L-4/T-1/CE Date : 10/01/2015

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2012-2013

Sub : **CE 451** (Transportation Engineering II : Pavement Design and Railway Engineering)

Full Marks : 280 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

Assume reasonable values for missing data, if any.

1. (a) What are classification of aggregates based on source, size and weight? Why is aggregate grading and blending important for any aggregate construction in roads? **(15)**

   (b) What are the main differences between Marshall and Hveem method of mix design regarding compaction and testing of specimens? **(15)**

   (c) How do you find out surface capacity value in Hveem method of mix design? An asphaltic concrete sample cut from a completed pavement weighs 3540 gm in air and 1962 gm in water. The laboratory compacted specimen of the same mix has a bulk specific gravity G_{mb} of 2.384 and voids of 5.5 percent. Is the mix satisfactory? **(16⅔)**

2. (a) Briefly state the steps for refining crude petroleum in order to get different varieties of asphaltic materials. What are the grades of asphalt cement based on standard capillary viscometer test results? **(18⅔)**

   (b) Name the laboratory tests of bituminous materials used in road construction. Write down the specification requirement for asphalt used runway overlay mixes. **(16)**

   (c) What are the especial qualities required for bitumen to be used in road construction of Bangladesh? How are these qualities be achieved? **(12)**

3. (a) Define Perpetual Pavement? What are the technological advancements made Perpetual Pavement possible? Write down three main considerations of Perpetual Pavement. Compare between flexible pavement and rigid pavement. **(3+4+3+12=22)**

   (b) State the common modes of distresses of flexible pavement. What are the problems associated with pavement Fatigue Cracking and main causes of this distress? State the ways of removing 'Bleeding of bituminous pavement'? What were the purposes and outcomes of AASHO road test? **(7+6⅔+3+8=24⅔)**

4. (a) List different methods of pavement design. Write down the types of rigid pavement joints and functions of dowel bars. Draw a typical joint detail of rigid pavement showing sealant reservoir and backer rod. **(6+8+4⅔=18⅔)**

   (b) Design a concrete pavement by using PCA method for the conditions given below. Give one trial and put your comments on the trial thickness. Solution could be given in the worksheet provided at the end of question paper. **(28)**

Contd P/2

General Data

Traffic (Average Daily Traffic, ADT):	[illegible] v/day (both directions)
Trucks:	15 percent of ADT
Annual growth:	3 percent
Modulus of Rupture, M_R:	550 psi
Modulus of Subgrade Reaction, k:	100 pci
Design life:	20 years

Other Data

Doweled joints:	Yes
Shoulder:	No
Subbase:	6 in untreated

Truck Axle Load Distributions

Axle Load Group	No. axles per 100 trucks on the road	
	Single Axles	Tandem Axles
12-14	8.0	
14-16	7.3	
16-18	6.1	
18-20	5.4	
20-22	3.2	
22-24		7.6
24-26		8.4
26-28		9.0
28-30		11.2
30-32		9.4
32-34		1.8
34-36		1.4
36-38		0.9
38-40		1.0

Effect of Untreated Subbase on *k* Values,

Subgrade value, pci	Subbase k value, pci			
	4 in.	6 in.	9 in.	2[illegible]
50	65	75	85	110
100	130	140	160	190
200	220	230	270	320
300	320	330	370	430

Contd P/3

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Explain nature and values of various train resistance for a moving locomotive. **(10⅔)**

(b) Explain factors affecting the choice of a railway gauge and mention examples of countries for different gauges. **(16)**

(c) Write short notes on the following: **(20)**

(i) Deficiency in super-elevation

(ii) Working principals of compressed air and vacuum brakes

(iii) Types of wear on rails

(iv) Coning of wheels

(v) Minimum depth of ballast cushion.

6. (a) Explain with neat sketches the construction and function of a semaphore signal. **(6⅔)**

(b) Explain with neat sketches the classification of railway signals according to location. **(20)**

(c) What is a "turnout"? Draw a complete labelled diagram for a left hand turnout. **(20)**

7. (a) Write down main strategies for customizing low cost road options. What do you mean by Engineered Earth road? Discuss construction of Dressed Stone road surface and Penetration Macadam road surface. Draw a neat section of Bangladeshi rural road with Herring Bone Bond (HBB) brick pavement and its construction and material specifications. **(6+4+10+10=30)**

(b) Discuss following construction requirements of plant mixed hot bituminous pavement. **(16⅔)**

(i) Quality control plan including testing frequency

(ii) Preparation of asphalt concrete

(iii) Preparation of application surface

(iv) Compaction of asphaltic mix on road

8. (a) Write down names and uses of 10 highway construction equipments. Explain how Gantt Charts Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT) are useful tool in highway construction management. **(10+10=20)**

(b) Write down names of cement concrete uniformity testing prior to start of rigid pavement construction. Explain various curing means for rigid pavement. Discuss pumping distress phenomenon in rigid pavement. **(16⅔)**

(c) Explain highway network management system framework with a schematic flow chart. **(10)**

For Q. No. 4(b)

