TEACHING PLAN

BACHELOR OF EDUCATION IN BUILDING ENGINEERING (BE-BE) STUDY PROGRAM

DEPARTMENT OF CIVIL ENGINEERING, FACULTY OF ENGINEERING, UNIVERSITAS NEGERI PADANG

COURSE	CODE	COURSE CLUSTER	CREDITS		SEM	VERSION
			Theory	Practice		
ROAD PAVEMENT CONSTRUCTION	SIP	Compulsory courses of study program	3			

Lecturer in Charge			**Lecturer in Charge** Oktaviani, S.T., M.T. NIP. 197210041997022001
Remarks	**Dean of Faculty of Engineering**	**Head of Civil Engineering Department**	**Coordinator of BEVE**
	Dr. Fahmi Rizal, M.Pd., M.T NIP. 195912041985031004	Faisal Ashar, Ph.D. NIP. 19750103 200312 1001	Drs. Revian Body, MSA. NIP. 19600103 198503 1003

Program Learning Outcomes

Program Learning Outcomes (PLO)

By considering input from all stake holders and the minimum requirements set by ASIIN, the PLO's that must be possessed by graduates from the Bachelor of Education in Building Engineering Study Program are determined as follows:

1. Master *basic knowledge of science* (mathematics, natural sciences) and other scientific disciplines that form the basis of building engineering vocational education field for carrying out professional work *(Knowledge and Understanding).*
   - 1.1. Able to implement basic concepts of mathematics and physics to master subjects matter in the field of building engineering vocational education.
   - 1.2. Mastering Statics, Mechanics, Statistics, Technology Materials, and Engineering Drawings as the basic

	knowledge in the field of building engineering vocational education. 2. Able to identify, formulate, solve, and evaluate various technical problems of buildings as the basic ability for teaching in the field of building engineering vocational education *(Engineering analysis, investigation and assessment)* . 2.1. Able to identify, formulate, solve, and evaluate technical problems in the field of geotechnical and transportation as the basic ability for teaching in the field of building engineering vocational education. 2.2. Able to identify, formulate, solve, and evaluate technical problems in the field of structure and construction management as the basic ability for teaching in the field of building engineering vocational education. 2.3. Able to identify, formulate, solve, and evaluate technical problems in the field of hydrology as the basic ability for teaching in the field of building engineering vocational education. 3. Possess the ability to design building by taking into account environmental, social, health and work safety issues as the basis for teaching in the field of building engineering vocational education *(Engineering design).* 3.1. Able to make design programming by taking into account environmental, social, health and work safety issues, in cooperation with various party related. 3.2. Able to analyze the design by taking into account environmental, social, health and work safety aspects. 3.3. Able to produce design by taking into account environmental, social, health and work safety aspects. 4. Possess social, managerial, team work, and effective communication competencies, entrepreneurial character, environmental insight and life-long learning habits. *(Transferable and soft skills).* 4.1. Possess religious character implemented in personal and professional activities. 4.2. Possess the spirit of nationalism, social sensitivity and environmental insight 4.3. Able to communicate effectively and work in a team. 4.4. Able to transfer science and technology to the community to improve the quality of life 4.5. Possess entrepreneurial character 5. Possess the ability to innovate and adapt to the development of science and technology, and implement it into the learning process of building engineering vocational education field by taking into account non-technical risks that may occur (ethical, ecological, commercial, and industrial impact) *(Engineering practice).* 5.1. Able to innovate and use information technology (software) in the field of building engineering vocational education by taking into account the ethical, ecological, commercial and industrial impact.

