TED (15) : 6042

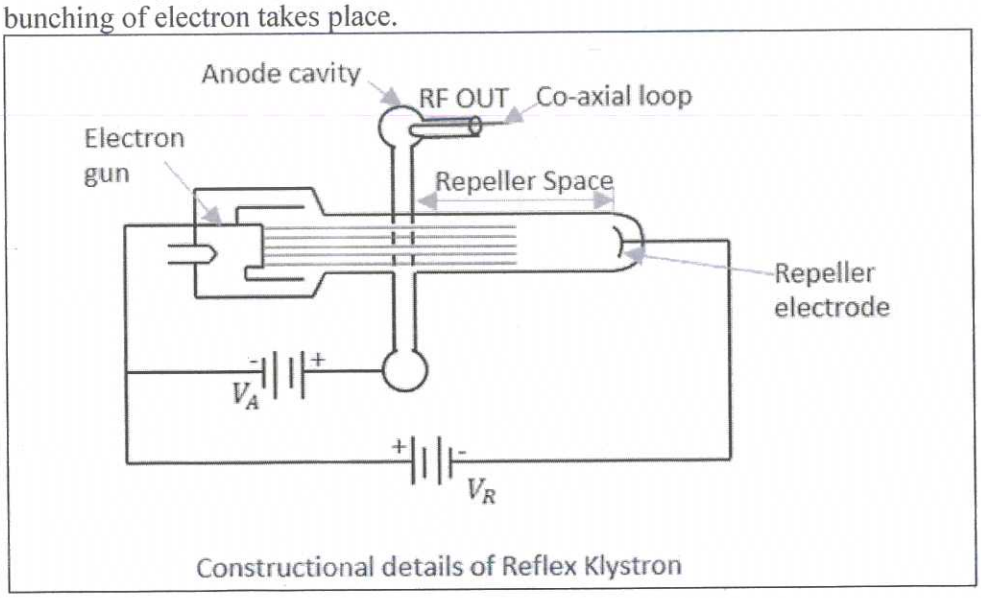
(Revision - 2015)