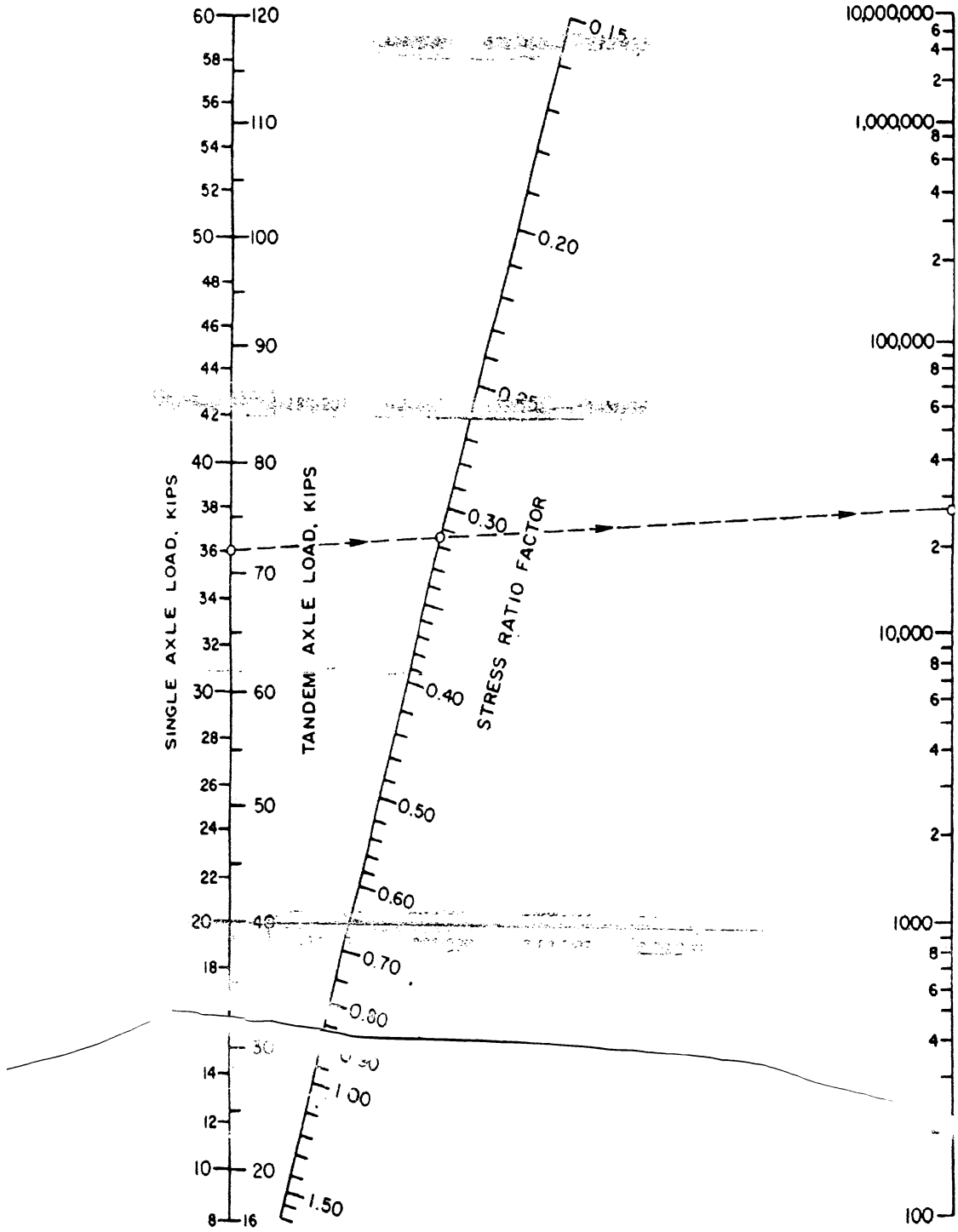
Equivalent Stress — No Concrete Shoulder (Single Axle/Tandem Axle)

Slab thickness, in.		k of subgrade-subbase, pci						
		50	100	150	200	300	500	700
4	4.5	825/679 699/536	726/585 [illegible]	671/542 [illegible]	634/516 [illegible]	584/486 498/406	523/457 448/378	484/443 417/363
5	5.5	602/516 526/461	531/436 464/387	493/399 431/353	467/376 409/331	432/349 379/305	390/321 343/278	363/307 320/264
6	6.5	465/416 417/380	411/348 367/317	382/316 341/286	362/296 324/267	336/271 300/244	304/246 273/220	285/232 256/207
7	7.5	375/349 340/323	331/290 300/268	307/262 279/241	292/244 265/224	271/222 246/203	246/199 224/181	231/186 210/169
8	8.5	311/300 285/281	274/249 252/232	255/223 234/208	242/208 222/193	225/188 206/174	205/167 188/154	192/155 177/143
9	9.5	264/264 245/248	232/218 215/205	216/195 200/183	205/181 190/170	190/163 176/153	174/144 161/134	163/133 151/124
10	10.5	228/235 213/222	200/193 187/183	186/173 174/164	177/160 165/151	164/144 153/136	150/126 140/119	141/117 132/110
11	11.5	200/211 [illegible]	175/174 [illegible]	163/155 [illegible]	154/143 [illegible]	144/129 135/122	131/113 123/107	123/104 116/98
12	12.5	177/192 168/183	155/158 147/151	144/141 136/135	137/130 129/124	127/116 120/111	116/102 109/97	109/93 103/89
13	13.5	159/176 152/168	139/144 132/138	129/129 122/123	122/119 116/114	113/106 107/102	103/93 98/89	97/85 92/81
14		144/162	125/133	116/118	110/109	102/98	93/85	88/78