<table>
<tr><td></td><td>
5.2. Able to use information technology-based equipment (hardware) in field of building engineering vocational education.
6. Possess a good ability to design, implement and evaluate the learning process in the field of building engineering vocational education (Educational design).
6.1. Able to design curriculum and learning process of building engineering vocational education.
6.2. Able to implement, control, evaluate and improve the quality of learning process through research in the field of building engineering vocational education.
6.3. Able to develop an effective, efficient, and attractive learning media in the field of building engineering vocational education.
</td></tr>
<tr><td>Course Learning Outcomes</td><td>
Course Learning Outcomes (CLO)
<table>
<tr><th>Course LO</th><th>PLO</th></tr>
<tr><td>1. Know and understand about the definition of Highway Pavement Construction.</td><td>1.2, 2.4</td></tr>
<tr><td>2. Knowing, understanding the types of pavement and pavement layers and materials.</td><td>1.2, 2.4</td></tr>
<tr><td>3. Able to calculate, analyze and plan pavement thickness for asphalt / flexible pavement construction (new construction and stage)</td><td>1.1, 1.3, 2.1, 2.4, 3.2, 3.4, 4.1, 4.2, 4.3, 5.1, 5.2</td></tr>
<tr><td>4. Analyzing road damage and calculating the thickness of the additional layer on the asphalt / flexible pavement construction pavement</td><td>1.1, 1.3, 2.1, 2.4, 3.2, 3.4, 4.1, 4.2, 4.3, 5.1, 5.2</td></tr>
<tr><td>5. Planning and calculating the thickness of the cement / rigid pavement construction pavement</td><td>1.1, 1.3, 2.1, 2.4, 3.2, 3.4, 4.1, 4.2, 4.3, 5.1, 5.2</td></tr>
<tr><td>5. Planning and calculating the thickness of the cement / rigid pavement construction pavement</td><td>1.1, 1.3, 2.1, 2.4, 3.2, 3.4, 4.1, 4.2, 4.3, 5.1, 5.2</td></tr>
<tr><td>6. Analyze and plan the thickness of the additional cement concrete pavement</td><td>1.1, 1.3, 2.1, 2.4, 3.2, 3.4, 4.1, 4.2, 4.3, 5.1, 5.2</td></tr>
<tr><td>7. Analyze and evaluate highway pavement construction (flexible pavement, rigid pavement, composite pavement)</td><td>1.1, 1.3, 2.1, 2.4, 3.2, 3.4, 4.1, 4.2, 4.3, 5.1, 5.2</td></tr>
</table>
</td></tr>
<tr><td>Course Description</td><td>This course provides knowledge, understanding and design of types of road pavement construction (flexible pavement, rigid pavement, composite pavement) according to conditions in the field, starting from calculating the thickness of each layer, the materials used, and analyzing road damage and calculating the thickness of the additional layer of road pavement in accordance with the Indonesian National Standard (SNI)</td></tr>
</table>

<table>
<tr><td rowspan="3">Literature</td><td colspan="2">Main:</td></tr>
<tr><td colspan="2">1. ----------, Planning Guidelines for Flexible Pavement Thickness using the SNI Component Analysis Method No: 173 - 1989-F, SKB -23.26.1987.
2. ----------, Cement concrete pavement planning, SNI Pd T-14-2003
3. ----------, Thick concrete road design for low traffic, SNI 8457:2017
4. ----------, How to Test Flexible Pavement Using Benkelman Beam Tool RSNI3 2416-2008
5. ----------, Road Pavement Inspection Manual with Benkelmean Beam Tool, PU Bina Marga, 1993
6. ----------, Guidelines for Construction and Building, Planning for flexible pavement overlay thickness using the deflection method Pd T-05-2005-B</td></tr>
<tr><td colspan="2">Supporting:</td></tr>
<tr><td colspan="3">1. Arthur Wignall – Peter S – Kendrikck – Roy Ancill – Malcolm Copson, Road Projects (Theory and Practice), Jakarta, Erlangga, 2003.
2. Hendra Suryadharma – Benidiktus Susanto, Highway Engineering, Yogyakarta, Universitas Atma Jaya, 1999.
3. Ir. Alik Ansyori Alamsyah, M.T. Highway Engineering, Malang, Universitas Muhammadyah Malang, 2001
4. Ir. Djoko Untung Soedarsono, Highway Construction, Jakarta, Badan Penerbit PU, 1987.
5. Shierly L. Hendarsin, Highway Engineering Planning,Bandung, Poltek, 2000
6. Silvia Sukirman, Road Pavement Construction, Bandung, Nova, 1992.
7. Suryawan, Ari, Portland Cement Concrete Pavement (Rigid Pavement),Beta Offset, Yogyakarta, 2005</td></tr>
<tr><td rowspan="2">Teaching Media</td><td>Software:</td><td>Hardware:</td></tr>
<tr><td>Office Word, Excell, dan Power Point</td><td>Computer, LCD Projector and White Board</td></tr>
<tr><td>Team Teaching</td><td colspan="2">Oktaviani, S.T.,M.T, Rifwan Fitra S.Pd.,M.T, Nadra Mutiara Sari, S.Pd.,M.Eng</td></tr>
<tr><td>Assessment</td><td colspan="2">Mid-Semester Exam, Final Exam, Individual and Group Assignment, Group Presentation</td></tr>
<tr><td>Prerequisite</td><td colspan="2">Mathematics, Building Image Construction</td></tr>
</table>