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY

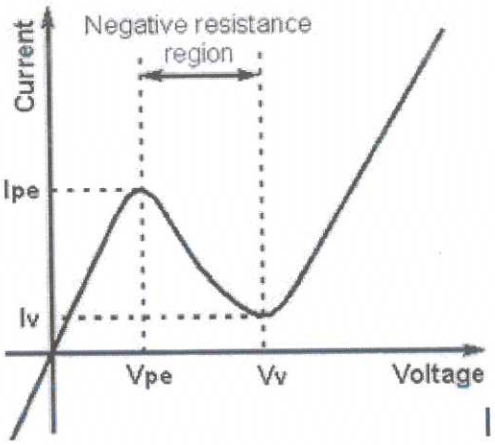
COMMUNICATION SYSTEMS

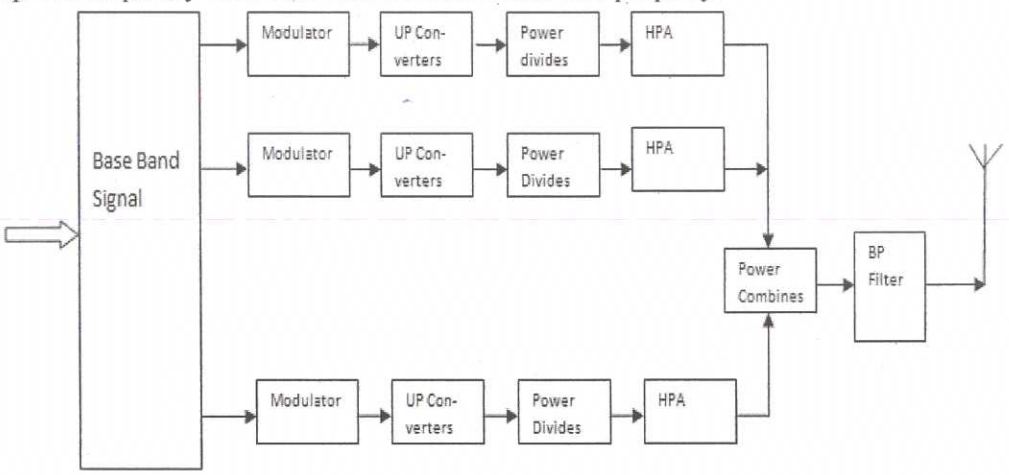
SCHEME OF VALUATION

Qn No.	Scoring Indicator	Split up Score	Sub total	Total
I	**PART : A**			
1	The variation of electron velocity in drift space	2		10
2	Satellite appears stationary with respect to earth	2		
3	Light gathering ability of an optical fiber	2		
4	In cellular system each geographical area is divided into number of hexagonal cells, each providing coverage area to only portion of service area	2		
5	p-i-n photodiode,avalanche photo diode,pn photo diode.	2		
II				5*6 =30
1	The reflex klystron contains a reflector plate referred as repeller instead of output cavity. After passing the gap in the cavity electron travel towards a repeller electrode which is at a high negative potential. The electron never reaches the repeller electrode because of the negative field and return back towards the gap. The RF voltage produced across the gap by cavity oscillation acts on electron to cause velocity modulation. Thus bunching of electron takes place.		6	

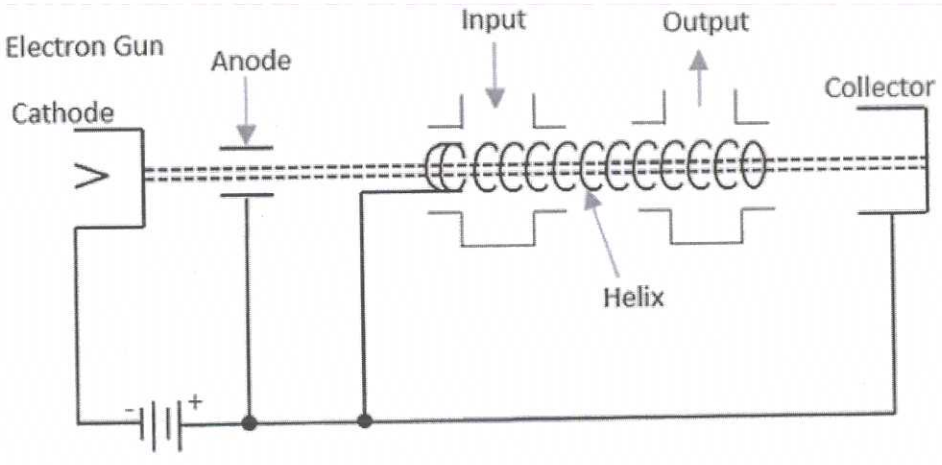


Constructional details of Reflex Klystron

2	When a PN junction is heavily doped ,1000 times more the depletion region width become extremely thin about 1$\bar{0}$ -5 and many carriers punch through the junction even when they do not possess enough energy to overcome the potential barrier. The conduction mechanism in which charge carriers bore through the barrier directly instead of climbing over it is called tunnelling effect or punchthrough effect. In tunnel diode large forward current is produced even when the applied bias is less than 100mV.Tunnel diode are usually fabricated 		6	
3	1. Weather forecasting 2. Radio and TV broadcast 3. Military service 4. Navigation satellite 5. Global telephone 6. Connecting remote area 7. Global mobile communication		6	
4	Advantages of FDMA:if channel is not in use it sit idle, channel bandwidth is relatively narrow, simple algorithm, no need for network timing, no restriction regarding the type of baseband or type modulation. Disadvantages ;the presence of guard band, requires right RF filtering to minimize adjacent channel interference, maximum bit rate per channel is fixed, small inhibiting flexibility in bit rate capability,doesnot differ significantly from analogue system	3 3	6	
5	When the mobile unit travel along a path it crosses different cells. As the frequencies of different cells are different the transfer of calls should be done between different channels or cells. This process is called hand-over or hand-off and the decision of hand-off is taken based on the received signal strength. Hand-off consists of 4 stages,initiation,resource location,execution,completion		6	