Erosion Factors — Dow[illegible] Shoulder (Single /Tandem Axle)

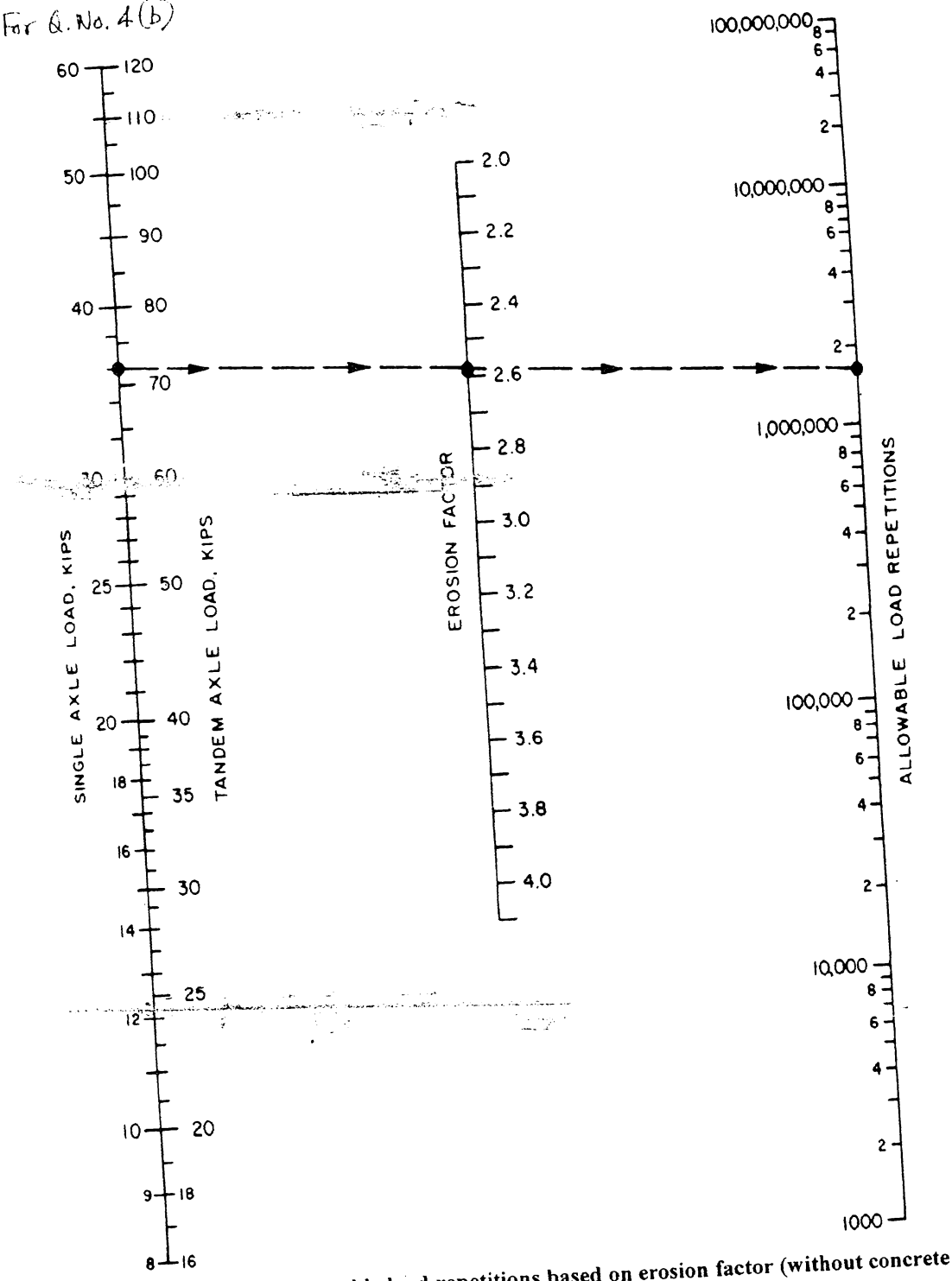
Slab thickness,		k of subgrade-subbase, pci					
		50	100	200	300	500	700
4	4.5	3.74/3.83 3.59/3.70	3.73/3.79 3.57/3.65	3.72/3.75 3.56/3.61	3.71/3.73 3.55/3.58	3.70/3.70 3.54/3.55	3.68/3.67 3.52/3.53
5	5.5	3.45/3.58 3.33/3.47	3.43/3.52 3.31/3.41	3.42/3.48 3.29/3.36	3.41/3.45 3.28/3.33	3.40/3.42 3.27/3.30	3.38/3.40 3.26/3.28
6	6.5	3.22/3.38 3.11/3.29	3.19/3.31 3.09/3.22	3.18/3.26 3.07/3.16	3.17/3.23 3.06/3.13	3.15/320 3.05/3.10	3.14/3.17 3.03/3.07
7	7.5	3.02/3.21 2.93/3.14	2.99/3.14 2.91/3.06	2.97/3.08 2.88/3.00	2.96/3.05 2.87/2.97	2.95/3.01 2.86/2.93	2.94/2.98 2.84/2.90
8	8.5	2.85/3.07 2.77/3.01	282/299 2.74/2.93	2.80/2.93 2.72/2.86	[illegible]/2.89 2.71/2.82	2.77/2.85 2.69/2.78	2.76/2.82 2.68/275
9	9.5	2.70/2.96 2.63/2.90	2.67/287 2.60/2.81	2.65/2.80 2.58/2.74	2.63/2.76 2.56/2.70	2.62/2 71 2.55/2.65	2.61/2.68 2.54/2.62
10	10.5	2.56/2.85 2.50/2.81	2.54/2.76 2.47/2.71	2.51/2.68 2.45/2.63	2.50/2.64 2.44/2.59	2.48/2.59 2.42/2.54	2.47/256 2.41/2.51
11	11.5	2.44/2.76 2.38/2 72	2.42/2.67 2.36/2.62	2.39/2.58 2.33/2.54	2.38/2.54 2.32/2.49	2.36/2.49 2.30/2.44	2.35/2.45 2.29/2.40
12	12.5	233/2.68 2.28/2.64	2.30/2 58 2.25/2.54	2.28/2.49 2.23/2.45	2.26/2.44 2.21/2.40	2.25/2.39 2.19/2.35	2.23/2.36 2.18/2.31
13	13.5	2.23/2.61 2.18/2.57	2.20/2.50 2.15/2.47	2.18/2.41 2.13/2.37	2.16/2.36 2.11/2.32	2.14/230 2.09/2.26	2.13/2 27 2.08/2 23
14		2.13/2.54	2.11/2.43	2.08/2.34	2.07/2.29	2.05/2.23	2.03/2.19

