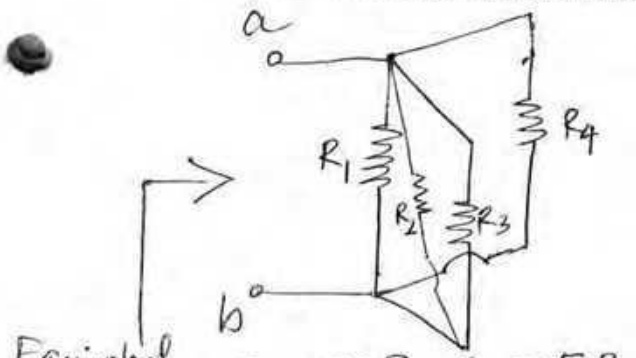
The University of Asia Pacific
Department of Civil Engineering
Midterm Examination Summer 2009

Course # ECE 201
Full Marks: 40

Course Title: Basic Electrical Engineering
Date: Time: 1 hour

There are five questions. Answer any four questions.

1. Find the equivalent resistance between the terminals a-b and c-d for the circuits shown in Figs. 1(a) and 1(b), respectively. (10)



$R_1 = 20\,\Omega$, $R_2 = 5R_1$
$R_3 = \frac{R_1}{2}$, $R_4 = \frac{3}{2}R_1$

Fig. 1(a)

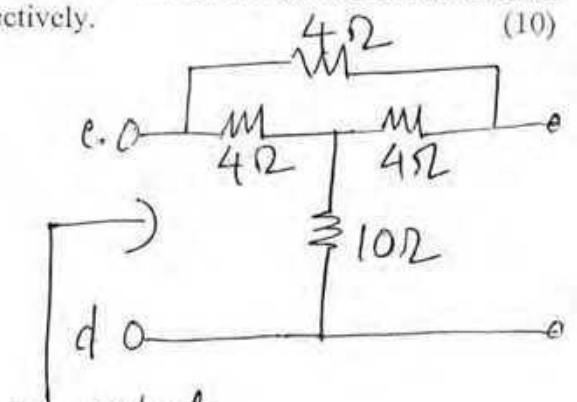


Fig. 1(b)

2. (a) For the circuit shown in Fig. 2, determine the value of current I using the Thevnin's theorem. (8)
   (b) State the superposition theorem. (2)

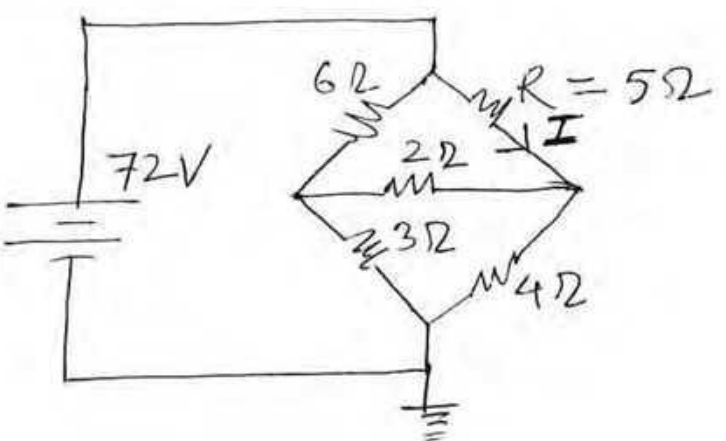


Fig. 2

3. For the circuit shown in Fig. 3, find the value of currents I_1, I_2 and I_3 .Use Mesh analysis technique. (10)

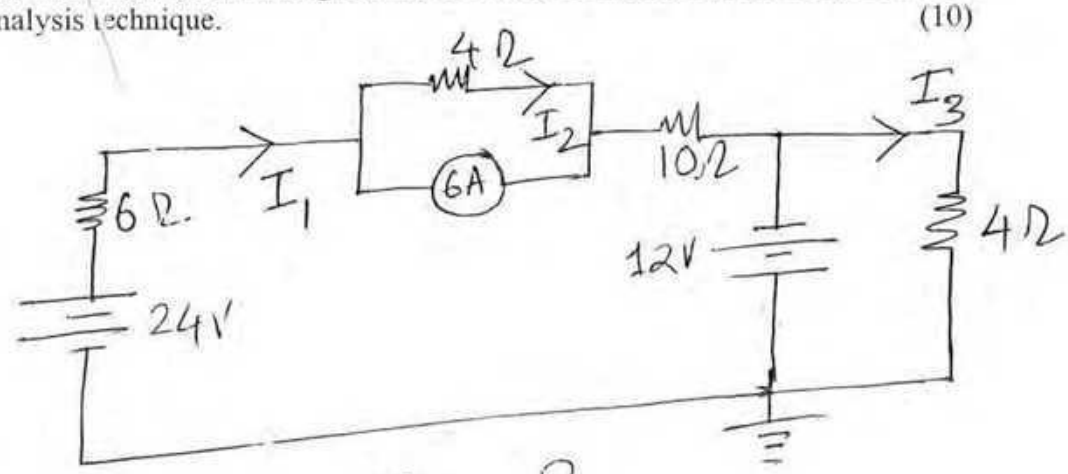


Fig. 3

4. Using the nodal analysis method, determine the value of current in the various resistors of the circuit shown in Fig. 4. (10)

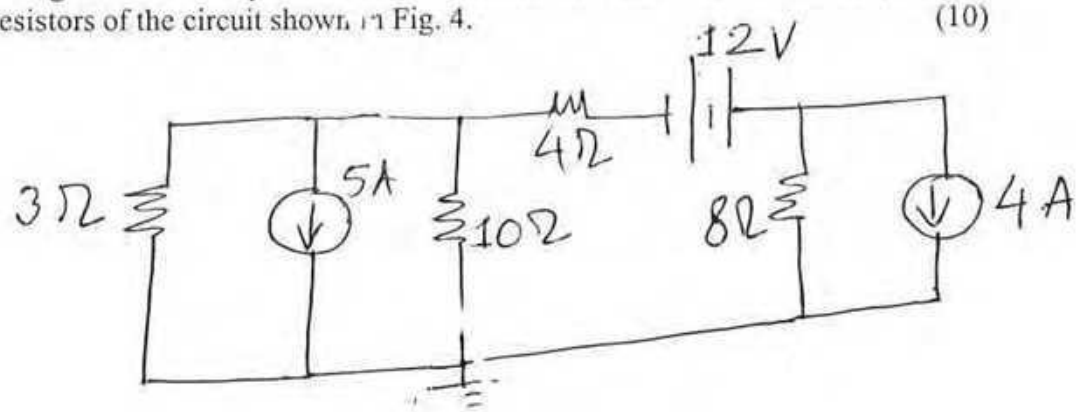


Fig. 4

5. State and prove the maximum power transfer theorem. What are the values of efficiency and voltage regulation when maximum power is transferred. (10)

The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2009

Course #: CE 403 Course Title: Professional Practices and Communication
Full Marks: 100 Time: 1 hour

There are four questions in this exam. Each question carries twenty five marks.
You are required to answer all four questions.

1. Define a project and list its characteristic features.
   Name the five phases of a project life cycle and show them in a diagram.
   Briefly describe the planning and organizing phase of the project life cycle. (25)

2. Briefly describe the four methods of contracting for a project. (25)

3. What are the various methods generally followed for choosing a contractor for a project?
   Briefly describe the typical criteria which are used to eliminate firms from further consideration during the first stage of a two-stage tendering process. (25)

4. What are the general bases of negotiation for single tenders?
   Briefly describe the method of breakdown of unit costs, quantities and component elements of work for a building or civil engineering contract. (25)

Somebody has answered the questions..

