1. **What should be done to increase broadband demand?**
   - PC Literacy: Computer literacy need to given a big impetus. It should be treated as basic educational need. Once the ordinary person is conversant with the PC then he will easily understand and reap its benefits.
   - PC Penetration: The PC is used as a key medium to access Internet and other broadband applications. In India the PC penetration is around 3% and urban areas command the majority share of it. The current cost of PC very high (Assembled PC costs more than Rs. 15000/- and branded one cost around Rs. 25000/- with reasonable specifications) and not affordable. Govt. need to work on this issue seriously.
   - Last Mile connectivity: Developing and deploying robust last mile connectivity (supporting broadband) will be shot in arm to increase the broadband penetration. Govt. should also think of giving boost to other wireline technologies like EoC, DOCSIS, and ETTH apart from 'DSL and wireless' as cable based broadband has immense potential. As Indian cable TV industry is primarily fragmented, so major MSOs / investors are shy of going with huge investments on broadband infrastructure despite its mammoth reach. Govt. should come with a clear framework for the cable TV industry which will led to the consolidation in the industry and in turn create conductive environment for the MSOs/ investors to invest in broadband sector.
   - Govt. need to develop and deploy e-applications in every sector in a consumer friendly was. For example digitization of land records and its accessibility by the consumer through one click will boost the broadband like a cracker. Every office at ground level need to be computerized. More the usage of PCs, it will also help in reducing the cost of PCs.
   - Affordability: Although the entry level for broadband has been very comfortable, but there is need to add more values in the basic packages being offered. This is only possible when the cost of International bandwidth will come down and it will make broadband more appealing. The cost of international bandwidth will come down with more international bandwidth providers, local content etc.
   - The development of locally hosted local content will make broadband more appealing and affordable.

2. **What, according to you, will improve the perceived utility of broadband among the masses?**

   - *Kindly note that perceived utility and broadband penetration will complement each other.*
   - Computer literacy will be the big impetus to understand the benefits of broadband by a common man. Govt. should make computer

education compulsory at every school at town / village level, computerization of all offices (post office, bank, police station etc.), Opening and bringing operational efficiency of e-kiosks etc are the factors which will motivate people to use computer and broadband; Hence increasing PC penetration and unleashing the benefits of broadband applications. Deploying of e-koisks is a good idea but it has been found that e-kiosks used to be out of order either due to connectivity issue or maintenance of the equipments. Although govt. has taken many initiatives to develop e-applications which are consumer friendly but the benefit of the same can't be reaped because of lack of computer literacy and its penetration.

- Apart from PC penetration, affordable broadband availability will help in increasing its penetration hence helping people to understand the benefits of the broadband. So making easy and affordable access to the broadband is very crucial.

- Availability and promotion of local content and e-applications in local language will always help in faster acceptability. So content innovation / e-applications and its hosting should be made easy and affordable. People should be encouraged to use e-applications for the various services rather than manual system. Govt. should launch awareness programs about the utility of the e-applications and provide incentives to people to use them.

3. What measures should be taken to enhance the availability of useful applications for broadband?

Expansion of backhaul network and its availability, easy of hosing of content locally and broadband penetration are the key factors for availability of useful applications.

- Expansion of backhaul network: The same need to be deeper in urban and villages. It should be possible for any individual or organization to host the content locally at the nearest POP and its maintenance. Since it requires huge investment and any provider will look for the business viability so govt. need to provide incentives to lay / ROW for fiber network. Laying of fiber should be considered as infrastructural status and be subsidized.

- Last mile penetration: Either not available or of poor quality or only few options. So availability of robust last mile penetration (supporting broadband) with multiple options to customer will enhance the qualitative broadband penetration which in turn will enhance the demand or evolution of useful applications.

- Govt. should promote those technologies which support symmetric bandwidth delivery to up to the consumer like ETTH, DOCSIS or EoC. Since it will boost development of heavy applications and make it easier to transfer the same from home or office.

4. How can broadband be made more consumers friendly especially to those having limited knowledge of English and computer?

- Increase of PC penetration and awareness of ease of its functionality to common man. The price of computer need to be reduced considerably and its accessibility should be every one through various mediums. For example voluntary training should be available at ground level through e-kiosks, computer labs in schools and other institutions.
- Availability of content on local language.

5. Do you agree with projected broadband growth pattern and futuristic bandwidth requirements?

- Yes we agree

6. Do you agree that existing telecom infrastructure is inadequate to support broadband demand? If so what actions has to be taken to create an infrastructure capable to support futuristic broadband?

The current dominating broadband infrastructure is based on DSL technology. The existing copper bundling was initially designed for voice services but have some limitations in delivery high speed internet. Coax cable is the second in line but hasn't penetrated due to its dependency on operators and adaptation and upgrade to new technologies.

