SCHEME OF VALUATION
(Scoring Indicators)

Revision: (15) Core code: (15) 6042

Coure Title: Communication Systems

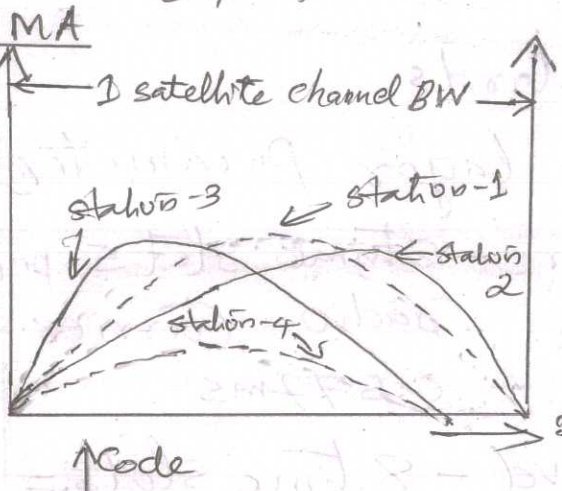
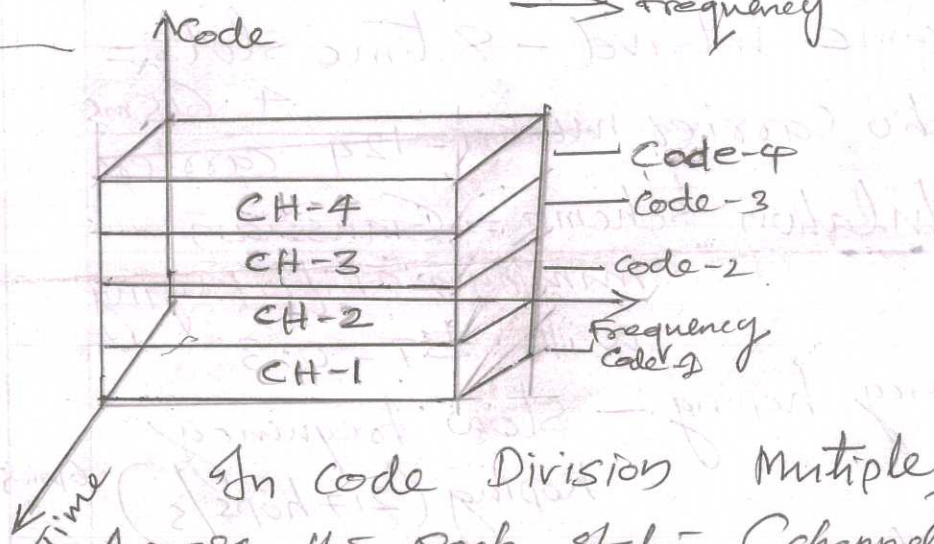
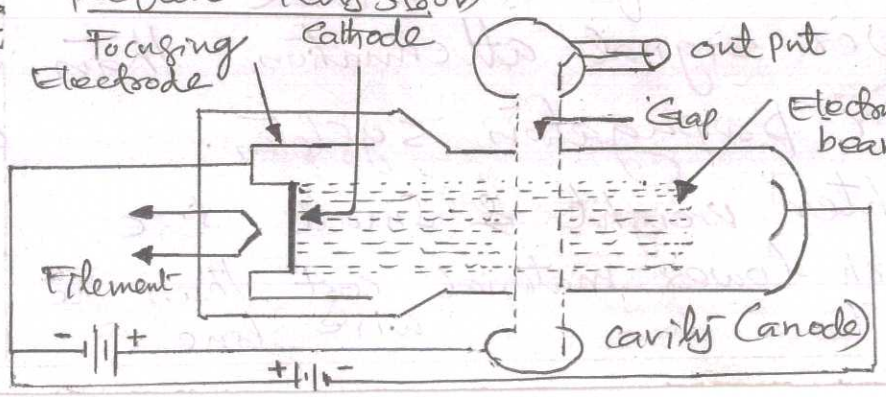
Qn: No	Scoring Indicators	Split up score	Sub Total	Total
	PART-A			
1	1. The horn antenna is to produce a uniform phase front with a larger aperture. which couples the electric field fully into the space; Hence greater Radiation directivity obtained and diffraction Reduced	2		
	2. a. Telephone Transmission b. Television and Radio program distribution c. Navigation d. Military Command and Control e. Electronic Mail f. Meteorology and climatology g. Remote Sensing h. Surveillance of cloud Patterns	2		
	3. Numerical apperture is the cable ability to collect light into the cable from an external source.	2		
	4- High Capacity is acheived by limiting the coverage of each Base station transmitter to a small geographic area called a cell. $NA = \sin\theta_c$ or $NA = \sqrt{n_1^2 - n_2^2}$	2		
	5- Gps navigation System is a satellite-baged Navigation system consisting			