Ans: .....

d) Shut the door after you.

Ans: .....

e) A huge wave overturned the little boat.

Ans: .....

f) Who gave him the chocolate box for his birthday?

Ans: .....

g) Did the police search your bag?

Ans: .....

4. Change the forms of speech of any five (5) of the following sentences: **05**

a) My colleague said to me, "I'll leave it on the table."

Ans: .....

b) Father said to me, "Get your hair cut."

Ans: .....

c) My friend said to me, "Were you too busy yesterday when I called you?"

Ans: .....

d) Kamal said "Alas! The house is on fire!"

Ans: .....

e) The teacher said to his student, "May you succeed in everything you do."

Ans: .....

f) The Chairman said to his members, "Let us meet for another day."

Ans: .....

g) The teacher said, "Rome was not built in a day."

Ans: .....

5. Make sentences using any five (5) of the following idioms: **05**

a) Yellow journalism: .....

b) Hand in hand: .....

c) For good: .....

d) A burning question: .....

e) Look for: .....

f) Bear in mind: .....

g) Have a cold feet: .....

6. Make sentences with any five (5) of the following pairs of words using their different meanings: **10**

a) Error: .....

Mistake: .....

b) Award: .....

Reward: .....

c) Drown: .....

Sink: .....

d) Publicity: .....

Propaganda: .....

e) Crime: .....

Sin: .....

f) Hire: .....

Rent: .....

The University of Asia Pacific (UAP)

Department of Architecture/ Business Administration/ CE/ CSE

Mid-term Examination: Spring 2009

HSS 103: English Language II

Time: 1 Hour **Full Marks: 40 (20)**

....

Invigilator's Signature ***Examiner's Signature***

Name: Deptt.:

Roll # : Reg. # Marks Obtained:

1. Correct any ten (10) of the following sentences: **10**

a) There are less students in the class today.

Ans: .....

b) I kept the scissors which is the sharpest.

Ans: .....

c) He together with his team mates play very well.

Ans: .....

d) My parents made me to see the better sides of life.

Ans: .....

e) I am used to do such tasks.

Ans: .....

f) Its really a very interesting experience for me.

Ans: .....

g) Two thirds of our population is living under the poverty line.

Ans: .....

h) Bangla bhai was hung for his terrorist activities.

Ans: .....

i) He is more cleverer than his brother.

Ans: .....

j) Hepatitis B is not an air-born disease.

Ans: .....

k) He has proven his leadership qualities since being appointed as the captain.

Ans: .....

l) I went there with a view to see my friend.

Ans: .....

2. Complete any five (5) of the following conditional sentences: **05**

a) It would be good idea if, ...

b) If you had got up earlier this morning, ...

c) If you don't come tomorrow, ...

d) If you searched his pocket, ...

e) If the rain did not come, ...

f) He wouldn't have learnt English, ...

g) If he studied more, ...

3. Change the forms of voice of any five (5) of the following sentences: **05**

a) A new company has taken the business over

Ans: .....

b) Have the children put away their toys?

Ans: .....

The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2009
Program: B. Sc. Engineering (Civil)

Course Title : Design of Concrete Structures I | Course Code: CE 315
Time: One Hour | Full Marks: 20

Answer all questions. The figures in the right margin indicate the marks of the questions.

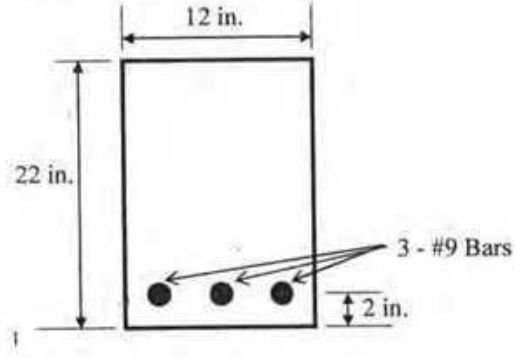
1. (a) "Tensile yielding of steel is preferable to compressive failure of concrete" – Why? 2

(b) Define balanced steel ratio. Derive the following equation: 3

$$\rho_b = 0.85\beta_1 \frac{0.003}{0.003 + \frac{f_y}{E_s}} \frac{f_c'}{f_y}$$

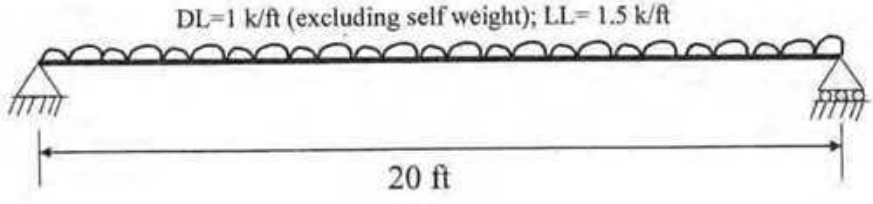
The symbols carry the usual meanings.

(c) Refer to the following beam section. Determine the maximum working moment that can be resisted by the section. Assume: $f_y = 60{,}000$ psi, $f_s = 24{,}000$ psi, and $f_c' = 4000$ psi. 5



2. (a) Compare WSD and USD. 3

(b) Refer to the following simply supported beam. Design the beam by WSD. $f_s = 24{,}000$ psi, $f'_c = 4000$ psi. 7



The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2009
Program: B. Sc. Engineering (Civil)

Course Title : Engineering Materials | Course Code: CE 201
Time: One Hour | Full Marks: 40

Answer any <u>THREE</u> questions including Question No. 1.
<u>Question No. 1 is compulsory.</u> The figures in the right margin indicate the marks of the questions.

1. Two sand samples were collected for a construction project. The sieve analysis data of the sand samples are summarized below: 24

ASTM Sieve	Sand A	Sand B
	Material Retained (g)	Materials Retained (g)
3 inch	0.0	0.0
1.5 inch	0.0	0.0
1 inch	0.0	0.0
¾ inch	0.0	0.0
3/8 inch	0.0	0.0
#4	0.0	0.0
#8	40.0	60.0
#16	5.0	50.0
#30	5.0	40.0
#40	60.0	45.0
#50	90.0	50.0
#100	65.0	30.0
#200	30.0	0.0
Pan	5.0	25.0

(i) Calculate the FM of the sand samples A and B,
(ii) Draw the grading curves the sand samples A and B,
(iii) Make a brief discussion on the FM, sieve analysis data, and grading curve
(iv) In what proportions the sand samples A and B are to be mixed to obtain FM = 2.5.

Sieve opening of #40 sieve is 0.425 mm and #200 sieve is 0.075 mm.

2. Based on the following data, calculate the unit contents of a mortar to be prepared for plastering on a brick wall. What is the weight of the mortar per cubic meter? 8

Sand to cement ratio (weight ratio) = 2.2,
W/C=0.485,
Specific gravity of cement = 3.1,
Specific gravity of sand = 2.65,
Air content = 2%.