The future networks which we presume will be based on delivering triple play and other VAS services will require enormous bandwidth up to the customer premises. Futuristic networks will require deep fibre penetration by extended the reach of fibre within the manageable radius of users for delivering and upgrading existing last mile infrastructure for supporting the technologies such as VDSL2,Fiber to building +LAN,FTTH, Ethernet on Coax(EOC),DOCSIS 3.0 .All these technologies are capable of handling the bandwidth in gig's.

7. What network topology do you perceive to support high speed broadband using evolving wireless technologies?

……….

8. Do you see prominent role for fibre based technologies in access network in providing high speed broadband in next 5 years? What should be done to encourage such optical fibre to facilitate high speed broadband penetration?

The futuristic networks can only be created by deploying the deeper fiber networks within the close proximity of users. The robustness of any fiber networks can be achieved with its layout, many providers are delivering FTTH & FTTB+LAN on overhead fiber network in an unplanned structure and are finding difficult to maintain the QOS. The deployment of Underground fiber within the lanes, by lanes, building etc will require huge investment and above all the permissions for ROW and other government charges puts more burdens on provider. The various electronic equipments, fiber and other cables are being subsidized for Telco's by abolishing different surcharges/custom duties whereas the providers other than Telco's has been deprived of these benefits.

The network roll out on overhead medium is faster and cheaper and easily manageable if designed in planned way as compared to the Underground structure. Government agencies have to show some flexibility on providing ROW and subsidizing the other charges for laying fiber on overhead structure.

The cost benefit on equipments provided to Telco's should be extended to other providers also.

9. What changes do you perceive in existing licensing and regulatory framework to encourage Cable TV operators to upgrade their networks to provide broadband?

- As Indian cable TV industry is primarily fragmented, so major MSOs / investors are shy of going with huge investments on broadband infrastructure despite its mammoth reach. Govt. should come with a clear framework for the cable TV industry which will led to the consolidation in the industry and in turn create conductive environment for the MSOs/ investors to invest in broadband sector. Govt. should come up with some sunset date for complete digitization of the cable TV industry beyond which no channel will be allowed on analogue mode.

- There should be subsidy / reduced duties to import or locally manufacture the equipments needed to upgrade the cable networks, so that broadband services can be delivered through them.

10. Is non-availability of optical fibre from districts/cities to villages one of the bottlenecks for effective backhaul connectivity and impacts roll out of broadband services in rural areas?

Yes to some extent

11. If so, is there a need to create national optical fibre network extending upto villages?

Backhauling is the basic building blocks of any national or international telecom infrastructure. On many routes to villages connecting from districts/cities, the incumbent was unable to provide backbone services because of poor backbone coverage and have to depend on expensive satellite backhaul. In many villages backhaul infrastructure is non-existent.. Fiber optic-based backbone is sparsely deployed in India. Much of it has been deployed in the last five years. Although there was demand for backbone infrastructure from ISPs, business users, and other telecom operators and with the creation of national fiber networks the providers can expand their reach.

Although Telco's have already deployed the backhaul/underground fiber across the National/State highways with the huge capacity in place. Their existing fiber network can give leverage to other providers to extend the networks deeper up to the other distant villages .

12. In order to create National optical fibre core network extending upto villages, do you think a specialized agency can leverage on various government schemes as discussed in para B?

Few Telco's have already deployed miles of fibre which are passing through various villages but are reluctant to share it with other providers.

In current market scenario the provider will hesitate to collaborate in villages due to low tele density and lack in presence of basic amenities like electricity, water etc are still beyond reach. Government need the initiate by hiring the specialised agencies and deploy the infrastructure and later lease to the interested players.

13. Among the various options discussed in Para 3.35 to 3.37, what framework do you suggest for National Fibre Agency for creating optical fibre network extending upto village level and why?

The setting of Autonomous National level agency under the government scanner should be better option for driving the project.

In current market scenario the provider will hesitate to collaborate (refer scheme 3.36 & 3.37) in villages where the basic amenities like electricity, water etc are still beyond reach. The best way forward is to have a National level agency that will deploy the national level infrastructure and later lease it to the interested providers.

14. What precautions should be taken while planning and executing such optical fibre network extending upto villages so that such networks can be used as national resource in future? What is suitable time frame to rollout such project?

The teledensity in Metros like Mumbai and Delhi was soon to touch 130-140% the same wasn't the case in rural areas. In rural India the teledensity is still 18 to 20 per cent.
Considering the slow growth and lack of basic amenities in few remote villages planning team should consider deploying network across the already developed highways and state roads which can be later extendedly to other villages Vs to Vs the deployment of basic infrastructure.

