheric drag affects the overall performance of a satellite?	**10**
Q-3 (a)	What is Range Rate method. How it is used to calculate the distance between the satellite and TT&C station?	**10**
(b)	Mathematically prove "The squares of the orbital period of the planet (satellite) is proportional to the cube of the semi major axis of their orbits".	**10**
Q-4 (a)	How can you differentiate between an Orbital and Launch window of a satellite?	**10**
(b)	How a satellite changes its longitude in its orbit. Prove that the change in velocity (Δv) is dependent on the longitudinal drift rate λ^*?	**10**
Q-5 (a)	What is the importance of mass estimation. Calculate the primary power mass of a satellite?	**10**
(b)	Write advantages and disadvantages of a liquid propelled rocket?	**10**
Q-6	Discuss various steps involved in the construction of PAKSAT- 1R. What is the concept of Know How and Technology Transfer (KHTT) in it?	**20**
Q-7 (a)	How a Space Shuttle is taken to its launching pad. Discuss various time wise procedures in launching a shuttle?	**12**
(b)	Write down salient features of the families of Solid Propellants?	**08**
Q-8	Write in detail the overall working of METEOSAT Meteorological satellite?	**20**
Q-9	**Write notes on any TWO of the following**	**20**

i. Kinetic Energy Anti Satellite Weapon System (KEASAT)
ii. COSPAS-SARSAT
iii. Solar Radiation Pressure

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M.A./M.Sc. Part – II Annual Examination – 2020

Roll No. .....

Subject: Space Science (New Course)
Paper: VI / VI-N14 (Geographic Information System) (GIS)

Time: 3 Hrs. Marks: 100

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

1. What is a Decision Support System? Explain map components of GIS. Why are Customization software and automation process becoming popular? (5, 7, 8)

2. Discuss techniques of NORMALIZATION in Relational DATA MODEL. Also Explain JOINING and RELATING of Data Tables. (4,12,4)

3. Define SLOPE and ASPACT in context of GIS. How these quantities can be measured using different ALOGRITHMS? (8,12)

4. What is a MAP PROJECTION? Discuss UNIVERSAL TRANSVERSE MERCATOR (UTM) projection. How UTM is different from the TRANSVERSE MERCATOR Projection? (5,10,5)

5. What are Land Tenure and Land Information System? Discuss the role of GIS in cadastral mapping. Explain the cadastral mapping in Pakistan. (5, 5,10)

6. What is the GEO-CODING and GEO-REFERENCING in GIS? How do we encode locational information with example? (10,10)

7. Explain Project Planning and Aero triangulation process in detail. Explain Flight planning in Photogrammetry and give at least one example. (10,10)

8. What is NAVSTAR GLOBAL POSITIONAL SYSTEM (GPS)? Explain how a Global Positioning System is used to measure Position of a User on the Earth. Explain its three most useful applications. (4,12,4)

9. Write a comprehensive note on any TWO of the followings: (10,10)
   Triangulated Irregular Network (TIN)
   Advantages of GIS and limitations of GIS
   Internet GIS
   Components of GIS