3. (a) Explain the strength development process of bricks during burning. 1.5
(b) Define flash setting of cement. How is it controlled? 1.5
(c) What is hydration of cement? Write the hydration products produced in hydration reactions of aluminates and silicates. 2.5
(d) Compare creep and relaxation. 1
(e) Write short notes on (i) resilience, (ii) toughness, and (iii) proof stress. 1.5

4. (a) What is efflorescence? What are the reasons for having efflorescence on brick surfaces? What will happen if the bricks having efflorescence are used in brick walls? 1.5
(b) Write the steps of cement manufacturing process. 2.5
(c) Write a short note on sulfate resisting cement. 1
(d) Define fineness of cement. "A fine cement gives early strength" – Why? 2
(e) Write the properties of good quality sand. 1

The University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Spring, 2009

Course # 341 (B) | Course Title: Geotechnical Engineering I
Full Marks: 60 (4 x15 = 60) | Time: 1 hour

Answer any Four (4) questions:-

1a) Classify soil (mention names only) based on origin and transportation agent. Write a short note on alluvial soil. 2+3=5

1b) Categorize soil (no description required) based on size limits. 2

1c) Show with sketches different shapes of soil particles. 3

1d) Classify soil structures (mention names only). Write short note on honey-comb structure. 2+3=5

2a) Laboratory test results of the following inorganic soil samples are summarized in the following table. Classify the soils (Use Attachments Chart-1, Chart-2, Chart-5, Chart-6 and Simplified Plasticity Chart as needed) according to ASTM D-2487 (Unified Soil Classification System). 3x2=6

Soil Sample No.	Atterberg Limits		**% passing** through # 200 sieve	**% retained** on # 200 sieve	**% retained** on # 4 sieve
	Liquid Limit	**Plastic Limit**			
1	50	20	60	---	15
2	20	17	51	24	---
3 (C_u = 6.5 C_c = 2.9)	20	15	11	45	---

2b) Define liquid limit and plastic limit of soil. 2x1=2

2c) A soil sample was collected from **SITE A**. The following data were obtained: 7

Moisture content at 25 blows was obtained to be 60% from the laboratory Atterberg limit test.
Wt. of wet sample (when the sample was changing from plastic to semi-solid state) = 70 gm
Dry wt. of the sample = 56 gm
Determine the Plasticity and Liquidity Indices of this soil at natural moisture content of 34%.

Another soil sample was collected from another adjacent site, **SITE B** that has natural moisture content of 35%. The soil of this site has Liquid and Plastic limits of 82 and 32, respectively. Determine with proper justification which soil will exhibit higher strength.

Use the following information for comparison of strength.

Range of Liquidity Indices, I_L (%)	Consistency (degree of firmness)
0 <	Hard
0 - 20	Very Stiff
20 - 40	Stiff
40 - 60	Medium Stiff (Firm)
60 -80	Soft
80 - 100	Very Soft

3a) Define well-graded and poorly-graded soils. 3

3b) From the following sieve analysis data, determine C_u and C_c of the soil. Comment on the gradation of the soil with proper justification. What is the effective size of this soil? 12

Sieve No./ Opening	Amount Retained (gm)	% Retained	Cumulative % Retained	% Finer
# 4 (4.75 mm)	0.0	0.0	0.0	100.00
# 8 (2.36 mm)	30.0	6.00	6.00	94.00
# 16 (1.18 mm)	48.7	9.74	15.74	84.26
# 30 (0.6 mm)	127.3	---	---	---
# 50 (0.3 mm)	136.8	---	---	---
# 100 (0.15 mm)	91.8	---	---	---
# 200 (0.075 mm)	43.3	8.66	95.58	4.42
Pan	22.1			

Total = 500 gm **--- To be calculated**

4a) For the following compaction test data generate the compaction curve and determine the maximum dry unit weight and optimum moisture content from the curve. Also calculate the moist (total) unit weight and theoretical maximum dry unit weight (unit weight at Zero-Air-Void, ZAV, condition) of the soil at its optimum moisture content. 8

Volume of the mold = 0.033 ft^3

Weight of Wet Soil in Mold (lb)	Moisture content (%)	Dry Unit Weight (lb/ft^3)
2.904	10	80
3.327	12	---
3.637	16	---
3.310	18	85

--- To be calculated

4b) Derive the following relationships

(i) $\gamma_d = (1-n)G_s\gamma_w$ 3

(ii) $\gamma_{sat} = \dfrac{(G_s+e)\gamma_w}{(1+e)}$ 4

5a) *Define void ratio, porosity and degree of saturation of soil.* 3

5b) For a moist soil, given porosity (n) = 0.31; volume occupied by soil solids (V_s) = 5.0 m^3; moisture content (w) = 15 %; specific gravity of soil solids (G_s) = 2.64; e_{max} = 0.85 and e_{min} = 0.38. 12

Determine the following parameters:-

(i) void ratio (ii) total volume

(iii) total weight (iv) dry unit weight and moist unit weight

(v) volume occupied by water (vi) degree of saturation

(vii) relative density, maximum and minimum dry unit weights

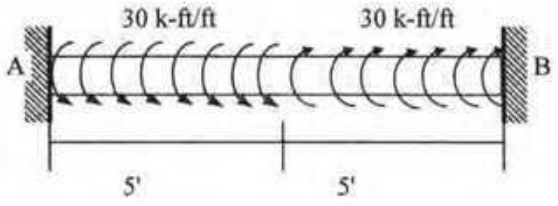
Also determine the amount of water, in kN, needed to saturate the soil.

The University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Spring 2009
Program: B. Sc Engineering (Civil)

Course Title: Mechanics of Solids II Course Code: CE 213 Credit: 3.00
Time : 1.00 Hour Full Marks:40 (= 10 × 4)

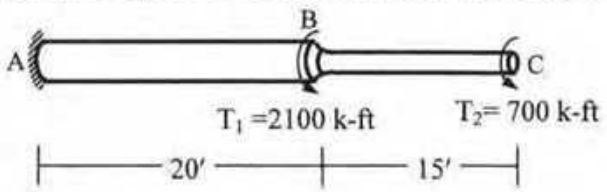
[Answer **any four** of the following 05 questions]

1. A circular cross-section bar is clamped at each end and loaded by the distributed twisting moments as shown in the following figure. If the maximum allowable shearing stress is 5000 psi,, determine the required diameter, d of the bar.



Cross-section of member AB

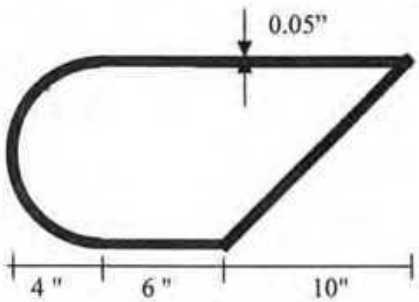
2. In the figure shown below, calculate the minimum permissible diameter, d if the allowable shearing stress is 6000 psi and the total twist between A and C is limited to 3^0 [Given: G = 12000 ksi].