TEACHING MATERIAL

Weeks	Expected Competency	Study Material	Teaching Method and Strategy	Assignment	Assessment Criteria/ Indicator	Reference
(1)	CLO-1 Knowledge and understanding of: 1. Road Pavement Construction 2. The rules that apply in road construction planning	**Introduction to Highway Pavement Construction and its Regulations**	Lectures and Discussions	Assignment/Quiz	1. Attitude 2. Knowledge	Main : 1 Supporting: 1- 6
(2)	CLO-2 Knowledge and understanding of: 1. Types of Highway Pavement 2. Road Pavement Layers and their functions 3. Types of Material Used on Highway pavements	**Types of Highway Pavement, Function of Road Pavement Layers and Materials**				Main : 1 Supporting: 1- 6
(3) (4)	CLO-3 Calculation and planning: 1. Percentage (%) of Vehicles, 2. Determination of coefficient and equivalent values. 3. Soil Bearing Capacity (DDT) 4. Regional Factors (FR) 5. Pavement Thickness Index (ITP) 6. Thickness of the sub-base layer 7. Thickness of the	**Calculation and Planning of Flexible Pavement Pavement Layers (new construction) in accordance with SNI**	Lectures and Discussions	Assignment/Quiz	1. Attitude 2. Knowledge 3. Competence Achievement	Main : 1 Supporting: 1- 6

Weeks	Expected Competency	Study Material	Teaching Method and Strategy	Assignment	Assessment Criteria/ Indicator	Reference
	foundation layer 8. Surface Coating Thickness 9. Drawing of Road Construction Plan.					
(5)	CLO-3 Calculation and planning: 1. The thickness of the flexible pavement pavement stage I 2. The thickness of the flexible pavement pavement stage II 3. Drawing of Road Construction Plan	**Calculation and Planning of a flexible pavement pavement layer (method gradually / stage) in accordance with SNI**	Lectures and Discussions	Assignment/Quiz	1. Attitude 2. Knowledge 3. Competence Achievement	Main : 1 Supporting: 1- 6
(6)	CLO-4 1. Analysis of road damage, at: a. Ply the road surface b. Upper and lower foundation layers 2. Calculation of additional layer thickness on flexible pavement pavement	**Analysis and Calculation of Additional Layers of Flexible Pavement Pavement based on SNI**				
(7)	CLO-4 1. Analysis of road damage, at: a. Upper Deflection b. Lower Deflection Calculation of additional layer thickness on flexible pavement pavement	**Analysis and Calculation of Flexible Pavement Pavement Additional Layers using the Benkelman Beam method**	Ceramah dan Diskusi	Tugas/ Quiz	1. Sikap 2. Pengetahuan 3. Pencapaian Kompetensi	Main : 4-6 Supporting : 1-6