Qst. No	Scoring Indicator	Split up Score	Sub Total	Total
	of a network of 24 orbiting satellites that are eleven thousand nautical miles in space and in six different orbital paths. It referred to as Navigation system using Timing and ranging satellite	2		
	PART-B		5×2 =10	10
11 1.	Due to 'skin effect' the Electro-magnetic waves above 1 GHz (Mwave) Cannot be transmitted through cable or wires. So we a Hollow metalic tube required for the transmission of Microwaves Wave guide is used only to Specially made hollow metalic tube that carry microwaves frequency. They are transverse electric (TE) wave, Transverse Magnetic (TM) wave and Transverse electro-magnetic (TEM) wave. The physical structure of wave guide can be of rectangular, circular, elliptical, single ridged or double ridged	Expln. 4+ Types 2 Nos 2 mark		6
11 2	Geostationary satellites orbit Earth above the equator with the Same angular velocity as earth. Hence, geostationary satellites			

Qst. No	Scoring Indicators	split up sgg	sub-Total	Total
	appear to remain in a fixed location above one spot on Earth's surface. Since a geostationary satellite appears to remain in a fixed location, no special antenna tracking equipment is necessary - Earth Station antennas are simply pointed at the satellite. A single high-altitude satellite can provide reliable communication to approximately 40% of the earth surface.	4+		
	Advantages:			
	(a) No frequency shift as there is no movement of the source and Destination		6	
	(b) No antenna tracking systems are required at the Earth Station	2Nos 2marks		
	(c) There is no need switch from one geosynchronous satellite to another as they orbit overhead.			
	(d) The effects of Doppler Shift are negligible			
11 3.	The Principle of Total Internal reflection is propagate light inside an optical Fibre. When light travels from a medium with a higher refractive index to a medium with a	2+		

Qst. No	Scoring Indicator	Split up score	Sub-Total	Total
	Lower refractive index and it strikes the boundary at more than the critical incident angle all light will be reflected back to the incident medium meaning it will not penetrate the second medium. This phenomenen is called total internal reflection.	4	6	
II 4	@Wi-Max is one of the hottest broadband wireless technologies around today.			
	@Wi-max systems were expected to delive broadband access services to residential and Enterprise Customers in an economical Way.	4Nos x1.5 =6		
	@Wi-Max is a standardized wireless version of Ethernet intended primarily as an alternative to wire technologies to provide broadband access to customer premises.		6	
	@Wi-max is an indury trade organization formed by leading Communications Component and equipment Companies to promote and certify Compatibility and interoperability of broadband wireless access equipment that Conforms to the IEEE 802.16			

Qst. No.	Scoring Indicator.	Split up Score	Sub-Total	TOTAL
	(E) Higher speeds over greater distances and for a greater number of users.			
II/5.	(c) GSM Standards Physical layer parameters: TDMA structure – 8 time slots per radio carrier. Time slot – 0.577ms Frame interval – 8 time slots = 4.615ms Radio carrier number = 124 carriers Modulation scheme – Gaussian minimum shift keying with BT = 0.3 Frequency hoping – Slow frequency hoping (217 hops/s) Equalizer – Equalisation up to 16 ms time dispersion	6 6 points 6×1 = 6	6	
II/6	a. The information carrying capacity of a fiber is very greater b. Immunity to electrostatic interference c. Elimination of crosstalk d. Lower signal attenuation than other propagation systems. e. lighter weight & small size f. Much lower material cost than the wire line	6 6 points 6×1 = 6	6	

Qst. No	Scoring Indicator	Split up score	Sub Total	Total
9	Eliminate the spark hazardous			
b.	It is very difficult to do inter-Septed or taped			
II -7	CDMA  $No = \frac{(k-1) R_R}{B_N}$			
		Fig: 4+		6
	In code Division Multiple Access the each station (channel) has its own code, so no restrictions on time or Bandwidth. The input data is multiplied by unique chip code Then it mixed with a IF Carrier and transmitted. The other channel data is multiplied by another unique chip Code	EAP 2		
III (a)	PART-C Reflex Klystron 	Fig -3-		X

Qst: No. — Scoring Indicators — SPLIT UP Score — Sub Total — Total

Definition:- This is a single cavity Low power Low efficiency micro-wave oscillator.

Structure:-

Reflex klystron consists of

1) cathode
2) Re-entrant Resonant cavity
3) Repeller electrode at a moderate negative voltage wrt cathode.

Exp: 3

Working

→ Explained using apple gate diagram

→ Apple gate diagram is drawn for 3 reference es voltage A, B, C.