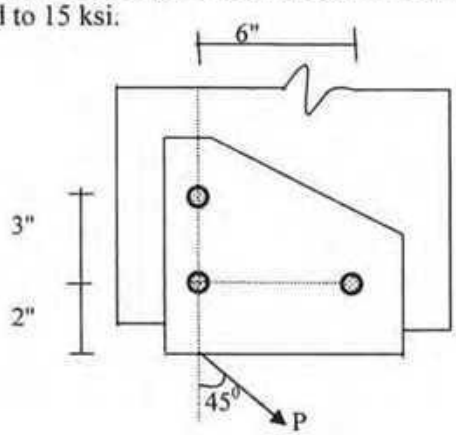
Cross-section of member AB

Cross-section of member BC

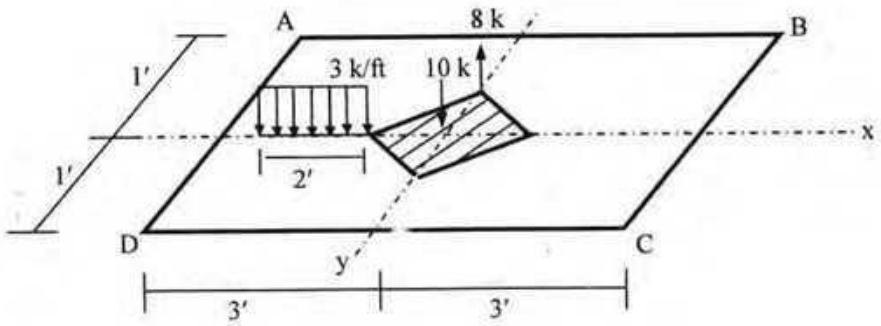
3. Find maximum shearing stress and angles of twists per unit length due to an applied torque of 100 lb-ft. for the following figure.



4. For the riveted connection in the figure below, determine the allowable load P if the shearing stress in the 0.75" rivets is limited to 15 ksi.



5. The shaded area shown below represents the kern of the rectangular footing ABCD. For the given loads calculate the normal stresses at A, B, C, D and locate the neutral axis.



Formulae

* Torsional Rotation $\phi_B - \phi_A = \int(T/J_{eq}G)\,dx$, and $= (TL/J_{eq}G)$, if T, J_{eq} and G are constants

Section	Torsional Shear Stress	J_{eq}
Circular	$\tau = Tc/J$	$\pi d^4/32$
Thin-walled	$\tau = T/(2\textcircled{A}\,t)$	$4\textcircled{A}^2/(\int ds/t)$
Rectangular	$\tau = T/(\alpha bt^2)$	βbt^3

b/t	1.0	1.5	2.0	3.0	6.0	10.0	∞
α	0.208	0.231	0.246	0.267	0.299	0.312	0.333
β	0.141	0.196	0.229	0.263	0.299	0.312	0.333

* Biaxial Bending Stress: $\sigma_x(z, y) = M_z\, y/I_z + M_y\, z/I_y$
* Combined Axial Stress and Biaxial Bending Stress: $\sigma_z(x,y) = -P/A - M_x\, y/I_x - M_y\, x/I_y$
* Corner points of the kern of a Rectangular Area are (b/6, 0), (0, h/6), (–b/6, 0), (0, –h/6)
* Maximum shear stress on a Helical spring: $\tau_{max} = \tau_{direct} + \tau_{torsion} = P/A + Tr/J = P/A\,(1 + 2R/r)$
* Stiffness of a Helical spring is $k = Gd^4/(64R^3N)$

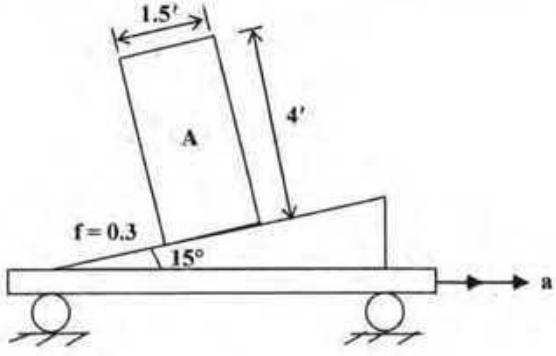
The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2009
Program: B.Sc. Engineering (Civil)

Course Title: Engineering Mechanics II Course Code: CE 103 Credit: 3.00
Time: 1.0 hour Full Marks: 40

There are **FIVE** questions. Answer any **FOUR**. ***(4X10 = 40)***

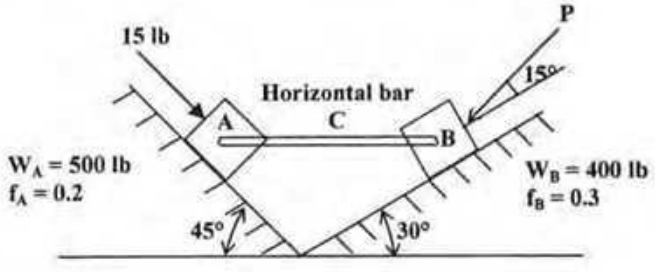
1. A body is rotating about a fixed axis with a radius of 15 inch so that its angular acceleration is $\alpha = 10t^3 - 5t^2 + t + 4$ rad/sec^2. If the initial angular velocity is 8 rad/sec, what are the angular velocity and angular displacement at the 5th sec? What is the change in angular acceleration between 4th and 5th sec?

2. A homogeneous body **A**, weighing 400 lb, is loaded on a truck on an inclined surface as shown in the following figure.



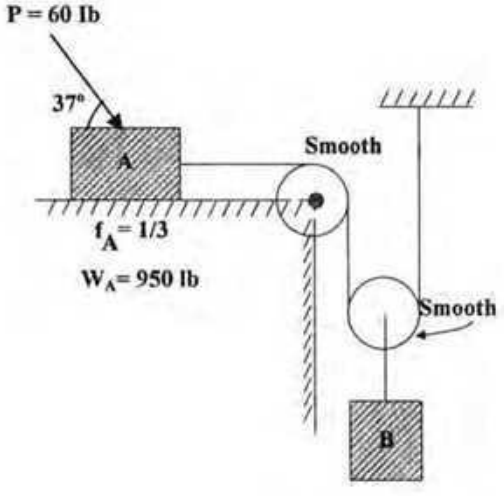
(a) Will the body tip over or slide if the acceleration of the truck, (**a**) is gradually increased?
(b) What is the maximum acceleration of the truck, if the body **A** is to maintain its equilibrium position on the inclined surface?

3. In the following figure, what force **P** will cause the block **B** to impend downward? What is the force in the horizontal bar **C**.



4. Derive the expressions for the moment of inertia of mass of a right circular cone-
(a) about an axis through its apex and parallel to the plane of the base, and
(b) about a parallel gravity axis.
(c) The diameter and the height of the cone are 24 inch and 48 inch respectively. The material of the cone weighs 450 lb/ft^3. What are the moments of inertia of mass of the cone about the axes, mentioned in (a) and (b) of this problem?

5. Refer to the following figure, speed of the block **A** changes from 20 fps to 60 fps in 30 sec. Determine-
(i) the weight of block **B**,
(ii) the distance moved by **B** in 30 sec, and
(iii) the tension in the cables attached to block **A** and block **B**.



2 For a building construction project, the recommended FM was 2.6 for sand and 6.6 for stone chips. From a nearby market, sand and stone chips sample were collected and sent to the Concrete Laboratory of The University of Asia Pacific for sieve analysis. The sieve analysis data are given below: (22)

ASTM Sieve	Amount Retained (g)	
	Sand	Stone Chips
3 inch	0	0
1.5 inch	0	0
1.0 inch	0	0
¾ inch	0	2000
½ inch	0	500
3/8 inch	0	1000
#4	0	1450
#8	70	0
#12	70	0
#16	70	0
#30	70	0
#40	70	0
#50	5	0
#100	5	0
#200	45	0
Pan	45	50

(i) Calculate the FM of the samples.
(ii) Draw the grading curve of the samples.
(iii) Discuss the possible ways to improve the FM of the samples to the recommended values.
(iv) Comment on the samples based on the sieve analysis data and grading curves.