15. Is there a need to define fixed and mobile broadband separately? If yes, what should be important considerations for finalizing new definitions?

Yes there is need to define fixed and mobile broadband differently. Both have their own characteristics, benefits and limitations. In case of fixed broadband high bandwidth can be offered and at the same time QoS can be maintained. However in case of mobile broadband, although it enhances the reach or last mile connectivity but it has lot of limitations in terms of bandwidth and QoS. Following should be the considerations while deciding their definitions.

- QoS

- Bandwidth delivery per user

- Level of symmetric bandwidth support by the technology

- Mobility

16 Is present broadband definition too conservative to support bandwidth intensive applications? If so, what should be the minimum speed of broadband connection?

Yes; the present definition is too conservative which was defined in year 2004. The today's scenario is totally different and bandwidth usage per user has gone multi fold upwards and new bandwidth hungry applications have emerged. 256Kbps is no more relevant in today's megabit scenario. The broadband definition should be upgraded to 2Mbps minimum. 2Mbps is the most common bandwidth being offered and advertised by the all major players in India today.

17. What specific steps do you feel will ease grant of speedy ROW permission and ensure availability of ROW at affordable cost?

Currently there is requirement to take permission of many agencies to lay underground fibre network. This results in lot of delay of projects getting implemented and subsequent cost pressure. There should be single window provision for all the permissions pertaining to RoW. This will help in lot of saving on resources and faster implementation.

18. Does the broadband sector lack competition? If so, how can competition be enhanced in broadband sector?

Yes, the broadband sector lacks competition. Healthy competition exits only in metro / urban cites which even vary from area to area within a city. Competition can be enhanced when the ISPs will find the business viable. In case of wireline; creating wireline infrastructure is very expensive and complex exercise and RoI takes its own time. That's why only few players are seriously in the market; even they are expanding at slow pace (except BSNL and MTNL). With the auction of WBA more players will come in the field and competition will increase and it will increase pressure on the ISP to offer better services. The benefit of wireless broadband will be the boost to last mile connectivity and the access to the internet at fair bandwidth; but the real benefit of the broadband can only be reaped when there are more wireline players as the wireline technology can support the higher bandwidth as well as QoS requirement of today's and future. The govt. needs to offer serious incentives to the ISPs to invest in wireline infrastructure / technologies.

- DSL technology has distance limitation and limited copper lines. However ETTH, DOCSIS and EoC can be a better alternative to offer symmetric bandwidth and highly scalable technologies to accommodate future traffic.

- Deeper under ground fibre requirement is there in case of any wireline technology. This should be considered as infrastructural requirement and MSOs / Cable operators should be given incentives to lay fibre at low cost.

- Incentives should be offered to manufacture CPEs (cable modem / routers etc) locally or less duties to import the same.

19. Do you think high broadband usage charge is hindrance in growth of broadband? If yes, what steps do you suggest to make it more affordable?

Current broadband charges are no more hindrance in growth of broadband. In today's scenario broadband packages start from as low as Rs. 250/- with 1GB data limit per month. However surviving at ARPU below Rs. 400/- is very difficult for any ISP considering the investment they have to make to create infrastructure. ISPs have already slashed the rates to threshold level; but more values can be offered to the customer provided international bandwidth becomes cheaper. Although international bandwidth charges are coming down day by day but still they are on higher side when compared to the rest of the world. One of the main reasons of higher international bandwidth prices is that there are only three players in India who have their own gateways. These three suppliers

manage the entire India bandwidth demand. More players should be encouraged to join international bandwidth arena which will in turn help in making bandwidth market more fair and competitive.

20. Do you think simple and flat monthly broadband tariff plans will enhance broadband acceptability and usage?

No. Different customers have different requirements. The ISPs have smartly covered every ones requirement through their commercial offerings. With the reduction of bandwidth prices, more value can be offered to the customer.

21. Should broadband tariff be regulated in view of low competition in this sector as present?

No. Broadband tariff be left to the market forces. In fact govt. should try to bring more competition, reduce international bandwidth prices etc. The market will itself take care of the consumer's interest.

22. What should be the basis for calculation of tariff for broadband, if it is to be regulated?

It should be left to the market forces. It can't be regulated unless or until the bandwidth cost is at par to every ISP irrespective of the size of the ISPs.

23. How can utilization of International Internet bandwidth be made more efficient in present situation?

- One should be able to access the domestic content through domestic route rather than International route. This will led to huge savings on international bandwidth. This can be achieved by expanding the network of NIXI which is limited to only few cities of India.

- Hosting of content within India should be cheaper so that individuals and organizations should host it locally.

- Evolution and promoting cloud computing within all services providers.

24. How can use of domestic and international internet bandwidth be segregated? Will it have direct impact on broadband affordability? If so, quantify the likely impact.