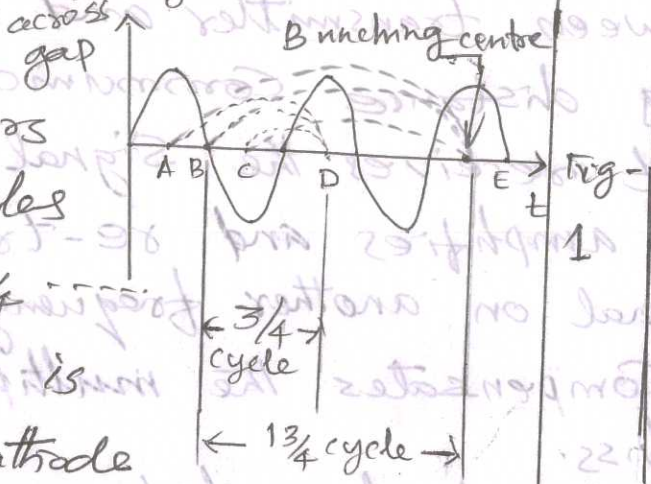


Fig-1

→ Bunching occurs at N+3/4 cycles ie, 3/4, 1 3/4, 2 3/4 ....

→ when voltage is applied to cathode e beam is produced.

→ one it reaches the repeller electrode the es repel back at a velocity depending on the +ve, 0 and -ve peak of inherent noise.

→ so all es return back at same velocity forming electron

9

Qst: No	Scoring Indicators	SPLIT up Score	SUB-Total	Total

bunches (as in the diagram)

→ The e bunches transfer the energy to the gap here by producing sustained oscillations

Applications

1) signal source in microwave generators
2) Local oscillator in microwave Receiver
3) power wave oscillator in microw wave
4) pump oscillator for parametric amplifier

2 point -2-

III b

Microwave Repeater

→ Microw wave Repeater acts as a link between transmitter and receiver in long distance Communication.

→ It receives the signal from transmitter, amplifies and re-transmit the signal on another frequency to receiver

→ Compensates the multipath and fading loss.

→ placed at a distance of 20-60 miles

→ Kept at higher altitude for reliable long distance Communication

Expl -6-

IV (a)

Microwave Transmitter

The block diagram shows the convorder Multiply the signal frequency to uplink frequency after it is encoded and

Modulated properly.

After upconverting the frequency, it is applied to power dividers. The output of power divider goes to high power amplifier. Normally travelling wave tube amplifiers or multicavity klystron amplifiers are used.

Here the modulation is performed at 3 70 MHz intermediate frequency and is then up converted to a uplink frequency of 6 GHz. The output of several high power amplifiers are combined in a power combining amplifiers and the output then passes through band pass filters and circulator