3 (a) Draw typical stress-strain curves of concrete with the variation of compressive strength (f'_c = 3000 psi, 4000 psi and 6000 psi). Comment on the curves. (2.5)

(b) Draw typical stress-strain curves of steel with the variation of tensile strength (f_y = 40,000 psi, 60,000 psi and 80,000 psi). Comment on the curves. (2.5)

(c) Define the following mechanical properties of a material: (5)
(i) Ductility
(ii) Fatigue strength
(iii) Malleability
(iv) Resilience
(v) Toughness

(d) Write the main steps of the brick manufacturing process. (3)

(e) Explain the strength development process of brick during burning. (3)

(f) Why is drying of bricks necessary before burning? (3)

(g) Explain the causes of efflorescence on bricks. (3)

4 (a) What is hydration of cement? Write the hydration reactions of silicates and aluminates. Explain the morphology and the significance of each cement hydration product. (7)

(b) Compare fly ash cement and ordinary Portland cement with respect to the followings: (7)

(i) Strength development of concrete at the early age
(ii) Strength development of concrete after long-term
(iii) Environmental benefits
(iv) Heat of hydration of cement
(v) Length of curing time of concrete
(vi) Microstructure of concrete
(vii) Durability of concrete

(c) Write the ASTM specifications for normal consistency, initial setting time, and final setting time of OPC. (3)

(d) Write the main steps of cement manufacturing process. (3)

(e) Discuss the role of gypsum in cement. (2)

5 (a) Explain the sulfate attack of concrete with chemical reactions. What kind of cement is to be used to reduce the sulfate attack of concrete? (8)

(b) During construction site visit of a residential project, the following points were noted: (10)

(i) Footing 1 – water is accumulated in the trench cut for the construction of Footing 1. Concrete is placed without removing the water.
(ii) Beam 1 - clear cover is 0.2 inch in one side and 3.8 inch at the other side
(iii) Beam 2 – construction joint is placed at the face of the beam
(iv) Column 1 – laitance is not removed
(v) Column 2 – over vibration is applied
(vi) Column 3 – zero-slump concrete is used.
(vii) Slab 1 – leakage of water with sand and cement was found in many locations of the formwork
(viii) Slab 2 - concrete is placed in the early morning of a hot day and the slab is kept without any cover for the whole day
(ix) Sand – a lot of dust was present in the sand
(x) Coarse aggregate – a significant amount of particles less than 4.75 mm is found

Comment on each of the above points considering durability, strength, and ACI guideline.

(c) Define workability of concrete. How is it measured? (2)

(d) "Permeability is a key parameter related to durability of concrete" – explain briefly. (2)

6 (a) Discuss the changes of workability of concrete for the following situations: (5)

(i) W/C is reduced at site
(ii) A coarser sand is used
(iii) Water reducing admixture is not used which was specified in the mix proportion
(iv) Shingles are used instead of stone chips
(v) Sand-to-aggregate volume ratio is increased.

(b)	"Cube strength of concrete is higher than the cylinder strength of concrete" – why?	(3)
(c)	Write short notes on the followings: (i) Self compacting concrete (ii) High performance concrete (iii) Drying shrinkage (iv) Ferrocement (v) Construction joint (vi) Superplasticizer (vii) Functions of accelerator and retarder	(7)
(d)	Explain how concrete industry pollutes the environment and also explain the ways to reduce the pollution from the concrete industries.	(5)
(e)	What is maturity of concrete? Write some factors related to maturity of concrete.	(2)
7 (a)	What points are to be taken into account to improve the durability of concrete structures during construction works near the sea? Discuss briefly.	(5)
(b)	Discuss the common causes of deterioration of concrete structures in Bangladesh.	(4)
(c)	Explain the corrosion of steel in concrete with chemical reactions.	(3)
(d)	How are steel bars protected from corrosion in concrete? Explain briefly the chloride-induced and carbonation-induced corrosion of steel in concrete.	(5)
(e)	Write a short note on bulking of sand.	(3)
(f)	Discuss the effect of excess lime in brick earth.	(2)
8 (a)	Write short notes on three industrial forms of timber.	(3)
(b)	Write the names of five market forms of timber.	(2)
(c)	Explain the following defects of timber: (i) Twisted fiber (ii) Heart shake and star shake (iii) Knot	(3)
(d)	Write short notes on the followings: (i) Uses of rubber in Civil Engineering works (ii) Manufacturing of natural rubber (iii) Ingredients of a varnish (iv) Hexagonal closed packed unit cell (v) Atomic radius for the face centered cubic unit cell (vi) Atomic packing factor for the body centered cubic unit cell (vii) Electroplating	(14)

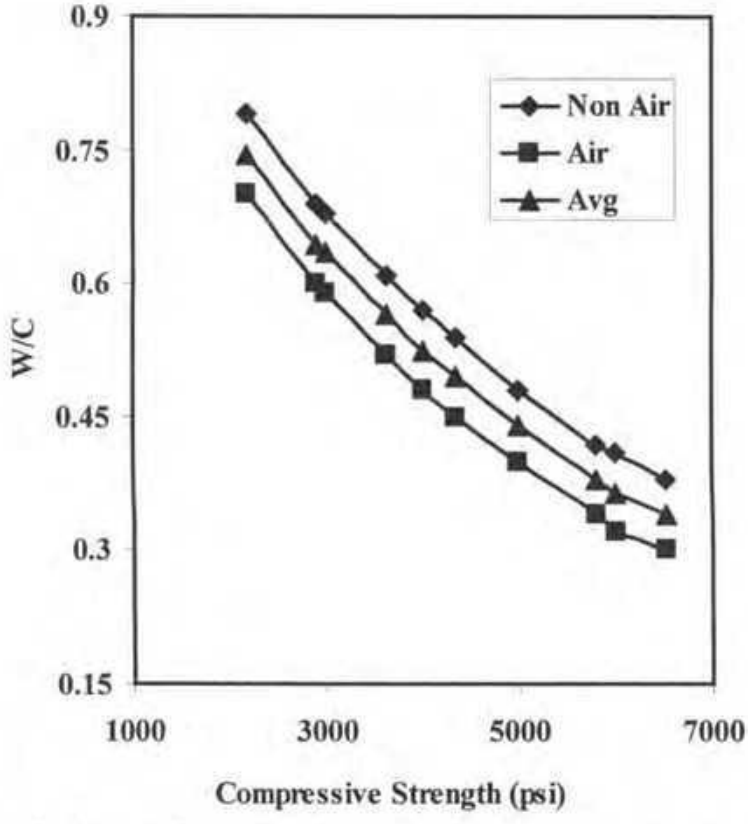


Fig. W/C versus Compressive Strength (aggregate type = stone chips)