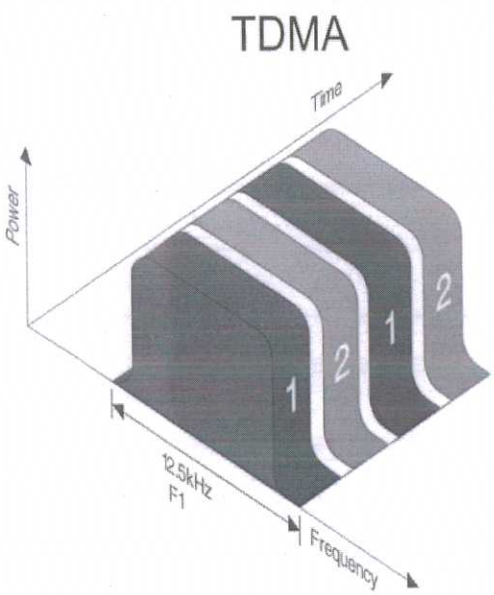
6	Wi-Fi: Wireless technology is alternative to wired technology which is commonly used for connecting devices in wireless mode. Wi-Fi is a genric term that refers to IEEE 802.11,Wi-Fi network connect computers to each other to internet and to the wired network. The term Wi-Fi suggests Wireless Fidelity. Wi-Max: acronym for World wide interoperability for Microwave Acess,single station can serve hundreds of users, much faster deployment of new users comparing wired networks, speed of 10Mbps at 10 KM with line of sight, it is standardized and same frequency equipment should work together.	3 3	6	
7	1. Optical fibers are light weight and smaller in size. 2. As data transmission through optical fiber is in form of light rays the system has no electromagnetic interference. 3. Data transmission rate is high 4. The cost of cable 5. The raw material is abundant on earth 6. Low installation and Handling cost 7. They are not affected by drastic environmental conditions 8. Intermediate amplifiers are not required.		6	
				15*4 =30
III a,	Microwave transmitter, microwave carrier modulates multichannel telephony or TV signals amplifies it to raise the power level to few watts which is radiated out through a directional antenna to the first repeater station at a frequency. The signal to be transmitted must be at uplink frequency. The converter multiply the signal frequency to uplink frequency after it is encoded and modulated properly.  Figure: Microwave Transmitter	9	1	

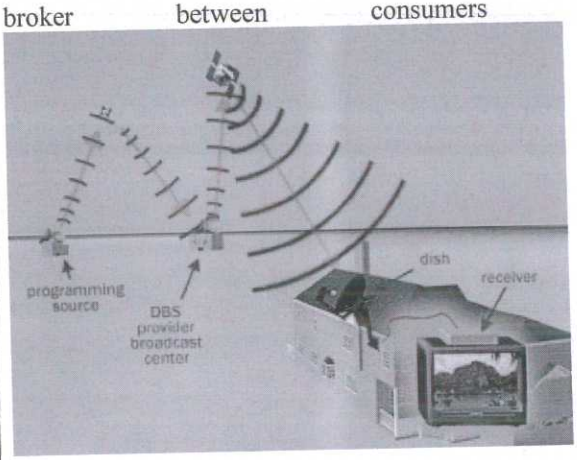
b.	Increased bandwidth availability 1. Improved directivity properties 2. Fading effect and reliability 3. Power requirement are low 4. Transparency property of microwave 5. Identifying objects by non-contact methods 6. Eliminate transit time effect	6		
I V a	TWT: The TWT makes use of a distributed interaction between an electron beam and a travelling wave. To prolong the interaction between an electron beam and RF field it is necessary to ensure that they are both travelling in same direction with nearly the in the same velocity. Thus it differs from klystron in which the electron beam travels and the RF field is stationary. The electron beam travels with a velocity governed by anode voltage. The RF field propagates with velocity equals to velocity of light. Normally slow wave structures are used to retard the RF field like helix or a waveguide arrangement. When applied RF signal propagates around the turns of helix, it produce an electric field at the centre of helix. Rf field propagate with velocity of light.When the electron beam travelling through the helix approximates the rate of advance of axial field then interaction takes place between them.	9	15	