Expl 3

7

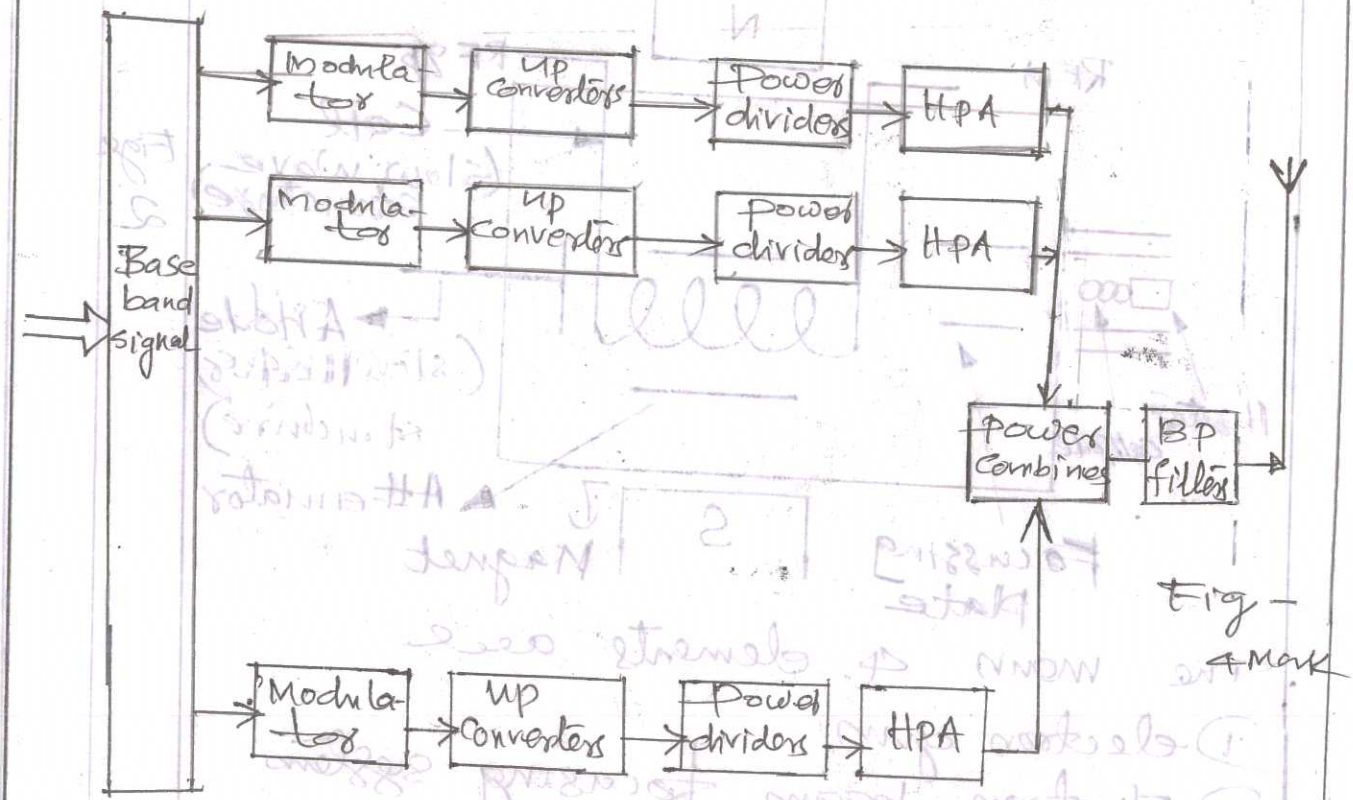


Fig- 4 Mark

Block diagram of a Microwave transmitter

Qst: No.	Scoring Indicators	Split up score	Sub-Total	Total

V (b) **Definition**

There are high gain, low noise wide BW microwave amplifier.

Features

1) gain 40-70dB
2) designed for operation frequency range 300MHz - 100GHz
3) Power level upto 10MW
4) A linear beam tube
5) 2 types - helix TWT and coupled Cavity TWT.

Structure

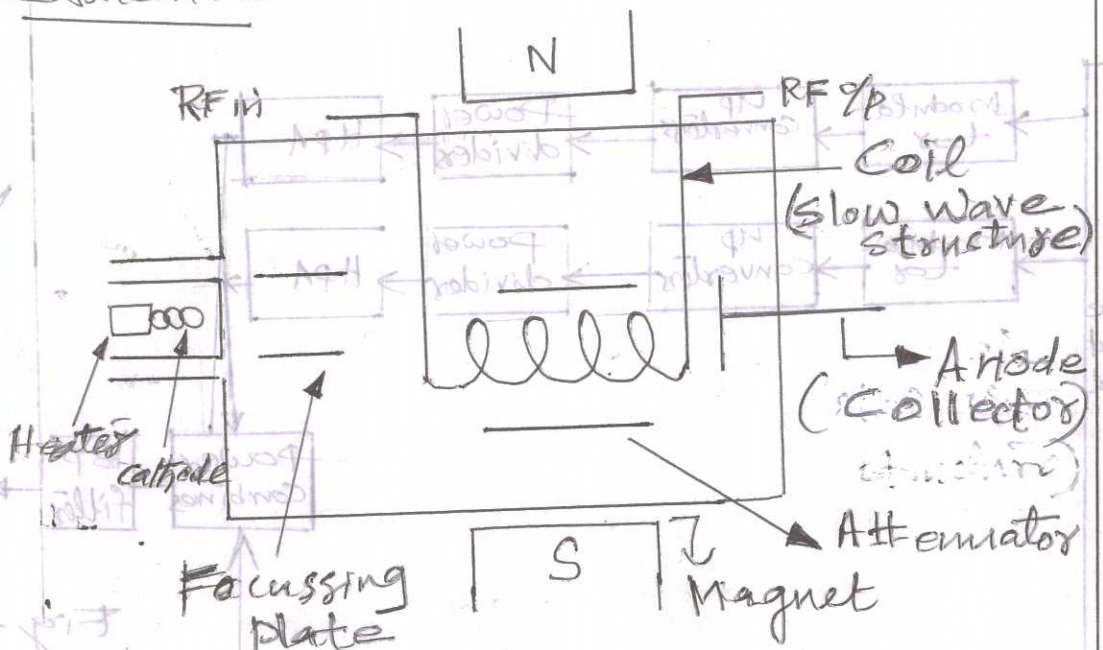


Fig 2

The main 4 elements are
1) electron gun
2) Electron beam focusing system
3) Slow wave structure
4) collector

All parts are held in high Vaccum.