Segregation can happen once all the domestic traffic within the country will be reached locally thru NIXI and interconnecting all the NIXI PoP.

NIXI with its limited presence need to expand to all the major cities with an inter network connectivity between them. The cost of connectivity form ISP provider PoP to NIXI PoP should be subsidized as a special case.

There will be impact on broadband affordability but not in a big way.

25. What steps should be taken to bring down the cost of international internet bandwidth in India?

- More players in International gateway segment

- Hosting of local content locally, making hosting affordable and accessed local content locally

- Increase of broadband penetration and more use of bandwidth will led to decrease of international bandwidth rates due to economy of scale.

26. How can competition be enhanced in the International bandwidth sector?

Currently only three TELCOs (TATAs, Bharti and Reliance) are the international bandwidth providers despite the fact there are many other big TELCOs in the market (BSNL, Vodafone, Aircel, Idea etc) who have still not ventured into data services (except BSNL –since it has its own last mile infrastructure). The reason is the huge investment on ILD infrastructure (setting up of submarine landing stations, submarine fibre network, regulatory issues etc) and huge investment on last mile network, which makes RoI poor. Even BSNL has not ventured into international bandwidth segment; maybe they find it cheaper to buy bandwidth from existing players rather than investing huge on setting up of undersea submarine cables.

So business viability is very crucial for more players to enter in this segment.

With wireless broadband becoming reality in coming time, more PC penetration and increase broadband penetration; the business potential from data services will explode in time to come, these developments will prompt new players to jump in international bandwidth segment provided govt. provides conductive environment for setting up of ILD infrastructure.

27. QoS of broadband, availability of bandwidth, adherence to given contention ratio, affordability, availability and spread are some intricately linked parameters. In your opinion what should be done to ensure good quality broadband to subscribers?

As speed is the prime criteria when users select an Internet service provider, due to falling international bandwidth cost, increasing competition; providing the high speed internet within the affordable cost will be within the reach of user.

Robust last mile connectivity followed by the good support structure will ensure good quality broadband

28. Do you think that bad quality of broadband connection is impacting the performance of bandwidth hungry applications and hence crippling the broadband growth? If so, please suggest remedial actions.

In the Internet world there are many different issues that affect how our applications perform. The performance of application depends on the content location, distance, latency, congestion.

- Cloud computing is coming up as a new concept of delivering content closest to the users. There are providers like Akamai, yahoo, Google who are housing their hardware in provider's data center for delivering the content. The providers should peer with Content providers and promote cloud computing.

- Most of the domestic content is still hosted outside the country creating performance delay for applications. There are applications which are hosted outside the country with the maximum hits generated from within the country .There is an immediate need to promote the hosting of application locally for faster access.
- The technologies and last mile connectivity are still not conversant to handle huge bandwidth pipes. Upgrade of last mile will automatically evolve new technologies capable of delivering high speed internet to users.

29. Is there a need to define new/redefine existing quality of service parameters considering future bandwidth hungry applications, time sensitivity of applications and user expectation? What should be such parameters including their suggestive value and should such parameters be mandated?

The evolution of cloud computing, content localization, promoting the domestic content within the country will automatically reduce the delay and improve the performance for bandwidth hungry applications.
The current QOS is well defined and there should not be any mandatory parameter included for delivering the QOS.

30. What measures do you propose to make Customer Premises Equipment affordable for common masses? Elaborate your reply giving various options.

Although CPEs (excluding computer) cost have down but it is only for those technology equipments which are popular. The same can be further brought down through

following measures.

- Waiver of duties if manufactured locally to promote locally manufacturing.

- Lowering of duties on CPE to be imported. There should be favour to those CPEs which are supporting new futuristic technologies or their encouragement to get manufactured locally at cheaper cost rather than be imported through various incentives.

31. What measures are required to encourage development of content in Indian vernacular languages?

Govt. need to initiate

32. Do you perceive need for any regulatory or licensing change to boost broadband penetration?

Standalone ISP should be treated at par with TELCOs regarding the benefits extended to them for data services.

33. Are there any specific competition and market related issues that are hindering growth of broadband?

- Less PC penetration in rural and semi urban areas is hindering the growth of broadband as service providers find their business model unviable.

- Lack of last mile as it is very expensive to create and maintain the last mile network and returns are very low.

34. What other fiscal/non-fiscal measures should be considered to boost broadband penetration?

- Lowering of cost of PC / CPEs by reducing the duties on related components.

- Cost of equipments to "create last mile network or making cable networks two way" need to be reduced to reduce the cost of creation of last mile network. For example; online UPS is extensively required for providing power back up and it is very expensive. As the networks are becoming deeper fibre based day by day, there is more requirements of online UPS which adds to the cost considerably.