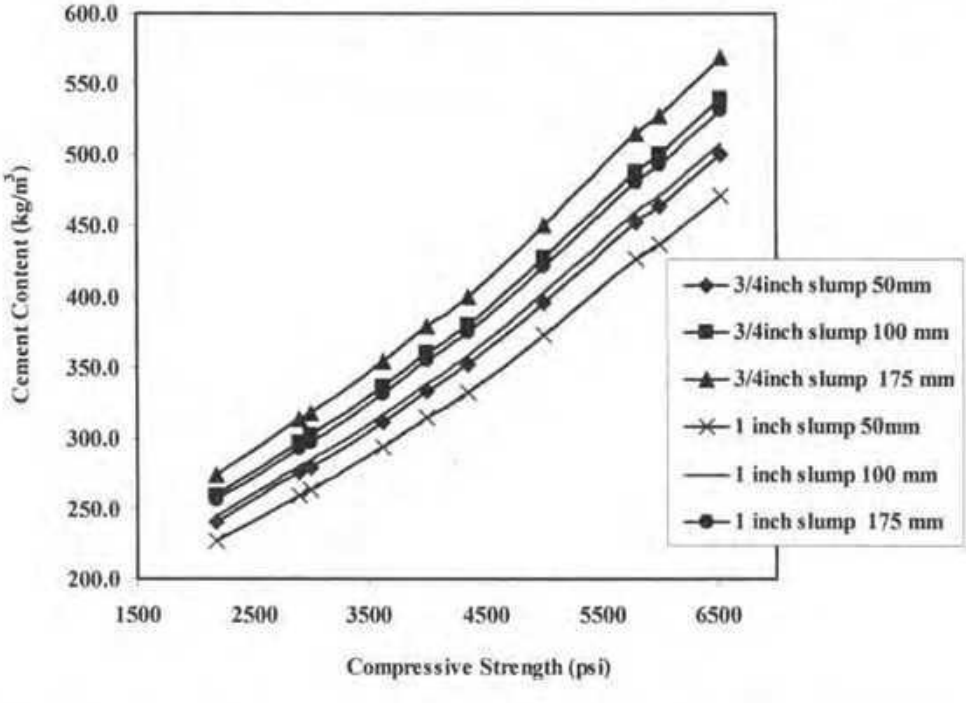


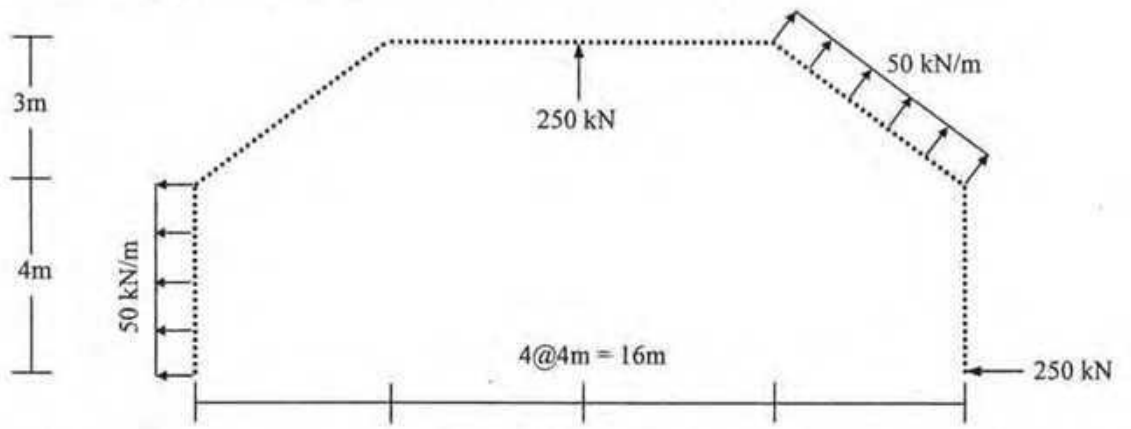
Fig. Cement Content versus Compressive Strength (aggregate type = stone chips)

The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2009 (Set B)

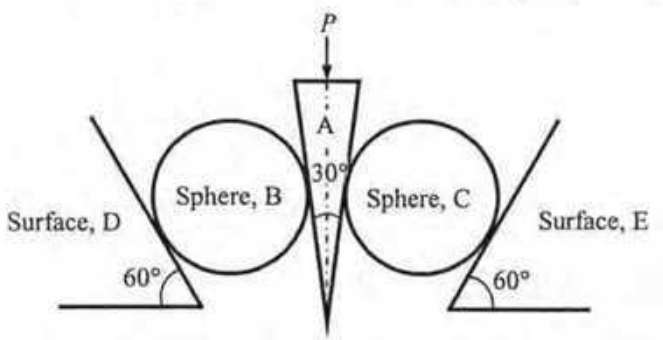
Course #: CE 101 — Course Title: Engineering Mechanics I
Full Marks: 40 (= 4 × 10) — Time: 1 hour

[Answer **any 4 (four)** of the following 5 questions]

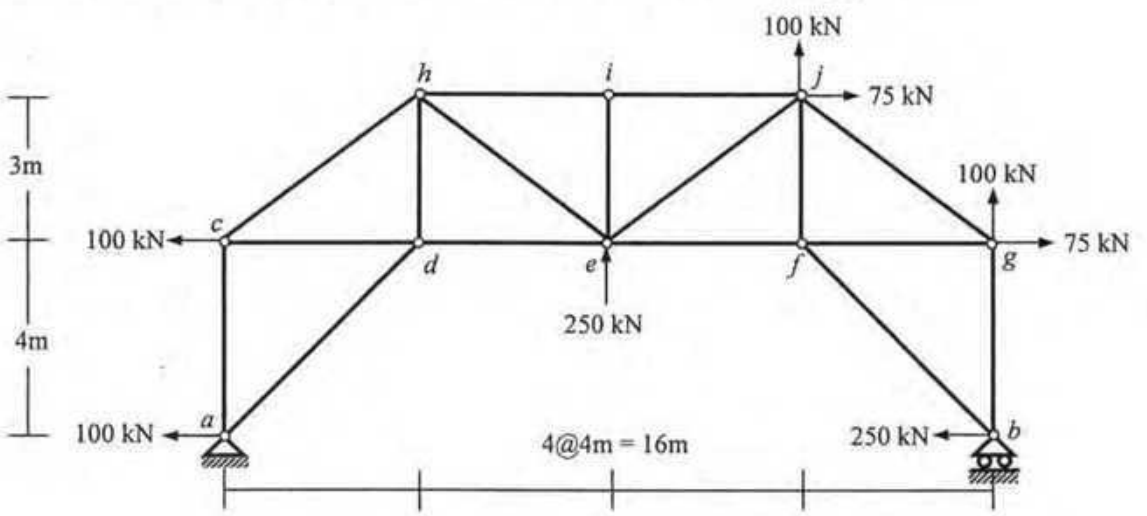
1. The figure below shows a system of forces acting on a structure (shown by dotted lines). Calculate the magnitude, direction and location of the resultant force.



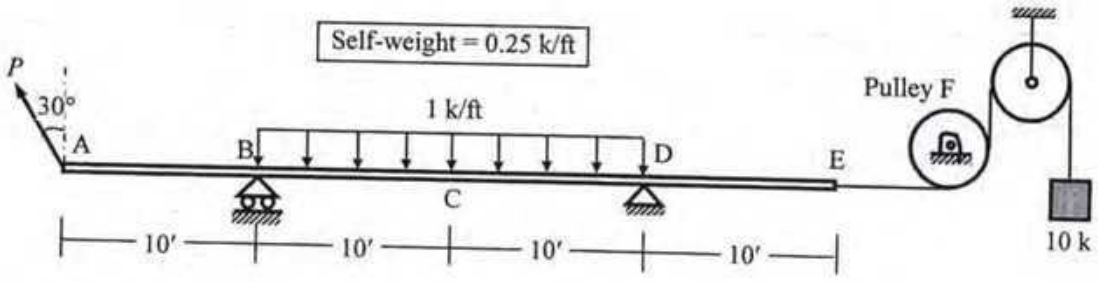
2. The figure below shows a weightless wedge A being driven between spheres B and C by a force *P*. Calculate the maximum allowable value of force *P*, weights W_B and W_C (of spheres B and C) if the allowable reaction between sphere B and surface D (also sphere C and surface E) is 100 lb.