Qstn No.	Scoring Indicators	Split up score	Sub-Total	Total
	Working :-			
	- when Voltage is applied the cathode produces $\bar{e}$ beam.			
	- If no I/p is applied the $\bar{e}$ beam will be collected by anode.	4		
	- when RF I/p is applied the $\bar{e}$s are accelerated / de-accelerated by helix depending on the +ve and -ve peak of the RF I/p.		8	
	- This results in electron bunches. These $\bar{e}$ bunches travel towards the anode within the helix.			
	- The volume of $\bar{e}$ bunch will be stronger and stronger as $\bar{e}$s approach towards the anode.			
	- Thus amplified O/p is produced			

V/(a)

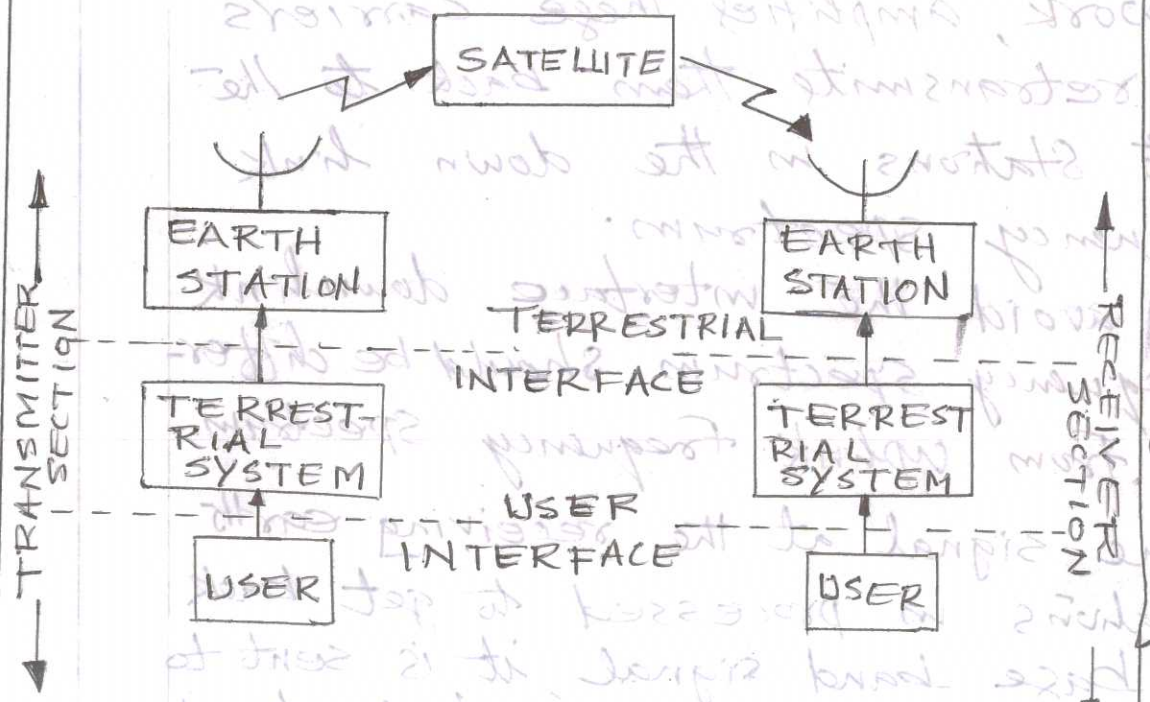


Fig (4)

BASIC STRUCTURE OF A SATELLITE COMMUNICATION SYSTEM.

Qst No	Scoring Indicators			
	→ This Consists of many earth stations on the ground and these are linked with a satellite in space. The user is connected to the earth station throng a terrestrial network and this terrestrial network may be a telephone switch or dedicated link to a Earth Station → The user generates a ~~base band~~ signal that is processed through a terriestrial network and transmitted to a satellite at the station. → The ~~Satellight~~ Consists of a large number of repeaters in space, that receives the modulated RF carrier in its uplink Frequency spectrum From all the earth stations in the network, amplifies these carriers and retransmits them back to the earth stations in the down link frequency spectrum. → To avoid the interface downlink frequency spectrum should be different from uplink frequency spectrum. → The signal at the receiving earth Stations is processed to get back the base band signal, it is sent to the user through a terrestrial network	Expl- 5	9	

Qst No	Scoring Indicators	SPLIT UP Score	sub-Total	Total
V (b)	Direct to home (DTH) refers to the reception of satellite signals on a T.V. with a personal dish in an individual home. The satellites that are used this purpose is geostationary satellites. The satellites Compress the signals digitally encrypt them and then are beamed from high powered geostationary satellites. They are received by dishes that are given to the DTH consumers by DTH providers.			
	Some of the common DTH providers in Idea are:-	2parts		
	1. TATA SKY 4. BIG TV 2. SUN DIRECT DTH 5. Dish TV 3. Airtel DTH 6. Videcon DTH	1		
	Advantage			
	a- Equally beneficial to everyone.	2point		
	b- High quality audio and video	1		
	c- No mediators			
VI @	FDMA assigns individual channels to individual users. ie each user is allocated a unique Frequency band or Channel.			