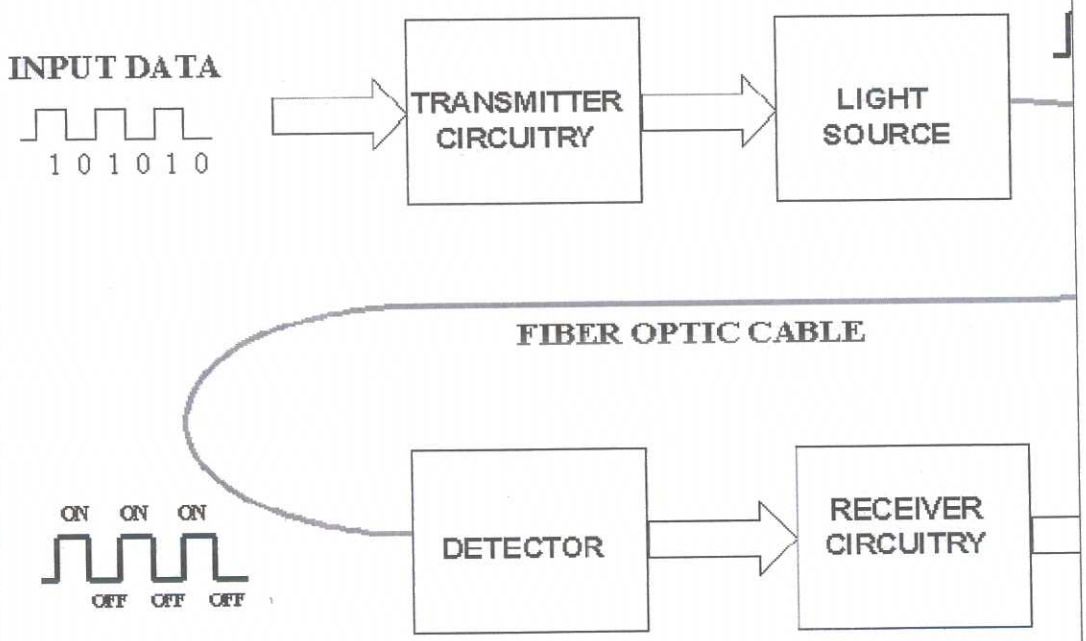


Schematic Electrode Arrangement in TWT

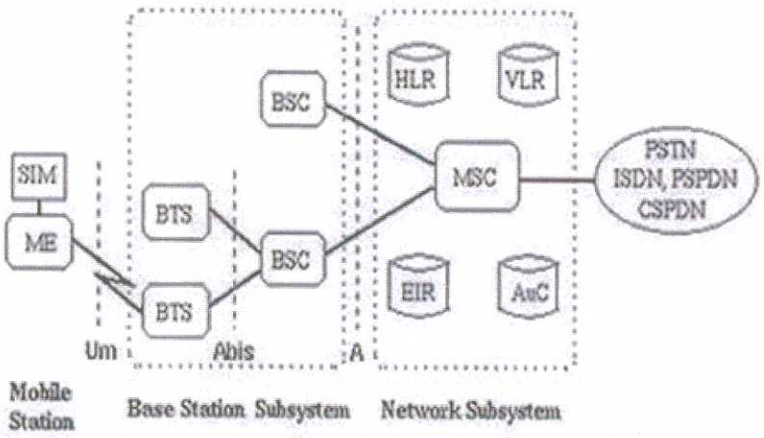
b.	Sectoral horn antenna: When the flaring is done at only one particular direction it is known as sectoral horn antenna. Depending on direction they are of 2 types,E-plane sectoral horn antenna and H plane sectoral horn antenna. Pyramidal horn antenna:A horn antenna with horn in the shape of four-sided pyramid with rectangular cross section. Conical horn antenna: Horn in the shape of cone with circular cross section. If the flaring is done to the walls of circular waveguide.	6		
V a,	T.D.M.A: Improve the spectrum capacity by splitting each frequency into time slots. TDMA allows each user to access the entire radio frequency channel for the short period of call.TDMA share a single carrier frequency with several users where each users makes use of non overlapping time slots. flexible time slots, no frequency guard band required, no need for precise narrow band filters. High synchronization overhead is required. The number of time slots depend on several factors	9 4	15	