Weeks	Expected Competency	Study Material	Teaching Method and Strategy	Assignment	Assessment Criteria/ Indicator	Reference
(8)	**Mid-Semester Evaluation through Mid-Semester Examination**					
(9)	CLO-5, Knowledge and understanding of: 1. Rigid Pavement Construction 2. Structure and type of cement / rigid pament concrete pavement. 3. The rules that apply in the planning of rigid road pavements.	**Knowledge of Rigid Pavement / Cement Concrete**	Lectures and Discussions	Assignment	1. Attitude 2. Knowledge 3. Competence Achievement	Main: 2-3 Supporting: 1-7
(10)	CLO-5 Analysis and Calculation: 1. Traffic 2. Axis Repetition 3. Thickness of Concrete Plate	Calculating and Planning the Thickness of the Cement Concrete Plate	Lectures and Discussions	Assignment	1. Attitude 2. Knowledge 3. Competence Achievement	Main : 2-3 Supporting 1-7
(11)	CLO-6 Analysis and Calculation of Continuous Unreinforced Concrete Pavement	Reinforcement Planning for Rigid Pavement / Cement Concrete	Lectures and Discussions	Assignment	1. Attitude 2. Knowledge 3.Competence Achievement	
(12)	CLO-6 Analysis and Calculation of Continuous Reinforced Concrete Pavement		Lectures and Discussions	Assignment	1. Attitude 2. Knowledge 3. Competence Achievement	
(13)	CLO-6 Analysis and Calculation of Continuous Cement Concrete Pavement with Reinforcement:		Lectures and Discussions	Assignment	1. Attitude 2. Knowledge 3. Competence Achievement	

Weeks	Expected Competency	Study Material	Teaching Method and Strategy	Assignment	Assessment Criteria/ Indicator	Reference
	1. Longitudinal Reinforcement 2. Transverse Reinforcement					
(14)	CLO-7 Analysis and calculation of additional coatings of cement concrete pavement: 1. On flexible pavement 2. On cement concrete pavement	Planning of Additional Layers on Cement Concrete Pavement / Composite Pavement	Lectures and Discussions	Assignment	1. Attitude 2. Knowledge 3. Competence Achievement	
(15)	CLO-8 Analysis and Evaluation of Highway Pavement Construction	Analysis and Evaluation	Discussion	Paper	1. Attitude 2. Knowledge 3. Competence Achievement	
(16)	**Final Semester Evaluation (Evaluation which is intended to determine the final achievement of student learning outcomes)**					

Correlation between CLO, PLO and Assessment Methods

	Assesment	Weight (%)	LO-1				LO-2				LO-4				CPL-4			CPL-5			LO-6		
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	1	2	3	1	2	3
CLO 1	Mid Sem Exam (Question no. 1)	**1**																					
CLO 2	Mid Sem Exam (Question no 2)	**1**																					
CLO 3	Mid Sem Exam (Question no 3-13)	**11**																					
CLO 4	Mid Sem Exam (Question no 14-20)	**7**																					
CLO-3	Assignment/Quiz	**10**																					
CLO-4		**10**																					
CLO-5	Final Exam (Question no 1)	**10**																					
CLO-6	Final Exam (Question no 2-4)	**15**																					
CLO-5	Assignment	**5**																					
CLO-6		**2,5**																					
CLO-7		**2,5**																					
CLO-8	Paper	**10**																					
Presence		**10**																					
TOTAL		**100**																					

Assesment Components

Mid-Semester Exam	: 20 %
Final Exam	: 30 %
Assignment, Quiz	: 30%
Paper	: 10%
Presence	: 10%
Total	: **100 %**

Description of Assessment Level

	Excellent	**Good**	**Satisfy**	**Fail**
Description	80-100	70-79	51-69	>50
Formulation	-	-	-	-
Calculation	-	-	-	-
Analysis	90-100	70-89	51-69	>50

