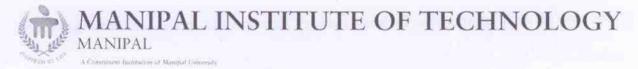
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## IV SEMESTER B.TECH. (OPEN ELECTIVE)

## **END SEMESTER EXAMINATIONS, APRIL 2018**

## SUBJECT: FUNDAMENTALS OF ASTRONOMY & ASTROPHYSICS [PHY3281]

## REVISED CREDIT SYSTEM

TIME	3 HOURS	MAX. MARKS	MAX. MARKS: 50	
Note:	Missing data may be suitably assumed $G = 6.67 \times 10^{-11} \text{ m}^3/\text{kg/s}^2$ $R_{\odot} = 7 \times 10^8 \text{ m}$ $1 \text{AU} = 1.5 \times 10^{11} \text{ m}$	$M_{\odot} = 2 \times 10^{30} \text{ kg}$ $L_{\odot} = 3.9 \times 10^{26} \text{ W}$ $c = 3 \times 10^8 \text{ m/s}$		
JE'	$m_p = 1.67 \times 10^{-27} \text{ kg}$ $e = 1.602 \times 10^{-19} \text{ C}$	$m_e = 9.1 \times 10^{-31} \text{ kg}$ $1 \text{ Jy} = 10^{-26} \text{ Wm}^{-2} \text{Hz}^{-1}$		
1A.	What is color index? How it is related to surface	temperature of stars?	[2M	
1B.	What is H – R diagram? Explain its significance.		[3M]	
iC.	A star at 4 pc has an apparent magnitude 2. W	hat is its absolute magnitude? Also, find the		
	luminosity of the star. Given: Apparent magnitu	de of Sun is - 26.73	[5M	
2A.	What is solar neutrino problem? Explain.		[2M	
2B.	Prove that gravitational potential energy is not the	e source of energy in Sun. Given: Age of Earth		
	is 4 billion years.		[3M	
2C.	Derive approximate expression for electron deg	eneracy pressure.	[5M	
3A.	If fusion is the source of energy, what is the rate at which Sun is converting mass into energy?		[2M	
3В.	Explain the process of formation of heavier nuclei via neutron capture.		[3M	
3C.	Briefly explain evolution off the main sequence of stars.			
4A.	It is believed that pulsars are rotating neutron st	ars. On what observational bases astronomers		
	have been able to derive this conclusion?		[2M	

4B.	Obtain the relativistic expression for kinetic energy and show that in non-relativistic system, it	
	reduces to $mv^2/2$ .	[3M
4C.	Consider a rotating neutron star with a mass $M=2\ M_{\odot},$ and a radius $R=15\ km,$ a period $P=15$	
	0.1 s, and a rate of change of the period $dP/dt = 3 \times 10^{-6}$ s/yr. Find (a) the kinetic energy, (b)	
	the rate at which the kinetic energy is decreasing, and (c) the lifetime of the pulsar if it loses	
	energy at this rate.	[5M]
5A.	Compare the light-gathering power of the naked eye, with a pupil diameter of 5 mm, to that of	
	a 1 m diameter optical telescope and express your answer in magnitude difference.	[2M]
5B.	Two radio sources in the Orion Nebula are 500 pc from us and are separated by 0.1 pc. How	
	large a telescope would you need to distinguish the sources at a wavelength of 21 cm?	[3M]
5C.	Based on Newtonian gravitation, explain the concept of open and closed universe.	[5M]
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