Seat No_____

GANPAT UNIVERSITY
M.Tech. Semester I Examination
Jan-Feb – 2012
PGCE–101: Advance Topics in Networks

Max Time : 3 Hour] **[Total Marks : 70**

Instructions:
1. All questions are compulsory
2. Figures to the right indicate full marks.
3. Answer Both Sections in Separate Answer sheets.

SECTION-I

Q-1 **12**

[A] Prove theorem: Expected message delivery time for **optimal** algorithm (single copy) **ED_{opt}(mm)** is given by **4**

$$ED_{opt}^{(mm)} = \frac{H_{M-1}}{(M-1)} EM_{mm},$$

Where H_k is the k^{th} Harmonic Number.

[B] Compute delivery delay of **Source spray and wait routing** for Random walk mobility model. Area = 700x700 , Nodes =30, communication range =20 , message copies = 12 **4**

[C] Calculate the delay of **Randomize routing** for area =8100,transmission range = 10, no. of nodes = 30, P= 0.7 **4**

[OR]

Q-1 **12**

[A] Prove lemma: Message is currently with node A at distance rA from its destination, and that another node B is encountered. Both the node uses **Seek and Focus** routing ,with a one to one utility function U(.),focus threshold Uf and $tf = U^{-1}(U_f)$. then **4**

$p_{tx}(r_A \rightarrow r_B)$ equals to

$$p_{tx}(r_A \rightarrow r_B) = \sum_{t_A<t_f} \sum_{t_B<t_A} \frac{u(r_A\, t_A)u(t_A)u(r_B|t_B)u(t_B)}{u(r_A)u\,(|r_B - r_A| \leq K\, t_B)}$$

$$+p \sum_{t_A \geq t_f} \frac{u(r_A|t_A)u(t_A)u(r_B)}{u(r_A)u\,(|r_B - r_A\, \leq K)}.$$

[B] Compute delivery delay of **Binary spray and wait** routing for Random walk mobility model. Area = 700x700 , Nodes =30, communication range =20 , message copies = 12 **4**

[C] **Compute expected delay** for direct transmission given random walk mobility model, Network area = 6400, transmission range = 5 no. of nodes = 20 **4**

Q-2 **11**

[A] The **expected hitting time** $ET_{comm}^{(in)}$ until a node A, moving according to the community model, encounters a static node B, who lies inside A's community, is given by: **4**

$$ET_{comm}^{(in)} = \frac{1}{1-\left[\left(1-p_{hit}^{l}\right)^{\pi_l}\left(1-p_{hit}^{r}\right)^{\pi_r}\right]}(\pi_l\bar{T}_l+\pi_l\bar{T}_r),$$

where $p_{hit}^{r} = 2K\bar{L}/N$ and $p_{hit}^{l} = p_{hit}^{r}/c$.

[B] Compute **Hitting time and Meeting time for random direction** mobility model : N= 400 x 400 K=10, Avg.time=200,Avg. speed= 1 m/sec.and pause time =20 **4**

[C] Derive an equation to compute average encounter rate for random way point mobility model with reference to analytical model. **3**

[OR]

Q-2 **11**

[A] Prove theorem:The **expected hitting time** $ET_{comm}^{(out)}$ until a node A, moving according to the community model, encounters a static node B, who lies outside A's community, is given by: **4**

$$ET_{comm}^{(out)} = ET_{rd} + \frac{1-p_r}{1-p_l}\frac{N}{2K\bar{L}}\bar{T}_l.$$

[B] Calculate Hitting time for **(small) community** based random direction model : Area= 500 x 500 , P_{local}= 0.8, $P_{roaming}$=0.2, Tl = 150, Transmission range =10, Average speed = 1 m/sec. **4**

[C] Analytically compute AER(encounters/min) for random way point mobility model : Communication range= 100m, Node Density = 50, Average Speed = 30 m/s and time = 10 sec **3**

Q-3 **12**

[A] Compute pairwise meeting rate p for RD & RWP and packet forwarding rate for n-epidemic routing : Avg. relative speed = 3 m/sec, Area = 500x500, transmission range = 10, battery enegery = 1000 units/node, energy consumed =4 unit transmit/receive, number of forwards =5, neighbours=3. **4**