Assessment System

Score Range	**Grade Letter**	**Grade Point**	**Notes**	**Score Range**	**Grade Letter**	**Grade Point**	**Notes**
85 – 100	A	4.0	Exceptional	55 – 59	C	2.0	Quite Satisfactory
80 – 84	A-	3.6	Excellent	50 – 54	C-	1.6	Poor
75 – 79	B+	3.3	Very Good	40 – 49	D	1.0	Very Poor
70 – 74	B	3.0	Good	≤ 39	E	0.0	Fail
65 – 69	B-	2.6	Fairly Good	-	T	-	Delayed
60 – 64	C+	2.3	Satisfactory				

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MID-SEMESTER EXAM

Course : Road Pavement Construction
Code / Credits : 3
Type of Exam : Open Book
Lecturer : Oktaviani, ST.,MT, Fitra Rifwan, S.Pd.,MT, Nadra Mutiara Sari S.Pd,M.Eng
Time Allocation : 3 x 50 minutes
Max Score : 20%

No	Soal	Bobot
1	Below are the features of a flexible pavement except: a. Surface coating using asphalt b. cheap planning costs c. design age under 15 years d. low maintenance costs	1
2	In the flexible pavement construction, the parts that bear the most loads are: a. Subgrade land b. Lower foundation layer c. Top foundation layer d. Surface coating	1
3	What is the value of the distribution coefficient of heavy vehicles if the road is planned for a length of 10 km and a width of 12 m? a. 0,475 b. 0,3 c. 0,45 d. 0,5	1
4	What is the value of DDT seen from the correlation between CBR and DDT if it is known that CBR is 5%? a. 5,7 b. 4,7 c. 4,4 d. 5,4	1
5	What is the value of the Regional Factor (FR) if it is known that the climate is at 1100 mm / year, 9% slope,% of heavy vehicles is 30% and the soil condition is swampy? a. 3,0 b. 2,5-3,0 c. 2,0 d. 3,5-4,0	1
6	What is the value of the middle equivalent cross if it is known that the first and last equivalence values are 12.7634 and 21.3681, while the design age is 5 years? a. 17,07 b. 17,06 c. 34,13 d. 34,14	1
7	The road is planned with macadam material on the surface layer, Batu Broken CBR 60 for the top foundation and grade A gravel on the bottom foundation. What is the thickness of the top foundation layer if ITP 6.2 is obtained with a plan to maximize the surface layer?	1

	a. 20 cm b. 15 cm c. 10 cm d. 12 cm	
8	The stepwise construction planning method is based on: a. Coating concept b. Design age concept c. Maintenance concept d. Remaining life concept	1
9	The following are the characteristics of a gradual construction, except: a. Difficulty predicting long-term traffic developments. b. Sufficient budget for road construction. c. Can repair local damage caused by use. d. In construction planning it only thickens the surface layer.	1
10	The construction of new roads was carried out with planning in stages. In the first stage, the ITP value = 8, and the second stage, the ITP value = 9.8. The materials used for each layer are Lasbutag MS-454, Laston Atas 454 and Sirtu class A. What is the thickness of the top foundation and the total thickness of the surface layer in the road construction? a. 20 cm and 12 cm c. 15 cm and 16,5 cm b. 20 cm and 5,5 cm d. 15 cm and 11 cm	1
11	If it is known that the surface layer in stage 1 of the flexible part planning using the stepwise method is 10 cm and the overall thickness is 16 cm, how thick is the surface layer in the second stage? a. 10 cm c. 8 cm b. 6 cm d. 7,5 cm	1
12	The differences between new construction and overlay are: a. New construction is a new road whereas overlay is a gradual path b. New construction is a road that is planned directly while an overlay is a road that is planned after the foundation layer is completed. c. New construction is a road that is planned for a new road while an overlay is an additional layering on the old road. d. New construction is a new road that can be planned in stages, while the overlay is built simultaneously with the surface layer being built.	1
13	From the results of the road traffic analysis that will be overlaid, the ITP value is 6.2. The old road, which has a thickness at each layer, is damaged as follows: Lasbutag MS-340 surface layer (7.5 cm, 85%), class B crushed stone top foundation layer (15 cm, 90%), and sub-base layer sirtu class B (12 cm, 100%). How thick is the road overlay, if the material used is macadam asphalt? a. 5 cm b. 4 cm c. 6 cm d. 3 cm	1
14	The two-way arterial road has a macadam asphalt layer with a thickness of 14 cm, an air temperature of 33 ° C and a pavement surface temperature of 43 ° C. The influence factor of ground water = 1.5, the number of traffic plans 215, the planning age of 13 years and the traffic development of 5%. What is the value of the middle and bottom temperature of the road surface layer? a. 39,4°C and 36,4°C b. 31,6°C and 46,6°C c. 34,6 °C and 37, 6 °C d. 34°C and 37°C	1
15	What is the value of ft if the air temperature is 32ºC, the pavement surface temperature is 42ºC and the surface layer is 10cm thick? a. 0,98 b. 0,88 c. 0,89 d. 0,87	1
16	What is the value of N if it is known that the traffic development is 8% with a	1

