SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

Summer Examination 2020

HVPM's College of Engineering and Technology, Amravati

Department of Electronics & Telecommunication Engineering

Bachelor of Engineering Sem :- VII

Subject : SOFC **Code: 7ET3**

Instructions:

1) **Solve any two questions**

2) **All questions carry equal marks**

Que. 1		
a	State and prove Kepler's third law.	2 credit point
b	Explain in brief the concept of noise temperature in satellite link with the help of necessary expression.	2 credit point
c	Explain in brief two-way implementation architecture for VSAT network.	2 credit point
d	Explain with the help of neat diagram the light propagation in parabolic profile graded index fiber. Also state no of supported modes. Enlist the advantages of graded index multimode fiber over step index multimode fiber.	2 credit point
e	Explain with the help of neat diagram 1) stimulated emission, 2) population inversion in laser.	1 credit point
f	Enlist and elaborate performance and compatibility requirement for optical detectors.	1 credit point
Que. 2		
a	Explain in brief Solar Eclipse.	2 credit point
b	Discuss the various parameter to be considered while designing a downloading budget in satellite communication system.	2 credit point
c	Explain in brief the satellite signal acquisition in GPS.	2 credit point
d	when the mean optical power launched into 8km length of the fiber is 120µW, the mean optical power at the fiber output is 3µW. determine 1) overall signal attenuation in dB, assuming no connectors and splices in between. 2) the signal attenuation per kilometer of the fiber 3) the overall signal attenuation for a 10 km optical link using the same fiber with splices at 1Km interval, each giving attenuation of 1dB.	2 credit point
e	Derive an expression for coupling efficiency of LED.	1credit point
f	A germanium PIN photodiode with active dimension of 100 * 500µm has quantum efficiency of 55 % when operating of 1.3µm. the measured dark current at this wavelength is 8nA. Calculate the noise equivalent power and specific detectivity for the device. (Assume that the dark current is a dominant noise source) (Given that $h = 6.624 \times 10^{-34}$ and $e = 1.602 \times 10^{-19}$).	1 credit point

Que. 3		
a	Explain in brief doppler shift.	2 credit point
b	A satellite system has a 4db receiver with the following gains and noise temperature T_{in} = 25K, T_{RF}= 50 K, T_{IF} = 1000 K, T_m = 500K, G_{RF} = 23dB, G_{IF} = 30dB. Calculate the system noise temperature, assuming the mixer has a gain Gm=0dB. Recalculate the system noise temperature when the mixer has 10 dB loss. How can the noise temperature of the receiver be minimized when the mixer has a loss of 10 dB?	2 credit point
c	Explain in brief the principle of GPS position location.	2 credit point
d	Explain with the help of neat diagram, the macrobending and microbending losses in optical fiber.	2 credit point
e	Define and explain the following with reference to LASER 1) Differential external quantum efficiency 2) Internal quantum efficiency 3) External quantum efficiency 4) External power efficiency	1 credit point
f	Explain with the help of neat diagram the principle of operation of germanium avalanche photodiode.	1 credit point
Que. 4		
a	A satellite is an elliptical orbit has a perigee of 1000 Km and an apogee of 4000 km. using mean earth radius of 6378.14 km, find the period of the orbit in hours, minutes and seconds. also find the eccentricity of the orbit(given that $\mu = 3.986004418 \times 10^5$).	2 credit point
b	A satellite is operated at an EIRP of 56 dB W with an output back off BO of 6 dB. The transmitter feeder losses amount to 2dB and the antenna gain is 50 dB. Calculate the power output of TWT amplifier required for full saturated EIRP	2 credit point
c	Explain with the help of neat diagram the principle of operation of VSAT earth station.	2 credit point
d	A relative refractive index difference for an optical fiber, designed for long distance transmission is 1%. Estimate the numerical aperture and solid acceptance angle in air for the fiber when the core refractive index is 1.46. Further calculate the critical angle at core cladding interface within the fiber.	2 credit point
e	The radiative and non-radiative recombination lifetime of minority carrier in the active region of a double heterojunction LED is 60 nsec and 100 nsec respectively. Determine the total carrier recombination lifetime and the power internally generated within the device when the peak emission wavelength is 0.87μm at a drive current of 40 mA. (given that $h = 6.624 \times 10^{-34}$ and $e = 1.602 \times 10^{-19}$).	1 credit point
f	When 3×10^{11} photons each with a wavelength of 0.85μm are incident on a photodiode, on average 1.2×10^{11} electrons are collected at the terminal of the device. Determine the quantum efficiency and responsively of the photodiode at 0.85μm. (given that $h = 6.624 \times 10^{-34}$ and $e = 1.602 \times 10^{-19}$)	1 credit point