b.	 Communication satellite orbits: 1. Inclined orbits: virtually all orbits except those directly above the equator or directly over north and south poles. A satellite in this type of orbit generally has an inclination angle. 2. Polar orbit: when satellite rotates in a path that takes it over north and south poles in an orbit perpendicular to the equatorial planes. The angle of inclination is 90°. 3. Equatorial orbit/Synchronous orbit; when satellite rotate in an orbit directly above equator usually in circular path with an equatorial orbit the angle of inclination is 0°,the orbit is parallel to equator.	6		
VI a,	D.T.H: refers to the satellite television broadcasting process which is actually intended for home reception. D.T.H refers to the reception of satellite signals on a TV with personal dish. It has four main components, programming source, broadcast centre, satellite parabolic dish antenna D.T.H receiver. The programming source provides the channel to the broadcast centre. The channels are broadcasted from the broadcasting centre which is not created by DTH providers. The DTH providers pay other companies like HBO,SONY and so on for the right to broadcast	9		

b.	their channel to the DTH consumers through satellite. The DTH providers acts as a mediator or broker between consumers and programme channels.  G.P.S:The global positioning system is satellite based navigation system constiting of 24 orbiting satellites that are 11000 nautical miles in space and in six different orbital path. The satellite are constantly moving making two complete orbits around the earth in just under 24 hours.GPS consists of 3 segments. 1. The space segment: consist of minimum 24 operational satellite in 6 circular orbits 20,200 KM above the earth at an inclination of 55° .2.The control segment: consist of master control station in Colorado springs with 16 monitor stations and 12 ground antennas located throughout the world. 3. User segment: the GPS receivers. Used for location determining,navigation,tracking,mapping.	6	15	
VII (a)	Optical communication is a type of communication in which light is used as the carrier of information. Transmitter : in this section information bearing input voltage signal is converted into corresponding current values. This current changes the intensity of the light source. The light source may be LED,LASER. The intensity of light source proportional to the input voltage. The light source to fiber coupler couples the light from the source to the optical fiber channel. Optical fiber: An optical fiber is along cylindrical transparent glass structure with circular cross section. The information is transmitted in the form of optical pulses through optical fiber.The light passes through the fiber by using the principle of total internal reflection. Receiver section: In this section fiber to detector interface coupler couples the modulated light to the light detector such as PIN diode,APD. The light density produces a current proportional to the intensity of light from the fiber. This current is converted into voltage which represents the original transmitted information by a current to voltage converter.	9	15	