	plan age of 12 years? a. 15,05 b. 20,35 c. 18,40 d. 19,74	
17	Calculate the deflection value after overlaying the arterial road, if it is known that the value of d = 15, d2 = 38 with the number of observation points is 10! a. 4,2 b. 5,2 c. 4,1 d. 5,12	1
18	If it is known that the material used is AC with the amount of planned traffic 215, R = 5 years and i = 4%, what is the amount of accumulative traffic (AE 18 KSAL)? a. 1168492,75 b. 1738221,25 c. 1447863,75 d. 433966,75	1
19	Calculate the average number of traffic planned for a 3-lane 2-way road, if the vehicle composition of KR 2T (1 + 1) = 2500 vehicles, 8T Bus (3 + 5) = 875 vehicles, 2 axles 13T trucks = 225 vehicles! a. 662,54 b. 782,55 c. 665,54 d. 762,55	1
20	What is the thickness of the additional layer if it is known that the material used is HRA 340, with AE18KSAL = 433966.75 and the value of D = 3.5? a. 10 cm b. 9 cm c. 10,5 cm d. 14 cm	1
		20

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THE FINAL EXAM

Course : Road Pavement Construction
Code / Credits : 3
Type of Exam : Open Book
Lecturer : Oktaviani, ST.,MT, Fitra Rifwan, S.Pd.,MT, Nadra Mutiara Sari S.Pd,M.Eng
Time Allocation : 3 x 50 minutes
Max Score : 30%

<table>
<tr><th>No</th><th>Question</th><th>Score</th></tr>
<tr><td>1

CLO-5.</td><td>Plan the thickness of the concrete plate if it is known:
<table>
<tr><th>Jenis Sumbu</th><th>Beban Sumbu (ton)</th><th>Jumlah Sumbu</th><th>Proporsi Beban</th><th>Proporsi Sumbu</th><th>Lalu-lintas Rencana</th><th>Repetsi yang terjadi</th></tr>
<tr><td>(1)</td><td>(2)</td><td>(3)</td><td>(4)</td><td>(5)</td><td>(6)</td><td>(7)=(4)x(5) x(6)</td></tr>
<tr><td>STRT</td><td>6
5
4
3
2</td><td>310
800
650
300
650</td><td>0,11
0,30
0,24
0,11
0,24</td><td>0,66
0,66
0,66
0,66
0,66</td><td>3,46 x 10^7
3,46 x 10^7
3,46 x 10^7
3,46 x 10^7
3,46 x 10^7</td><td>2,6 x 10^6
6,8 x 10^6
5,5 x 10^6
2,5 x 10^6
5,5 x 10^6</td></tr>
<tr><td>Total</td><td></td><td>2710</td><td>1,00</td><td></td><td></td><td></td></tr>
<tr><td>STRG</td><td>8
5</td><td>780
300</td><td>0,72
0,28</td><td>0,26
0,26</td><td>3,46 x 10^7
3,46 x 10^7</td><td>6,9 x 10^6
2,5 x 10^6</td></tr>
<tr><td>Total</td><td></td><td>1080</td><td>1,00</td><td></td><td></td><td></td></tr>
<tr><td>STdRG</td><td>14</td><td>310</td><td>1,00</td><td>0,08</td><td>3,46 x 10^7</td><td>2,6 x 10^6</td></tr>
<tr><td>Total</td><td></td><td>310</td><td>1,00</td><td></td><td></td><td></td></tr>
<tr><td>Komulatif</td><td></td><td></td><td></td><td></td><td></td><td>34,6 x 10^6</td></tr>
</table>
The type of pavement : BBTT with Ruji, The type of the roadside : concrete, Life design : 25 years, JSKN Planning : 3,4 x 10^7, Load safety factor : 1,2, Flexural tensile strength of concrete (f'cf) age 28 days : 4,0 Mpa, The type and thickness of the foundation layer: The cement stabilization 15 cm, subgrade CBR : 4%, effective CBR: 30%</td><td>15</td></tr>
<tr><td>2.