Qst No — Scoring Indicators

In the TDMA it is possible to allocate certain time slots for communications. Many channels can be seperated with time 't' at the same frequency. i.e. The radio spectrum is divided into time slotes. — Expt- 5 mark

Main Features of FDMA

* Continous transmission
* Narrow band width
* Low over head
* used with both analog and digital signal. — 2 points 2 mark

Main Features of TDMA

* Shares single carrier frequency with multiple users. — 2 point
* Different time slots for Transmitter and Receiver, thus duplexors are not required. — 2 mark
* Non-Continuous transmission. This results in low battery consumption

VI (b) (i) → A GIS applied to geographical data → An information system is a set of process, excuted on raw data to produce information which will be useful when making decisions.

Qst No	Scoring Indicators	Split up score	Sub Total	Total
	→ A system is a group of connected entities and activities which interact for a common purpose → A GIS is an organized collection of computer hardware, software, geographic data and personal to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information → A GIS integrates spatial and other kinds of information within a single system to provide a consistant frame work for analyzing geographic data. → A GIS makes connections between activities based on geographic proximity	3 points 3 mark		
ii)	Dish antenna (Parabolic Reflector antenna) provide extremely high gain and directivity and are very popular for micro wave radio and satellite communication links. A parbolic antenna consists of two main parts; a parabolic Reflector and the active element called the feed mechanism. Satellite Transmi-	Expl 6 mark		

Qs No	Scoring Indicator	Split up score	Sub Total	Total

tting and Receiving purpose Microwave antenna is used. They allow people in rural areas without cable providers to receive television service and often offer superior picture and sound quality.

VII (a)

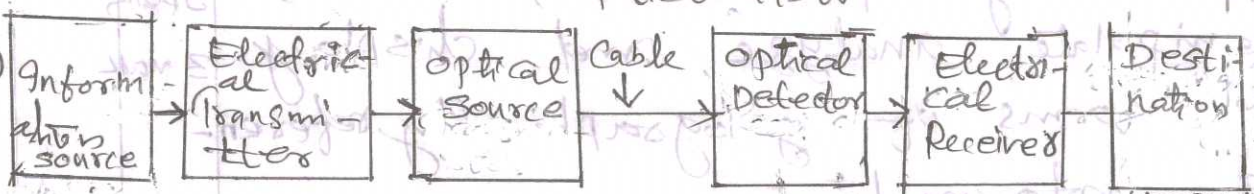


Fig:- 4

Basic Block diagram of Fiber Optic Communication Systems

The Fiber optics system can be divided into subgroups, the source the link and the detector.

Fiber optical transmission system employing a light emitting source usually light emitting diode (LED) or a solid state laser - that can be modulated to be impressed digital data or an analog signal on the light beam. Efficient optical connectors at the light-source to cable interface Opt. 5 at transmitting point and the cable to photo detector interface at the receiving point. A photo sensitive detector to convert the optical signal back to electrical signal at the receiver. P-i-n (positive intrinsic - negative) or

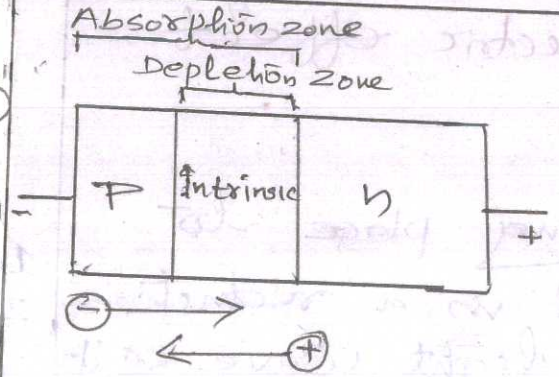
Qst: No:	Scoring Indicators	Split up score	Total

avalanche photo diode are used in these purpose.

VII b) Comparision b/w single mode & multi mode Fibers

Single Mode Fibers	Multimode Fibers.
1 Lower intermodal dispersion	Considerable dispersion due to different group velocities.
2. Maximum bandwidth Can be attained	Band width is Limited
3. Smaller core diameter	Larger core diameter
4. uses coherent optical sources	uses incoherent optical sources.
5. NA is smaller	NA is larger
6- Low Coupling efficiency	High Coupling efficiency
7. Superior transmission quality	Transmission quality is low
8. upgradation is possible	upgradation is difficult

VIII a)



PIN photodiodes construction.