Form 6. No. 4(b)



Fatigue analysis—allowable load repetitions based on stress ratio factor (with ar without concrete shoulder).

For Q. No. 4(b)



Erosion analysis—allowable load repetitions based on erosion factor (without concrete shoulder).

For Q. No. 4(b)

Calculation of Pavement Thickness

Project _____

Trial thickness _____ in
Subbase-subgrade, k _____ pci
Modulus of Rupture, MR _____ psi
Load safety factor, LSF _____

Doweled joints yes ____ no ____
Concrete shoulder yes ____ no ____
Design Period _____ years

Axle Load, kips	Multiplied by LSF	Expected repetitions	Fatigue analysis		Erosion Analysis	
			Allowable repetitions	Fatigue Percent	Allowable repetitions	Damage Percent
1	2	3	4	5	6	7

8. Equivalent stress _____
9. Stress ratio factor _____
10. Erosion factor _____

Single Axles

11. Equivalent stress _____
12. Stress ratio factor _____
13. Erosion factor _____

Tandem Axles

			Total		Total	

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B. Sc. Engineering Examinations 2011-2012

Sub : **CE 451** (Transportation Engineering III : Traffic Planning and Management)

Full Marks : 140 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

Necessary assumptions could be made for any missing data/information.

1. (a) Define and explain the function, hierarchy and classifications of the urban road system. Illustrate your understanding with suitable diagrams and figures stating different functional road types. List the predoniminant functions and activities that are commonly considered for different road types in urban areas. Also list some traffic operational and design improvements that are required to take full advantage of Arterial Street. **(13 1/3)**

   (b) Why do we need classification of road accidents? Give details of the accident classification system and explain the concepts and usefulness of collision diagram. **(10)**

2. (a) Define and explain different trip categories and discuss the factors affecting individual mode and route choice. Discuss the following: **(11)**

   (i) Congestion factors and characteristics and

   (ii) Diversion curve for traffic assignment.

   (b) Discuss the significance of Non-motorised transport (NMT) in urban areas of Bangladesh both in the present and future context. Briefly outline the various facilities used for safer and convenient movement of pedestrians and bicyclists in urban areas. List some countermeasures for reducing pedestrian-vehicular collisions at intersections. **(12 1/3)**

3. (a) Define road traffic accident and explain road traffic accident factors with particular reference to Haddon Matrix. Explain the following: **(12 1/3)**

   (i) Hazardous Road Location (HRL) Program elements

   (ii) Clustering of accidents on the road network.

   (b) What are the fundamental principles for safer road environment? What principles should be followed for designing safer intersections and links (mid-block sections)? State your understanding about the new tool of road safety audit and explain the stages and conduct of road safety audit. **(11)**

Contd P/2

4. (a) Define urban bypass and explain briefly the reasons, types and the consequences of the urban bypass. Why and in which way one way streets considered as one of the most cost-effective tools for improving traffic problems? **(11)**

(b) Explain in brief the salient features of the transportation planning process. **(12 1/3)**

A self-contained town consists of three residential areas A, B, C and two industrial estates X and Y. Generation equations show that for the design year in question, the trips from home to work generated by each residential area per 24 hour day are as follows:

A	1250
B	2250
C	1750

There are 3,700 jobs in industrial estate X and 4500 jobs in industrial estate Y. It is known that attraction between zones is inversely proportional to the square of the journey times between zones. The journey times in minutes from home to work are:

Zones	X	Y
A	16	20
B	14	12
C	12	15

Calculate and tabulate the interzonal trips for journeys from home to work.

Assume $K_{ij} = 1$ for all zones.

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) What are the eight important data items collected for analyzing traffic flow on the road. Compare manual and automated scheme for such data collection. Also, explain and deduce the interrelationship between **(2+5+6 1/3 =13 1/3)**

(i) Traffic flow and headway

(ii) Time mean speed and space mean speed

(iii) Occupancy and density

(b) Explain linear and logarithmic speed density model with graphs and equations. Also, combining fundamental traffic flow equation with the above model, derive condition for **(5+5)**

(i) Optimum speed and density

(ii) Maximum flow capacity

Finally, comment on their field implication with information technology (IT) support.