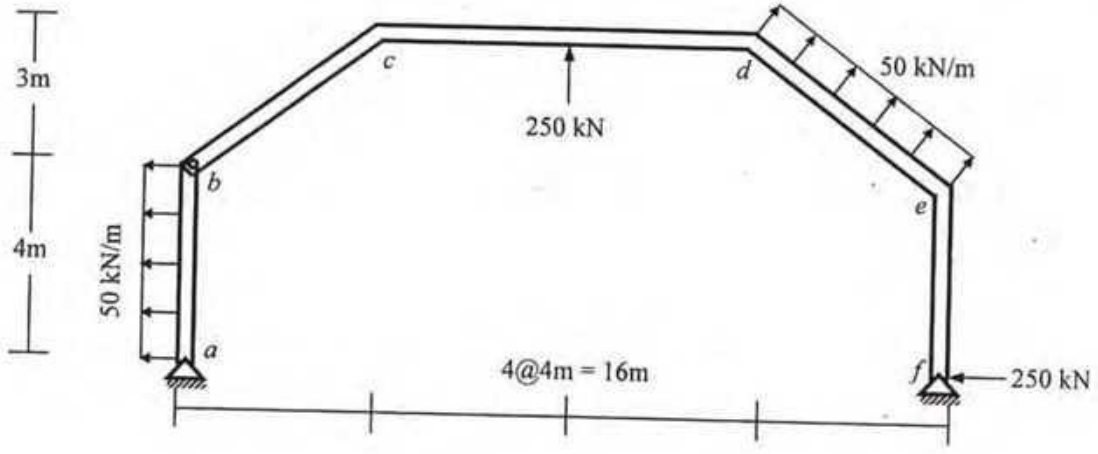
3. Calculate the reactions at supports *a* and *b* in the truss loaded as shown below. Also use the method of joints to calculate the forces in members *bf, bg, fj* and *ei*.



4. In the beam *abcde* loaded as shown below, calculate the
   (i) force P if the axial force at the left of B is 5 kips,
   (ii) reactions at supports B, D and pulley F [using the value of P calculated in (i)],
   (iii) shear force and bending moment at C.



5. The figure below shows a system of forces acting on frame *abcdef*.
   (i) Calculate the support reactions at a, f and pin reactions at b,
   (ii) Draw the free-body diagrams of members *ab* and *bcdef* and show that they are in equilibrium.



The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2009
Program: B.Sc. Engineering (Civil)

Course Code: CE 333 Course Title: Environmental Engineering II Credit: 2.00
Time: 1.0 hour Full Marks: 60

There are **FOUR** questions. Answer any **THREE**.
[Assume reasonable value for missing data (if any)]

1.(a) What are the typical functions of a sanitary system? What are the types of sanitary systems? Briefly discuss. **10**

(b) Design a leach pit for both single and alternating twin off-set pit pour-flush latrines serving a family of ten members. Water consumption of the family is 30 gpcd and the soil is a porous silty loam having the infiltration rate of 20 l/m^2-day. **10**

2.(a) Write down the advantages and disadvantages of a pour-flush pit latrine. **5**

(b) Design a two compartment septic tank to serve a household of twelve persons having the water consumption rate of 100 lpcd. The tank is to be desludged in every three years. Assume, the design temperature for sludge digestion is 25 °C and sludge accumulation rate is 0.06 m^3/person/year. **15**

3.(a) Write down the advantages and disadvantages of separate and combined sewerage systems. What are the suitable conditions for combined sewerage system? **5**

(b) Calculate the water requirements (m^3/day) of a small town of 60,000 inhabitants. The average water consumption is 140 l/day/capita. A small factory, located in the town, occupied an area of 1500 ha producing 0.30 l/s/ha wastewater. A hotel along with other commercial area occupied 200 ha producing 1.0 l/s/ha wastewater. What is the wastewater flow from that area? Assume, peak dry weather factor = 1.7, ground water constant = 0.45 l/sec/ha and appropriate infiltration factor =0.5. Design a circular sewer to carry the wastewater generated from the above catchment area (for full flow condition). The sewer is to be laid at a slope of 0.004 and assume roughness coefficient = 0.013. **15**

4.(a) Define the following terms: (i) Domestic sewage, (ii) Industrial wastewater, (iii) sanitary sewer, (iv) Storm sewer and (v) Sewerage. **5**

(b) Determine the peak discharge for use in the design of a highway crossing a canal. The catchment has the following characteristics: **15**
Mainstream length L = 4.0 km, Area = 7 km^2, Mainstream slope = 4.0 m/km,
Catchment type : Medium soil with C = 0.48
Assume, recurrence interval = 5 years.
Also, determine the diameter of the storm sewer crossing the highway, for the above data, with sewer material having n = 0.013 and laid at a slope of 0.001. The velocity at full flow should be less than 3.0 m/s. Check this maximum velocity for the designed sewer.

Formulae:

1. $V_{sc} = 0.4\ V_{sl}$
2. $t_h = 1.5 - 0.3 \log (P.q)$
3. $V_h = 10^{-3}\ P\ q\ .\ t_h$
4. $t_d = 30\ (1.035)^{35-T}$
5. $V_d = 0.5 \times 10^{-3}\ P.\ t_d$
6. $d_{sc} = 0.82 - 0.26\ A$
7. $Q = \sum D\ .d + \sum I\ .i$
8. $\sum D = P.q_r + A_c\ .\ q_c + A_i\ .\ q_i$
9. $\sum I = A_r\ .\ k + A_c\ .\ k/4 + A_i\ .\ K/4$
10. $t_c = (F\ .\ L) / (A^{0.1}\ .\ S^{0.2})$
11. $Q = F.C.I.A$

Note: Here, the symbols have their usual meaning.

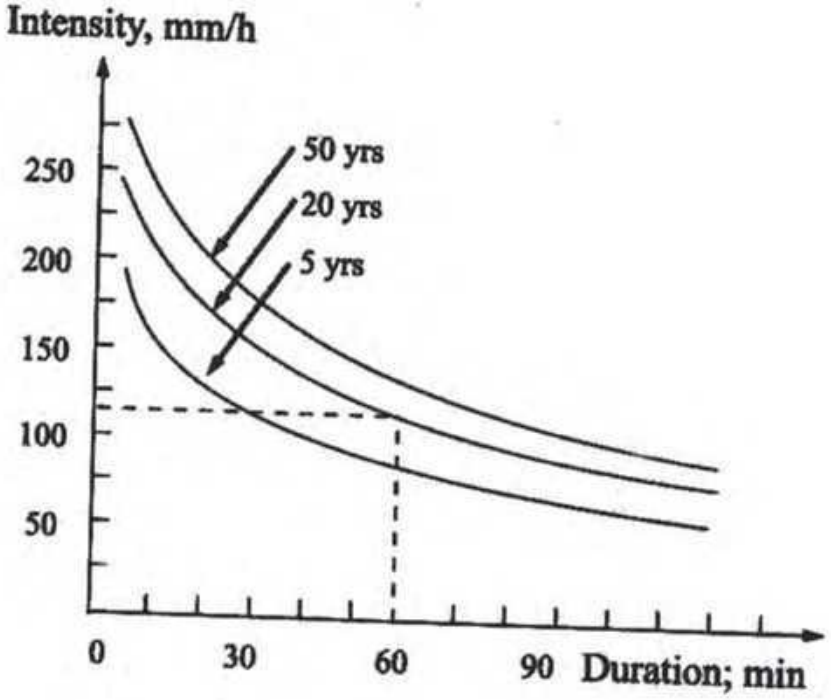


Fig: Rainfall Intensity-Duration-Frequency Curves

The University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Spring 2009
Program: B.Sc. Engineering Civil

Course Title: Fluid Mechanics | Course No : CE 221 | Credit: 3.00

Time : 1.0 hour | Full Marks : 20

Answer all questions. The figure in the right margin indicates full marks.