[B] Write pseudo code for SBR-DTN **4**

[C] Why ADHOC/MANET routing protocols fails in DTN environment?Find **average delivery predictabilities** from node A to node B after second encounter . [For Spray & wait with prophet] P_{init} = 0.50 , t1=20 , t2=50. **4**

SECTION – II

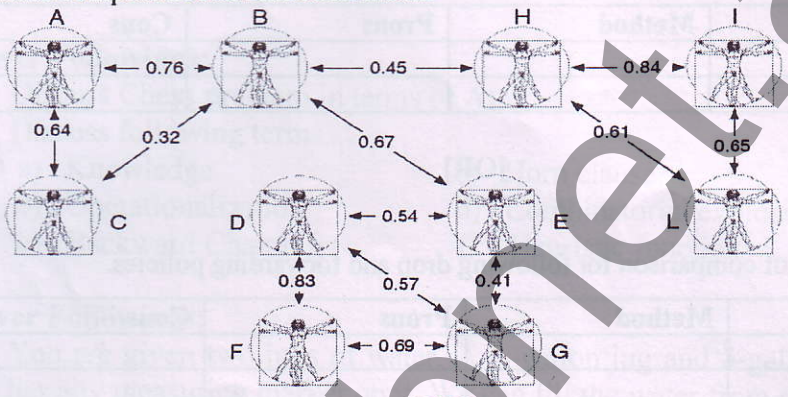
Q-4 **12**

[A] **Draw** schematic diagram of **Internet Vs. DTN Routing**. **Name** the strategy used for information exchange. List the class of service (CoS) provided by Bundle layer. **4**

[B] **Perform BoGu's classification of mobility models** for each of following scenario with short justification: **4**

1.Human walk patterns
2.Disaster Recovery
3.Freeway & city block/section scenario
4.Heterogeneous random walk

[C] For given social network, prepare **interaction** and **connectivity** matrix for threshold =0.50. Identify at least **two communities** from connectivity matrix and **write** an equation to compute social attraction index. **4**



[OR]

Q-4 **12**

[A] Show the classification chart of mobility models and Identify the mobility model type for each scenario presented below with short justification: **4**

1.Police officers attempting to catch escaped criminal
2.Group of children walking in single line to their classroom
3.Cellular network
4.Class of student touring an art museum

[B] Draw schematic diagram of ONE simulator along with routing and movement package classification. **4**

[C] Compute $\mathbf{EV_A}$ & $\mathbf{EV_B}$ for given CWC_A=20, CWC_B=40, $\acute{\alpha}$= 0.85, $\mathbf{EV_A}$=5 & $\mathbf{EV_B}$=10 using encounter based routing. Suppose node A has 12 copies of Message M1 and 10 copies of message M2. How many copies of each **messages** node A transmits to Node B ? **4**

Q.5 **11**

[A] How to improve PROPHET ? Write the pseudo code for PROPHET+ **3**

[B] Following table shows the current message vectors for Node A and Node B respectively. Show respective message vector's contents after encounter with each other for epidemic routing. **4**

Node A	
Dest Id	Seq.No
D	1
G	1
F	1

Node B	
Dest ID	Seq No
D	0
E	0
F	0
F	1

Write pseudo code for two hop routing protocol.

[C] Prepare the table of comparison for following drop and forwarding policies . 4

Forwarding Policy	Method	Prons	Cons
TSMF			
COIN			

Drop Policy	Method	Prons	Cons
N-drop			
MOFO			

[OR]

Q-5 11

[A] Prepare the table of comparison for following drop and forwarding policies. 4

Drop Policy	Method	Prons	Cons
MOPR			
LEPR			

Forwarding Policy	Method	Prons	Cons
TMHF			
GRTR			

[B] Show the classification chart of mobility models and list mobility metrics. 3

[C] Write pseudo code for large message fragmentation. 4

Q.6 12

[A] Write an equation to compute expected delay for Epidemic routing using **accordion phenomenon**. Use the **coloring process** to recursively compute **s(p)** [i.e. Aggregated neighbors of given node.] 4

[B] Compute the **delivery predictability** new values for $P_{A,B}$ $P_{B,C}$,$P_{A,C}$ 4

P_{init} =0.75 ,β =0.25

From/To	B	C
A	0.7	0.3
B	0.5	0.5

[C] How to make Encounter based routing protocol **secure**? Discuss **Time stamp protocol** with suitable example & diagram. 4

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