Contd P/3

6. (a) Explain the two classical volume delay functions with equation. Also, graphically explain their limitation with comments on their application and uses. **(6+4=10)**

(b) 'Urban road network capacity is dictated by intersection capacity' – Discuss. Explain saturation flow and effective green time graphically for a traffic signal. **(3 ⅓ +4+6=13 ⅓)**

A simple four-leg intersection needs a fixed time signal. The critical flows in the N-S and E-W directions are 600 and 400 veh/hr. Saturation flow is 1800 veh/hr and the lost time per phase is observed to be 1.2 s. Determine the cycle length and distribution of green following Webster's method.

7. (a) Explain the geometric elements for traffic circle design with illustration.
What is traffic calming? Explain features and uses of Forced turn island, Speed table, Textured pavement intersection Chicanes and Raised crosswalk. **(3 ⅓ +10)**

(b) What are the likely environmental impacts of large transportation project construction on surface and water? Make reference to these impacts for Padma bridge and Sonadia deep sea port. **(10)**

8. (a) What are the traffic management, Transit management, demand management and restraint measures option for transport system management. Also, explain benefits of separating local function from arterial traffic with schematic diagram. Explain its suitability for Dhaka. **(8+5 ⅓)**

(b) Discuss emission reduction through transport system improvement. **(4+6)**

Make a comparative discussion with schematic drawing for following three

(i) Trumpet Interchange

(ii) Conventional Diamond Interchange

(iii) Single Point Urban Interchange (SPUI).

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B. Sc. Engineering Examinations 2009-2010

Sub : **CE 451** (Transportation Engineering III)

Full Marks : 140 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Define and categories the urban bypass. Briefly outline the consequences of the urban bypass from the road users and community perspectives. What potential treatments are needed to pressure the full advantages of the urban bypass. **(13)**

   (b) State the importance of planning and design for pedestrians and cyclists in mix traffic situation, like urban areas of Bangladesh. List and discuss various pedestrian and bicycle facilities according to whether they are aimed at segregation, integration or separation. **(10⅓)**

2. (a) State the basic principles of transportation planning. Explain trip generation and trip distribution models and their influencing variables. Also explain the variety of variables used in the Diversion Curves for Traffic Assignment. **(12)**

   (b) Explain why road traffic accidents and injuries are now regarded as a serious man-made epidemic in low and middle income countries. What central roles could play by road engineers to mitigate this problem? What factors contribute to road traffic accidents? Explain these factors in the context of Haddon Matrix and how this matrix helps to understand the problem and to devise countermeasures. **(11⅓)**

3. (a) Explain the increasing supply and demand disparities of urban transport in developing countries such as Bangladesh stating their contributing factors and severe consequent effects. State the key issues and elements requiring urgent attention for improving the deteriorating urban traffic conditions in Bangladesh. **(10)**

   (b) Explain the functions, hierarchy and classifications of the urban road system and how these concepts are utilised in the development of an idealised road system. Illustrate your understanding with suitable diagrams and figures. Discuss the functional characteristics of Primary Distributors and Pedestrian Streets with respect Predominant activities and factors. **(13⅓)**

4. (a) Enumerate the basic parameters of traffic accident data items. State traffic engineering uses of accident records.

   Write notes on: **(15)**

   (i) Road Safety Audit (ii) Hazardous Road Locations (HRLs) Program

   (iii) Collision Diagram

   (b) Why do we consider one-way streets as an important traffic management tool? Discuss the operational characteristics, types, advantages and disadvantages of one-way

CE 451

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) What are the items of interest in traffic flow theory? Explain speed-flow-density relationship using Greenshield's speed-flow and speed-density model. Explain the scope and assumptions for Greenshield type of traffic flow model. **(13⅓)**

   (b) Discuss the limitations of classical volume-delay function with example and sketches. Why a car following type of traffic flow model can overcome the limitations of classical volume-delay function? Also, explain the general car following model of traffic flow with equation and figure. **(10)**

6. (a) You have following options for traffic control at road intersection. **(10)**

   (i) Uncontrolled junction.
   (ii) Priority controlled T and Cross junction
   (iii) Priority controlled traffic circle
   (iv) Traffic signal control
   (v) Grade separation.

   Explain the capacity scope for each type of control option and hence discuss the suitability of different options for different urban road type and traffic flow volume situation.

   (b) There could be as many as fourteen main tasks under the traffic management system architecture. Mention ten of them with sub-tasks under each of them. Discuss the present situation of Dhaka city traffic management with respect to each of the main tasks identifying the drawbacks and missing items. **(13⅓)**

7. (a) Classify the following measures of mitigating road traffic related air pollution as long, intermediate and short term. Also, explain how they can improve traffic air pollution situation. **(13⅓)**

   (i) Planning of road network.
   (ii) Design of road intersection.
   (iii) Operation planning
   (iv) On road vehicle pollution enforcement
   (v) Fuel quality.