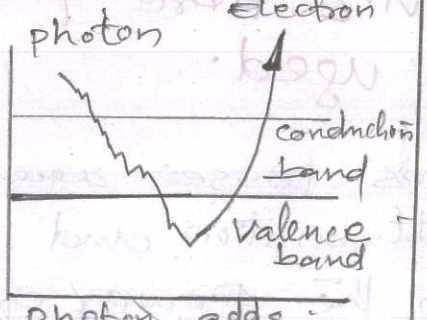
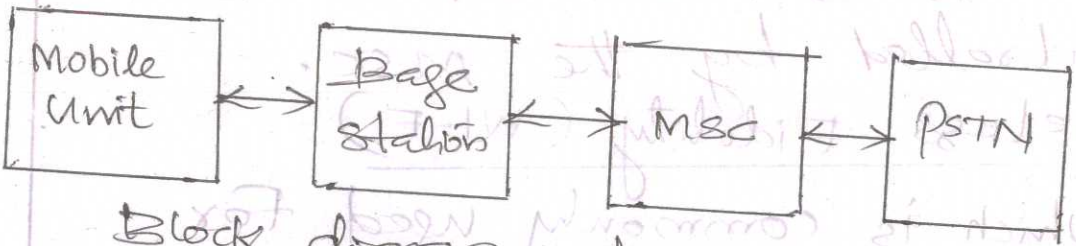


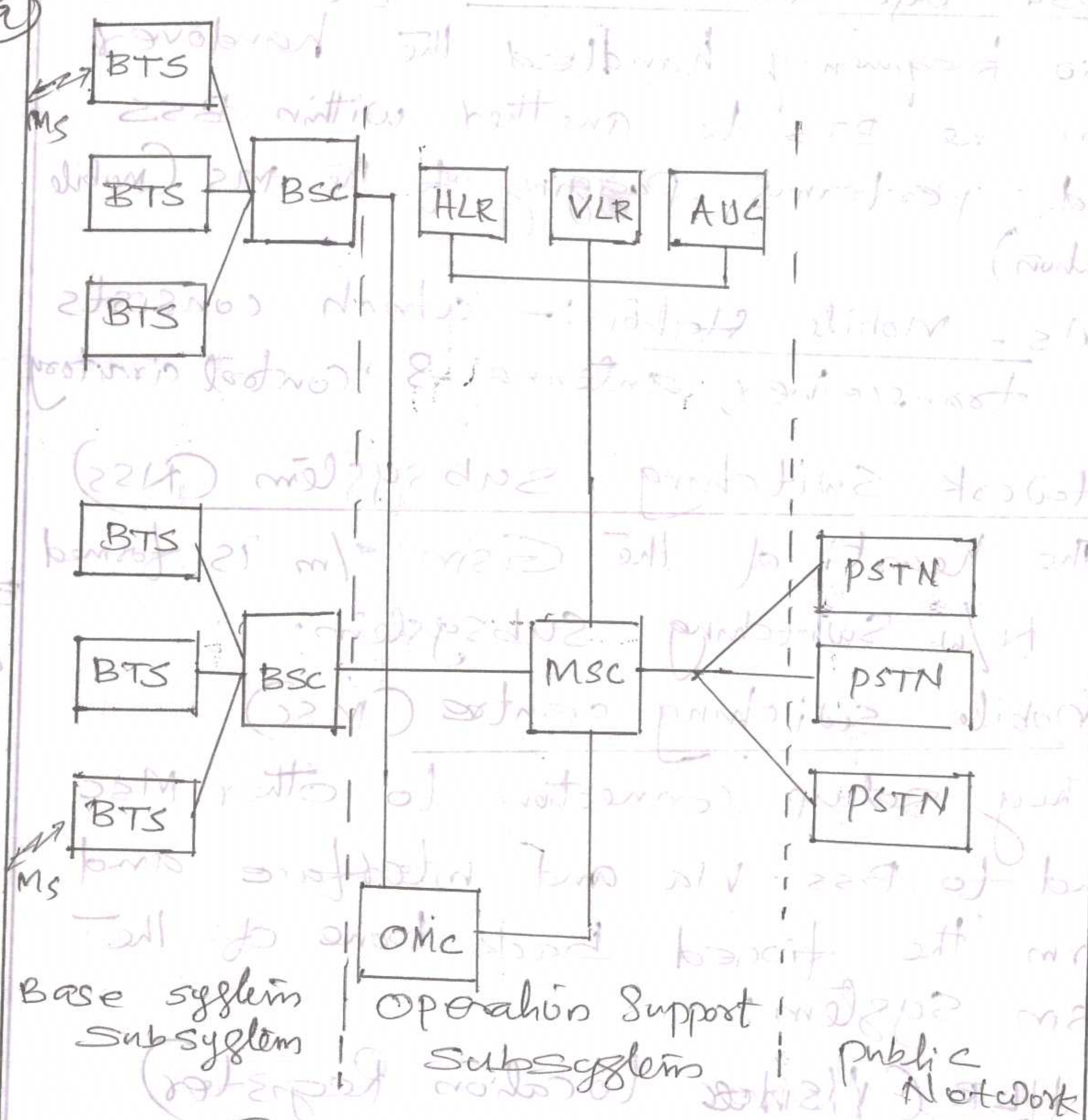
Fig - 4 -

photon adds sufficient energy to allow electron to move from valence band to conduction band.

