Time: 3 Hrs

M.Marks: 60

PART - 1

NOTE: Attempt all the questions:

1. a) What are different Network Management System functions? Briefly describe each one of them.
2

b) Briefly explain an organizational model from the point of view a manager, an agent, a managed object and unmanaged objects.
2

c) What are the differences between SNMP & OSI managed object perspectives?
2

d) Draw a schematic of SNMP V1 network management architecture which portrays the data path between a manager and an agent.
2

e) Draw the MIT for OID structure:
enterprise OBJECT IDENTIFIER := { 1 3 6 1 4 }
2

f) Write a object Macro for a list with syntax SEQUENCE {<type1>,<type 2>,<type 3>}
2

g) Draw the MIB tree for a list given in a lexicographic order as
{1, 1.1, 1.1.6, 1.2.17, 1.2, 1.3.6, 1.1.9, 2, 2.2, 1.22, 2.2.10, 3, 3.4.19, 9, 10.1} 2

h) What are the different ways we can do expansion of aggregate managed objects in SNMP v2?
2

i) Draw a schematic of SNMP V3 architecture with elements of entities clearly shown.
2

j) What is TMN functional architecture? Where do TMN reference points lie? 2

PART - 2

NOTE: Attempt any four questions:

2. a) State the need for a Network Management System for an Enterprise and Telecomm business domain. Explain Network Management functional flowchart along with various functions administrated by a typical NOC.
5

b) Consider a manager at node V_0 and agents on node V_i, i = 1, 2 ...Q. If S_q is the average size (bits) of a request initiated by the manager and S_d is the average size of a response from an agent then calculate the average traffic from (to) the V_0 node. Further what would be the average execution time in a

synchronous poling mode if bw^{ij} is the bandwidth (bps) of the link between nodes V_i and V_j, t_d^{ij} is the latency between the same nodes, t_{MIB} is the average time (seconds) for the MIB access and t_{alg} is the average data processing time.

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3. a) Explain SNMP network management protocol. What is its architecture? Illustrate its functioning.

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b) For the definition of interface table shown in Table 1 as IfTable { 1 3 6 1 2 1 4 29 1} and considering NetAddress as the index column, what would be OID and value of
(i) T.E.3.2
(ii) T.E.2.5

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Table 1 : ifTable

IfIndex	Physical Address	NetAddress	MediaType
1.7	00000c35c1d3	123.46.42.1	11
2.3	00000c35c1d2	172.46.41.1	4
1.1.1	00000c35c1d0	165.46.252.1	4
6.2	00000c35c1d5	172.46..44.1	15
1.2	00000c35c1d1	9.46.63.1	4
7.1	00000c35c1d6	172.46.165.1	4

4. a) Provide a MIT representation for the table 1. (OID for the table would be {ip 21}) Write the aggregate managed object macro for the same

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Table 1 : ipRouteTable

ipRouteIfIndex	ipRouteNextHop	ipRouteDest	ipRouteType
112	172.46.100.1	172.46.101.1	4
97	172.46.101.1	172.46.102.1	4
41	172.46.30.1	172.46.32.1	4
56	172.46..12.1	172.46.11.1	4

b) Following two rows are added to the table 1

12	172.46.60.1	172.46.63.1	4
71	172.46.105.1	172.46.165.1	4

Draw the operational sequence diagrams for a create-and-go operation and making these rows available subsequently.
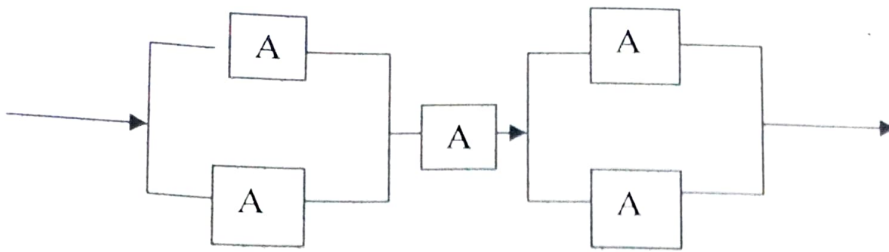
5

5. a) Explain Network Management functions carried out by a typical NOC in brief. What is a typical organization model for an NMS system?

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b) Calculate the overall availability of the system if individual availabilities of components is A, which let's say is 0.98.

5

6 a) Derive the general expression $T_{Rn+1} = T_{Sn+1} + \text{Max}[0, D_n - A_{n+1}]$ for a single server queue, where T_{Rn} = resident time of nth pckt, T_{sn} = service time for nth pckt & A_n & D_n are arrival and departure times respectively.   5

b) Compute an overall delay of datagram and virtual circuit packet switched networks respectively. What would be these delays for a network of 1 Gbps with a distance between the sender and receiver as 2000 km with data being transmitted on an optical fiber for a message size of 5 MB (Megabytes) and set-up message of 2.5KB (kilobytes).   There are three routers in the path from sender to receiver; each one at 500km.   5

7 a) With the help of object macros, explain how SMIv2 extends the concept table for an aggregate object from a single table to multiple table by adding the columns? Explain various scenarios in brief.   5

b) Draw the request-response messages for table 2. Assume you know the number of rows in the table and first element in the lexicographic order.
     a. Draw the get-next-request and response message.
     b. Draw the get-bulk-request and response message.
     c. Compare the results of (a) and (b)

Table 2

ipNetToMedia IfIndex	ipNetToMediaPhysical Address	ipNetToMedia NetAddress	ipNetToMediaType
1.7	00000c35c1d3	172.46.42.1	4
2.3	00000c35c1d2	172.46.41.1	4
1.1.1	00000c35c1d0	172.46.252.1	4
6.2	00000c35c1d5	172.46..44.1	4
1.2	00000c35c1d1	172.46.63.1	4
7.1	00000c35c1d6	172.46.165.1	4

The indices are ipNetToMediaNetAddress and (ipNetToMediaIfIndex masked with 255.255.0.0) . Ignore getting back sysUpTime.   5