   (b) Discuss the probable contents of environmental impact statement for the proposed elevated expressway between Narayangang and Gazipur through Dhaka city. Consider the fact that it pass through dense built up area of Dhaka city. **(10)**

8. (a) Define A-weighted sound scale. The elevated expressway as mentioned in Q. 7b. might pass through some noise sensitive neighbourhood of Dhaka city. Discuss the type of noise barrier which could be suitable in this case with reasons for excluding other types of noise barrier. **(10)**

   (b) Draw a typical single point urban interchange (SPUI) with a neat sketch. Discuss the design feature, advantage and disadvantage of SPUI. Also discuss its suitability for typical busy traffic signals of Dhaka city. **(13⅓)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B. Sc. Engineering Examinations 2007-2008

Sub : **CE 451** (Transportation Engineering III : Traffic Planning and Management)

Full Marks : 140 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Road function, hierarchy and classification are distinct but related concepts. Give a detailed explanation of these concepts stating their reasons, purposes and applications to design and management of the urban road and traffic system. List the predominant factors and activities that are considered in classifying roads in urban areas. **(15)**

   (b) Define one-way streets. Explain the types, requirements, advantages and disadvantages of one-way streets. **(8 1/3)**

2. (a) Define urban bypass and explain briefly the reasons, types and consequences of urban bypass. State your understanding of the favourable and unfavourable consequences of a potential Dhaka City bypass route. **(14)**

   (b) Explain the significance of walking and cycling as important modes of transportation in urban areas. Enumerate various pedestrian and bicycle facilities and their design concepts. **(9 1/3)**

3. (a) Why road traffic accidents are of serious concern to road engineering professionals and the community at large? Explain. Discuss the contributory factors of traffic accidents. List some basic parameters of accident data items which are required to carryout scientific analysis and understanding of accident problems. **(15)**

   (b) State the fundamental road safety strategies. Define road safety engineering and explain opportunities of road safety engineering strategies and the principles for safer road design. **(8 1/3)**

4. (a) Define and state the salient features of the transportation planning process. Define comprehensive transportation planning and explain its basic elements and requirements. List the factors influencing trip generation and attraction. **(13)**

   (b) Write short notes on **(10 1/3)**

   (i) Diversion curves for traffic assignment

   (ii) Road safety audit

   (iii) Collision diagrams and accident [illegible]

Contd P/2

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Write down five 'traffic data measurement' procedures explaining how these can be utilised for measuring items of interests such as rates of flow, speed, travel time, density and occupancy. Also, discuss the manual versus automatic equipment application in each method. **(13 ⅓)**

(b) Explain the traffic signal design parameters such as saturation flow, lost time, cycle time, split and offset of cycle time. Estimate traffic signal timing for the following junction situation : **(10)**

Direction	Saturation Flow (veh./hr)	Hourly Flow (veh./hr)
North → South	5000	3600
South → North	5000	3200
East → West	3000	1700
West → East	3000	1500

Consider 2 phases, all reds = 3 sec/cycle and lost time = 2 sec/phase.

6. (a) Chittagong-Cox'sbazar-Teknaf is an environmentally sensitive rapidly developing tourist zone of Bangladesh. Increasing number of personal holiday cars are attracted in this zone especially during peak dry season. Recently, Bangladesh Government has declared a plan to construct a railway line between Chittagong and Cox'sbazar. A deep sea port is also planned near Cox'sbazar. Besides, one of the proposed Asian Highway Route is situated in this area extending upto Myanmar. Under these contexts, you are asked to develop a transport-environment policy-cum-planning framework with the objective of sustainable transport sector development in this zone. Develop this framework and also write down the contents of Environmental Impact Assessment needed for such framework development. **(13 ⅓)**

(b) Explain the concepts of L_{eq} and L_{10} noise level graphically. Discuss the salient features of AASHTO noise level standards. Discuss the structural solution measures that can be adopted for noise attenuation in densely built Dhaka City situation. **(10)**

Contd P/3

7. (a) Discuss the framework for traffic air pollution management as a part of overall Air Quality Management System (AQMS). Also, discuss the features of traffic air pollution mitigation tools such as Engine Technology, Fuel type, Preventive maintenance, Sustainable planning and E-commuting. **(13 ⅓)**

   (b) Write down the harmful effects of traffic air pollutants on human health. Discuss the task of traffic emission inventory development including development of driving cycle. **(10)**

8. (a) Explain different forms of traffic interchange facilities with schematic sketches. Write down their advantages and disadvantages. **(10 ⅓)**

   (b) For the traffic signal stated in Q. 5(b) imagine peak hour demand has significantly increased with worsening traffic delay. It is suggested that a grade separated under or over pass can eradicate delay of through traffic in N → S and S → N direction. Design an intersection layout with such a grade separation in N → S and S → N direction and traffic signal control for rest of the traffic at a grade (under the overpass or over the underpass). This time consider that there are left and right turning traffic on all the four approaches. Also, mention the special design features needed for this type of single point urban interchange (SPUI). **(13)**

L-4/T-2/CE

Date : 18/02/2009

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B. Sc. Engineering Examinations 2006-2007

Sub : **CE 451** (Transportation Engineering III)

Full Marks : 140 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Briefly discuss about the weaknesses of the Dhaka Metropolitan City in particular relation to transportation problems. In your opinion what would be the probable long-term solutions. **(8+2)**

   (b) Differentiate between traffic supply management and demand management. **(5 ⅓)**

   (c) What are the main objectives of parking control? What considerations are to be made in selecting the location and size of "off-street" parking facilities? **(3+5)**

2. (a) Discuss about different control techniques of right-turning movements at intersections. **(7)**

   (b) What enforcement measures should be taken to make speed regulation a success? Explain how one-way system improves traffic operation and safety. **(4+7)**