b.	 On the basis of refractive index profile optical fiber are classified into 2 1. Step index:The refractive index of core is uniform throughout and undergoes an abrupt change at the cladding boundary, attenuation is more,NA varies from 0.14 to 0.5 2. Graded index:The core refractive index is made to vary as a function of the radial distance from the center of the fiber,attenuation is less,NA varies from 0.16 to0.2,they have bandwith of 600Mhz	6		
VII a.	Generally there are three process to obtain LASER. 1. Absorption: The process of transition of atoms from lower level to higher energy level is called absorption. An electromagnetic wave of energy can transfer an atom from ground level to excited level. 2. Spontaneous emission: Electrons in excited state remains there for a short period and fall back to the ground state . When one electron falls back from higher energy level to lower energy level it emits the energy that was absorbed by its during absorption. 3. Stimulated emission: this is the key process of laser beam generation as this process involves in the amplification of light. An electron at an excited state after certain time it falls back to the ground state due to spontaneous emission. If the incident photon is allowed to strike this excited electron before the spontaneous emission process take place there is no chance for this electron or atom to go to the further higher energy level. Then it emits another photon, so two photons are obtained at the output. One which strike the excited atom and other coming out because of the excited atom leaving the higher level. So one photon causes two photons to emit and the light amplification takes place.	9	15	
b.	1. In telecommunication application			

	2. In telephone application 3. In military application like naval, airborne,landbased and undersea systems. 4. In space application 5. In sensor application 6. In undersea transmission cables 7. In broadband and utility industry application	6		
IX a,	G.S.M: although basic architecture of different cellular standards are the same their individual components and configuration may differ, basic components are mobile station, base station subsystem, network subsystem. 1. Mobile station: it consists of the mobile equipment and a smart card called SIM. The SIM provide security and authentication of the subscriber so that the users have acess to the subscribed services. 2. Base station subsystem: the part of the network that provides radio interconnection between the MS and switching equipment. It consist of base station controller and base transceiver station. BSC is the connection between the mobile station and mobile switching center. 3.Network subsystem: it consists of the mobile service switching centre and its associated systems, control data bases and provide for interconnection between GSM and the PSTN.MSC is the central component of the network.	9	15	
b.	i)Frequency reuse: is the process in which the same set of frequency can be allocated to more than one cell, provided the cells are separated by sufficient distance. Cells using the same set of radio channels can avoid mutual interference, provided they are properly separated. By using frequency reuse concept the system can grow without geographical limits. ii)Channel fading: is the deviation of the attenuation affecting a signal over certain propagation media. The fading may vary with time, geographical position or radio frequency and is often modelled as a random process. A fading channel is a communication channel comprising fading. Two types slow and fast fading. The term slow and fast fading refers to the rate at which the magnitude and phase change imposed by the channel on signal changes.	6		



SIM Subscriber Identity Module BSC Base Station Controller MSC Mobile service switching center
ME Mobile Equipment HLR Home Location Register EIR Equipment Identity Register
BTS Base Transreceiver station VLR Vistor Location Register AuC Authentication Center

X a

GSM: Global system for mobile communication, storage is SIM,good coverage indoors, technology TDMA and FDMA,GSM technology allows various people to access the same connection hence it is less safer, spectrum 850 Mhz and 1900Mhz,GSM has maximum download speed of 384Kbps,GSM network emits continuous wave pulses, voice and data at the same time, dominant standard worldwide.
CDMA: Code Division Multiple acess,uses internal memory for storage, does not provide handset inter operability, low transmitter power permits large cells,technologly CDMA,CDMA makes optimal use of bandwith,dominant standard in USA,not able to transfer voice and data at the same time, higher security is provided on this network as it is build with encryption, each person has a unique code, spectral frequency 850 Mhz and 1900Mhz,CDMA has a maximum download speed of 2Mbps,no radiation is emitted.

9

b. .

4G: 4G stands for fourth generation of cellular wireless standard. It is a successor of 3G and 2G. Speed requirements for 4G service set the peak download speed at 100Mbps for high mobility devices such as cell phone and 1Gbps for low mobility devices such as modems. 4G is excepted to provide ultra broadband internet acess,IP telephony, gamming service and streamed multimedia may be provided to the users. In 4G the users has the freedom flexibility to select any desired service with reasonable Qos at affordable price anytime anywhere, support for multimedia services at low transmission cost.

6