CLO-6</td><td>From the data of question No. 1, Plan a continuous concrete pavement without reinforcement, if it is known that the plate thickness = 20 cm, with a width of 8m and a length of 5 m.</td><td>7,5</td></tr>
<tr><td>3.

CLO-7</td><td>Calculate the longitudinal and transverse cross-sectional area of the concrete pavement with reinforcement if it is known that the plate thickness = 20 cm, with a width of 8m and a plate length of 10 m. Tensile strength of 240MPA steel clearance, weight of concrete 2400kg / m3, friction coefficient value is the absorption layer of the asphalt bond on the surface of the bottom foundation and the gravity of 9.81 m / s2.</td><td>7,5</td></tr>
<tr><td></td><td></td><td>30</td></tr>
</table>

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TASK QUESTION/QUIZ, COURSE PAPER

Course : Road Pavement Construction
Code / Credits : 3
Type of Exam : Open Book
Lecturer : Oktaviani, ST.,MT, Fitra Rifwan, S.Pd.,MT, Nadra Mutiara Sari S.Pd,M.Eng
Time Allocation : 3 x 50 minutes
Score : 30% + 10%

No	Question	Score
CLO-3	A road with a width of 12 m, i = 7% and a design life of 8 years is planned. The implementation time started in 2000 and finished 3 years later, with I implementation 6%. The amount of traffic at the end of the planned life was as follows: The Light vehicle 2 ton (1+1) = 120 vehicles The Bus 8 ton (3+5) = 86 vehicles The Truck 2 as 13 ton (5+8) = 50 vehicles The Truck 3 as 20 ton (6+14) = 32 vehicles The Climate 950mm/th, The slope 4%, the swamp conditions and the value of the first equivalent cross is 30. As for the results of soil testing, the CBR value was obtained = 3, 5, 7, 6, 3, 4, 5 and 8. and the first cross-equivalent value is obtained 1. The materials to be used are: mechanical lapen with 2500 rougness, 80% crushed stone and 50% CBR gravel. Calculate how thick the road layer is if it thickens the sub-base layer!	5
CLO-3	A two-lane graded road with a width of 11m and a design life of 24 years is planned. For the first phase, 45% of the planned life is built. Roads were built in 1990 with i during implementation is 6% and roads opened in 1994 with i assumed to be the same during the design life. The traffic data at the beginning of the second stage of the planning age The Light vehicle 2 ton = 780 vehicles The Bus 8 ton = 500 vehicles The Truck 2 as 10 ton = 410 vehicles The Truck 3 as 20 ton = 100 vehicles The Truck 3 as 30 ton = 25 vehicles The climate in the area is 1200 mm / yr, The slope 8% and CBR: 4,7,8,9,4,8,3,6,5% and the value of the First Equivalent Crossing in the year the road was opened was 92. Material: Laston 454, Broken Stone (CBR 80%), and Sirtu (CBR 70 %).	5
CLO-4	1. It is known that a road has fine cracks, a slight deformation of the wheel tracks on the surface layer, the foundation layer has fine cracks but is still stable and the bottom layer has PI 7. Determine how thick the overlay of the road is, if it is known that the ITP value of the old road is 8.0 by maximizing the sub-foundation and the additional layer ITP of 8.7. The materials used on the old road were Laston 454 for the surface layer, CBR 50% crushed stone for the foundation layer and Sirtu Class B for	5