   (c) A minor road crosses a major road at right angle. Design speed on major road is 60 kmph. In obstructed intersection sight triangle, the distance of vehicle on major road with respect to corner of an obstruction is 15 m and that for vehicle on the minor road is 20 m. Calculate safe approach speed of vehicles on minor road for a giveaway situation. Assume, drivers perception-reaction time, t = 2.00 seconds. **(5 ⅓)**

3. (a) What are the main causes of road accident? Briefly discuss about the basic steps of accident studies. In your opinion what type of measures need to be taken to make accident studies more effective in Bangladesh. **(3+6+3)**

   (b) What are the uses of 'Spot Map' in accident studies? Draw a typical collision diagram. **(3+4)**

   (c) In a priority typed cross-junction there were 19 accidents in a year. After provision of traffic signal, the number of accidents dropped down to 13 per year. In the road network, where this junction is situated, the general trend observed was that number of accidents decreased at a rate of 5% during the period covered by the above two observations. Test whether the improvement in junction design has a significant effect at 5% significance level. Given χ^2 (critical) = 3.84 for 5% LOS with 1 d.o.f. **(4 ⅓)**

Contd P/2

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4. (a) Briefly explain the importance of "Access control" and "Traffic surveillance". **(6 1/3)**

   (b) Name different types of grade-separated interchanges. Draw a typical left-hand trumpet interchange. **(3+3)**

   (c) Give short descriptions of "Park and Ride Facility" and "Tidal-flow traffic operation". Schematically show the basic elements of transportation planning process. Justify the need for citizen participation in transportation planning. **(4+4+3)**

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Explain traffic flow fundamental diagrams with sketches. Using Greenshield's model (i.e. $u = u_f (1-k/k_{Jam})$), deduce expressions for optimum speed and maximum flow. Explain the implications of these deductions in an intelligent transport system based traffic management. **(16 1/3)**

   (b) Discuss typical bike facilities with experienced capacity range as per Highway Capacity Manual. **(7)**

6. (a) Explain the concept of highway capacity and level of service. Write down the ideal conditions of uninterrupted flow for a two-lane two-way road. **(13 1/3)**

   (b) Explain the parameters for determining pedestrian level of service on walkway, crosswalk and queuing areas and give their range of values as per Highway Capacity Manual. **(10)**

7. (a) Padma bridge is an upcoming large scale transportation infrastructure project in Bangladesh. What should be the contents of the Environmental Impact Statement for such a large project? **(11 1/3)**

   (b) Discuss the advantages and disadvantages of an urban bypass. What measures may be adopted for mitigation of adverse impacts of urban bypass? **(12)**

8. (a) Explain A-weighted sound level L_{eq} and L_{10} noise level. What are the means of noise attenuation? Also, discuss the general principles of noise barrier design. **(6+3+5)**

   (b) Explain emission and dispersion model. Discuss the control of road traffic related air pollution through planning, design and operation. **(3+6 1/3)**

L-4/T-2/CE **Date : 15/4/2007**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-2 B. Sc. Engineering Examinations 2004-2005

Sub : **CE 451** (Transportation Engineering – III)

Full Marks : 140 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are FOUR questions in this Section. Answer any THREE.

1. (a) Briefly discuss about the ways of minimizing conflicts between vehicle-vehicle and vehicle-pedestrian? Differentiate between supply management and demand management. **(4+5)**

   (b) Describe the underlying reasons of improving roadway capacity and safety with the introduction of one-way traffic operation system? Mention the introduction requirements of one-way traffic operation? Briefly discuss about different control techniques of right-turning movements at intersections. **(6+2 ⅓ +6)**

2. (a) Define overspeeding and mention its consequences? Briefly describe the reasons behind imposing lower speed limit on high standard roads? Deduce an expression to determine the safe approach speeds of vehicles at priority intersections. **(4+1+6)**

   (b) State the common problems associated with 'tidal-flow' type of traffic? Briefly discuss about different ...ques of reversible lanes. **(2+3)**

   (c) Briefly exp... importance of traffic surveillance. How traffic surveillance differs from other traffic manage... measures? Write down the ...lative advantages and disadvantages of existing side roads? **(3+1 ⅓ +3)**

3. (a) For p...ng control and management what general parking policies should be followed. What factors should be considered in selecting the location and size of "off-street" parking facilities. Write short note on "Park and Ride Scheme". **(3+6+2)**

   (b) Differentiate between "Flyover" and "Interchange". In your opinion which of the grade separated facilities constructed at Mohakhali and Khilgaon is "Flyover" and "Interchange"? State the relative advantages and disadvantages of 'Diamond' and 'Clover Leaf' interchange. List the factors to be considered in selecting a particular type of interchange? **(3+1+6+2 ⅓)**

4. (a) Briefly discuss about motor vehicle induced air pollution problems in Bangladesh. How traffic induced air and noise pollution can be controlled? What should be the ideal pattern of road network for urban and rural areas? **(4+4+4)**

Contd P/2

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Contd ... Q. No. 4

(b) Briefly describe the basic steps of accident studies. Mention different ways of expressing accident rates and in your opinion which one is the best way of expressing accident rate? Mention few important uses of accident data. What are the main usages of 'Spot Map' and 'Collision Diagram' in accident studies? **(4+1+2+2)**

(c) The accident data pertaining to Dhaka Metropolitan city for the years 1990 and 1995 are given below : **(2 ⅓)**

	1990	1995
Accidents number	[illegible]	285
Vehicle-km of travel (thousand)	640	[illegible]

Test whether there is any significant increase in the accident rates between 1990 and 1995 at 5% significance level. Given χ^2 (critical) = 3.84 for 5% LOS with d.o.f. = 1.