Qst No	Scoring Indicators	Split up Score	Total
	A PIN diode is a depletion-layer photodiode and is probably the most common device used as a light detector in fiber-optic communication systems. Figure shows the basic construction of a PIN diode. A very lightly doped (almost pure or intrinsic) layer of n-type semiconductor material is sandwiched between the junction of the two heavely doped n- and p-type contact areas. Light enters the device through a very small window and falls on the carrier-void intrinsic material. The intrinsic material is made thick enough so that most of the photons that enter the device are absorbed by this layer. Most of the photons are absorbed by electrons in the valence band of the intrinsic material. When the photons are absorbed they add sufficient energy to generate carriers in the depletion region and allow current to flow through the device. Here photo electric effect is used.	Expl: 4	8
VIII B	This losses are taking place to attenuation and results in a reduction in the power of the light wave as it travels down the cable.	1	

Qst No	Scoring Indicators	Split up Score	Total
	1. Internal losses a) Absorption losses b) Leaky modes losses c) Mode coupling losses d) Bending losses	3 points 3	7
	2. External losses 1. Connector losses 2. Source to cable interface losses 3. Cable to line detection interface losses 4. Splicing losses.	3 points 3	
IX (a)	 Block diagram of a basic cellular mobile telephone system	Fig 4	
	Mobile unit :- It contains a control unit, transceiver and antenna system. Base station :- A fixed station in a mobile radio system used for radio communication with mobile stations. Base stations are located at the centre or on the edge of a coverage region and consist of radio channels and transmitter and receiver antennas mounted on a tower.	Expl 5	

Qst: No	Scoring Indicators	Split up Score	Total Score
	MSC (mobile switching centre):- Switching centre which coordinates the routing of calls in a large service area. In a cellular radio system, the MSC connects the cellular base stations and the mobiles to the PSTN. An MSC is also called a mobile Telephone Switching office (MTSO). The call is initiated processed and terminated and this entire process is monitored and controlled by the MSC.		9
(b)	**Wireless Fidelity (WI-FI)** → which is commonly used for connecting devices in wireless mode → Wi-Fi works on physical and data link layer. → Wi-Fi suggests Wireless Fidelity	2	
	Features a) make access to information easir. b) ensure Compatibility and co-existance of devices c) eliminate Complex Cabling d) eliminale switches adapters, plugs, pins and Connectors.	4	6

Qst No	Scoring Indicators	Split up Score	Total Score
X (a)	 GSM system I: Base station subsystem (BSS) It Povides & manages radio transmission paths between mobile Station and Mobile Swiching centre (MSC) (a) BTS – Base Transceiver Station BTS comprises all Radio equipments ie antenna, signal Processing & amplifier necessary for signal Transmission	Fig (4)	

Qst No	Scoring Indicators	SPLIT up Score	Total Score
	b) BSC - Base Station controller:- It receives radio frequency handled the handover from one BTS to another within BSS and performs Pagging of the MS (Mobile Station)		
	c) Ms - Mobile Station:- which consists of transceiver, antenna & control circutory		
II	Network Switching subsystem (NSS)		
	The heart of the Gsm s/m is formed by N/w Switching subsystem.	Expl: 5	9
	1. Mobile switching centre (MSC)		
	They setup connection to other Msc and to Bss via and interface and form the fixed back bone of the Gsm system.		
	2. HLR (Home location Register)		
	The HLR is a data base with contains Subscribed information & location information for each user who resides in the same city as the Msc.		
	3. VLR (visitor location Register)		
	The VLR is a data base which temporarily stores the International mobile subscriber identity (IMSI) and Customer information for each roaming Subscriber who is visiting the coverage area of a particular Msc		

Qst: No	Scoring Indicators	SPLIT up Score	Total Score

4. AUC (Authentication centre)

AUC is a strongly protected data bage which handles the authentication and encryption keys for every single Suscriber in the HLR & VLR.

5. OSS (operation support subsystem)

The operation subsystem (OSS) containg the necessary function for Network operations and Maintanance

6. operation maintanance centre (OMC)

The OMC monitors and controls all other Network entities via the interface. Typical OMC Management function are:

* traffic monitoring
* Stams report of Network entity
* Suscriber Security Management
* accounting and billing.

(b) 4G is the fourth generation of broadband cellular Network technology, Succeding 3G. A 4G syslem must provide capabilities defined by ITU in IMT advanced potential and Corrent applications amended mobile web acces. IP telephony, gaming services, high definition mobile T.V, video Conferencing and 3D Television

Qst No:	Scoring Indicators	Split up Score	Total Score
	The first released Long Term Evolution (LTE) standared (a 4G candidate system) has been commercially deployed in oslo, Norway and Stockholm, sweden since 2009.	Expl 4	
	Features		6
	(i) High usability		
	(ii) support for multimedia service at low transmission cost.	2	
	(iii) personalization		
	(iv) Integrated		