<table>
<tr><td></td><td>the bottom layer.</td><td></td></tr>
<tr><td>CLO-4</td><td>There will be an overlay on the three-lane one-way arterial road section in 2010 for a design life of 6 years, using the benkelman beam method. The examination was carried out in the rainy season with an average surface temperature of 37 ° C and an air temperature of 32 ° C, and the data from the checkpoint were as follows:
<table>
<tr><th>The Point</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr>
<tr><td>d1 (mm)</td><td>69</td><td>68</td><td>70</td><td>69</td><td>68</td></tr>
<tr><td>d2 (mm)</td><td>69,5</td><td>69</td><td>70,5</td><td>69</td><td>69</td></tr>
<tr><td>d3 (mm)</td><td>69,5</td><td>69</td><td>70,5</td><td>70</td><td>69</td></tr>
</table>
The road is built on 2004 with the LHR:
The passenger car 2 T (1+1) = 1100 vehicles
The Bus 8T (3+5) = 510 vehicles
The Truck 2 as 8T (3+5) = 325 vehicles
With the development of traffic at 5.5% per year and new roads opened in 2006.
The pavement layer uses Lasbutag / Asbuton MS 590 with a thickness of 12cm. Initially the road was planned to be safe and comfortable to use until 2014 with a traffic growth of 6.5% per year. Due to the large amount of deflection that occurs after the road is used, an overlay will be carried out using Lasbutag / Asbuton MS-590. Calculate how thick the road overlay is using the Benkelman beam method!</td><td>5</td></tr>
<tr><td>CLO-5

CLO-6</td><td>Planning parameter data are known as follows:
• CBR subgrade = 4 %
• Bending tensile strength (fcf) = 4,0 Mpa (f'c = 285 kg/cm2, cylinder)
• Bottom foundation material = stabilization
• The reinforcing steel quality = BJTU 39 (f y : the melting stress = 3900 kg/cm2) for BMDT and BJTU 24 (f y : the melting stress = 2400 kg/cm2) for BBDT.
• The coefficient of friction between the concrete slab and the foundation (μ) = 1,3
• The roadside = Ya (Concrete).
• The trellis (dowel) = Ya
• Average daily traffic data:
- The passenger car : 1640 /day
- The Bus : 300 /day
- The Truck 2 as small : 650 /day
- The Truck 2 as big : 780 /day
- The Truck 3 as : 300 /day
- The Trailer Truck : 10 /day
- The Traffic growth (i) : 5 % /year
- Life Design (UR) : 25 years
A cement concrete pavement is planned for a 2-lane, 1-way road for Arterial Road.
Calculate:
1. Thickness of the concrete plate
2. Pavement concrete continuous without reinforcement (BBTT)
3. Concrete pavement with reinforcement (BBDT)
4.Continuous concrete pavement with reinforcement (BMDT)</td><td>7,5</td></tr>
<tr><td>CLO-7</td><td>It is known that a cement concrete road is damaged with the condition of the damage to the plate (18cm) late showing fine cracks, shedding of grains and degradation of the aggregate quality with a conversion factor value of 0.6. Damage also occurred in the foundation (10 cm) with an Fk value of 0.3.
Plan for additional layers of asphalt concrete pavement on the cement concrete pavement, if the final result is added to the last number of your NIM, if it is</td><td>2,5</td></tr>
</table>

	known that the average daily traffic is: light vehicles 1500 vehicles, buses 8 tons 1000 vehicles, trucks 2 axles 13 tons 750 vehicles, 3 axles 20 tonnes 90 vehicles. plan age 10 years with i = 5%. The value of DDT is 4.6, with FR 2.0 and ITP 9.5. The material used is macadam.	
CLO-8	Make a paper on road planning and road damage with at least 5 references from the article.	10