SECTION – B

There are FOUR questions in this Section. Answer any THREE.

5. (a) Define transportation planning and state its scope and objectives. Discuss policy planning, system planning and project planning. **(15)**

(b) Discuss the functions and characteristics of Urban Bypass Roads and Urban Ring Roads. **(8 ⅓)**

6. (a) State the assumptions and discuss the stepwise procedure for urban transportation planning process. Discuss the problems of transportation planning in Bangladesh. **(15)**

(b) Narrate the interdependence between land use and traffic. **(8 ⅓)**

7. (a) Define trip generation, trip distribution and traffic assignment. What are the purposes of traffic assignment? Discuss two methods of traffic assignment. **(15)**

(b) Discuss how are population, socio-economic factors and land use patterns predicted to formulate transportation plan. **(8 ⅓)**

8. Write explanatory notes on : **(23 ⅓)**

(i) Traffic Density, Spacing and Headways

(ii) Spot Speed and Running Speed

(iii) Pedestrian characteristics and Sidewalks

(iv) Citizen participation in transportation planning.

L–4/T–2/CE

Date: 5/5/2007

Full Marks : 140 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are FOUR questions in this section. Answer any THREE.

1. (a) Explain ---- "Good highway planning should be long range, comprehensive and co-ordinated". **(11 $\frac{1}{3}$)**

   (b) What is meant by "Subsidy"? Explain some justifications for providing subsidies to transit services. **(12)**

2. (a) Explain different fare structure practices for transit services. **(11 $\frac{1}{3}$)**

   (b) Briefly explain different components of highway construction and operation costs. **(12)**

(b) Explain some infrastructure and operational characteristics of different type of Light Rail Systems. **(12)**

SECTION – B

There are FOUR questions in this section. Answer any THREE.

5. (a) Discuss the main features of different patterns of road planning. Draw a neat sketch of the star and grid pattern and explain it in brief. **(8 $\frac{1}{3}$)**

   (b) State the Organization for Traffic Engineering at the state level. **(4)**

   (c) A, B, C, D, E are five alternative proposals with different road lengths serving different populations and agricultural products. Calculate the utility per unit length for each of the systems and indicate priorities of each proposal based on saturation system. **(11)**

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Contd ... Q. No. 5(c)

Proposal	Total length of road in km	Number of villages and Towns served with population range				Agricultural Products in (1000 ton)
		3001-5000	5001-7500	7501-12000	>12,000	
A	500	80	40	10	4	170
B	700	120	50	15	8	300
C	900	160	60	30	10	500
D	1000	200	70	40	12	600
E	1200	232	80	45	16	700

Utility units are given as follows:

population range	Units	Production
3001-5000	0.25	Unit is taken as
5001-7500	0.50	one for per 1000 ton
7501-12000	1.00	
>12,000	2.50	

6. (a) Explain the Model classification of Transportation Engineering. **(7)**

   (b) What are the basic stages in the highway development process? Explain the factors to consider during planning stages. **(8 $\frac{1}{3}$)**

   (c) Write short notes on : **(8)**

   (i) Nature of Transportation Demand

   (ii) Trip decision classification

7. (a) Explain the Multiple Linear Regression Analysis (MLRA), in connection with trip generation analysis. What are the assumptions in MLRA? **(7 $\frac{1}{3}$)**

   (b) The utility function is given as follows: **(7)**

   $U_m = -0.004\ t_m - 0.005\ C_m - 0.003\ W_m + 0.15\ d_m$

   where, t_m = in vehicle travel time (min)

   C_m = out of pocket cost (taka)

   W_m = waiting time (min)

   d_m = a dummy variable.

   Variable values are given in the following table.

CE 455

Contd ... Q. No. 7(b)

Mode	Variable values			
	t_m (min)	C_m (taka)	W_m (min)	d_m
Private Car	65	60	0	1
Business	75	5	5	0
Rapid Transit	25	8	20	0

If 10,000 trips are made from the Origin zone to the destination zone, determine the number of trips made by the different mode using Logit model.

(c) "During assessing the character of an area some questions to ask" --- what are those questions? **(9)**

8. (a) A house hold survey data are given in the following table. Based on the data provided develop the following table. (i) Number and percent of house hold in each income category V_s. Car Ownership. (ii) Average trips per house hold V_s. income and car Ownership. **(13)**

Sl. No.	Trip produced per house hold	Income ($ 1000)	Car Ownership Per household.
1.	2	16	0
2.	4	24	0
3.	10	68	2
4.	5	44	0
5.	5	18	1
6.	15	68	3
7.	7	38	1
8.	4	36	0
9.	6	28	1
10.	13	76	3
11.	8	72	1
12.	6	32	1
13.	9	28	2
14.	11	44	2
15.	10	44	2
16.	11	52	2
17.	12	60	2
18.	8	44	1
19.	8	52	1
20.	6	28	1

(b) Discuss the parties involved in urban goods movement and their concern. List the problem related to movement of trucks in a community. **(10 $\frac{1}{3}$)**