1. Differentiate between, (i) Lagrangian Method and Eulerian Method — 5
   (ii) Uniform and Non-Uniform Flow

   Or, Define (i) Surface Tension
   (ii) Capillarity — 5

2. a. Compute "y" in Figure 1 if the pressure differences between points A and B is 150.00 kN/m^2. ($P_A > P_B$)

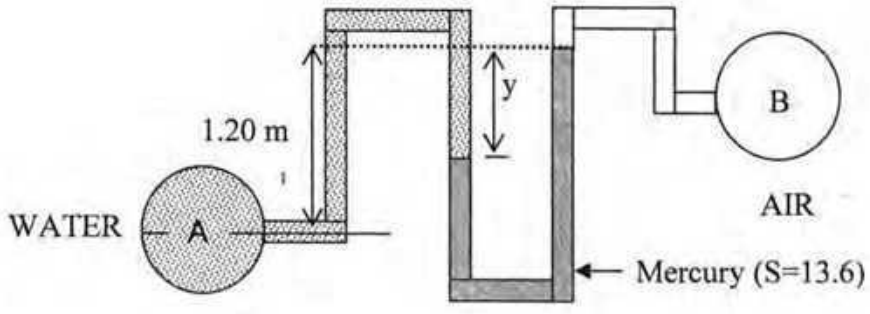


Figure 1

   b. In a straight streamline the velocity at any point (x,y) is given by $v = \sqrt{x^2 + y^2}$. Calculate the velocity and acceleration at x = 8, y = 6 m.

5

2. a. Determine the horizontal and vertical forces acting on the curve surface CD on the cylinder in Figure 2.

Or, Determine the horizontal and vertical forces acting on the curve surface DB on the cylinder in Figure 2.

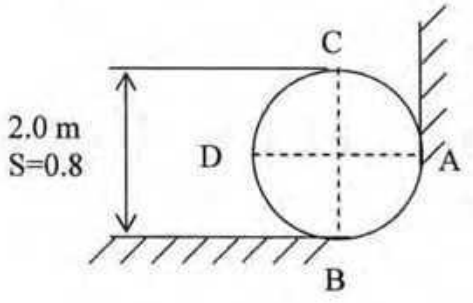


Figure 2

5

3. Oil flows through a pipe of 45 cm diameter (Figure 3). The pipe contracts from 45 cm diameter at point A to 30 cm diameter at point B. At point B, it bifurcates into two branches consisting of pipes of 20 cm and 15 cm diameters. If the velocity at A is 2 m/sec, calculate the discharge at A and the velocities at B and C. The velocity at D is 4 m/s.

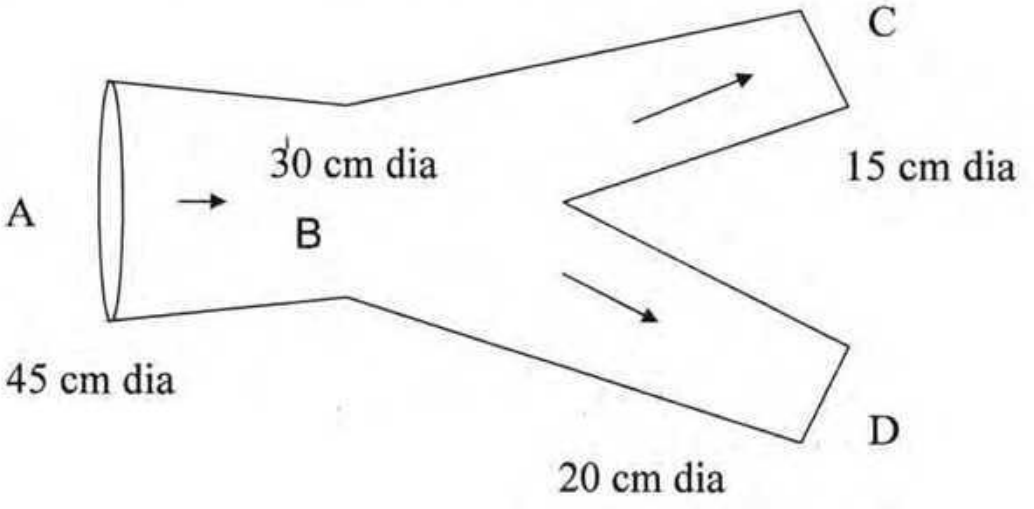


Figure 3

The University of Asia Pacific

Department of Interdepartmental Courses

Mid Semester Examination Spring '2009

Program: B.Sc. Engineering (CE)

Course Title: MTH-III **Course Code: MTH-201** **Credit: 3.00**

Time: 1 hr **Full Marks: 20**

Answer any **Four (4)** of the following:

Q.1. Find the Arithmetic Mean, Median, and Mode for the following data:

Profit	200-400	400-600	600-800	800-1000	1000-1200	1200-1400	1400-1600
No .of Companies	500	300	280	120	100	80	20

Q.2. (a) Define system of linear equations. Solve the system:

$$2x + 3y - 2z = 5$$
$$x - 2y + 3z = 2$$
$$4x - y + 4z = 1.$$

(b) Define linear combination. Write the vector $v = (2,-5, 3)$ in R^3 as a linear combination of the vectors $e_1 = (1,-3,2)$, $e_2 = (2,4,-1)$ and $e_3 = (1, -5,7)$.

Q.3. (a) Verify that $\begin{pmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & 4 \end{pmatrix}$ is nilpotent.

(b) If $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{pmatrix}$, verify that $A^2 - 4A - 5I = 0$.

SECTION B

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

1.(a) Define (i) Terrestrial latitude and Co-latitude (ii) Altitude and Zenith distance (iii) Declination. (5)

(b) A star having a declination of 65°15′N has its lower transit in the zenith of the place. Find the altitude of the star at its upper transit. (5)

2.(a) Find the shortest distance between two places A and B, given that the latitude of A and B are 25° 0′ N and 130° 23′ N and their longitudes are 55° 0′ E and 56° 21′ E respectively. (5)

(b) What are the types of spherical co-ordinate system? Write down the co-ordinates and great circles of reference for both of the Independent and the Dependent Equatorial Systems. (5)

3.(a) What are the fields of application of terrestrial photogrammetry? Describe the field works in terrestrial photogrammetry in brief. (5)

(b) A camera having the focal length of 25 cm is used to take a vertical photograph to a terrain having an average elevation of 1000 meters. What is the height above mean sea level at which an aircraft must fly in order to get the photograph at a scale of 1: 7000? (5)

Given formula:

$$\cos P = \frac{\cos p - \cos a * \cos b}{\sin a * \sin b}$$

$$\tan(A+B)/2 = \cot(P/2) * \frac{\cos(a-b)/2}{\cos(a+b)/2}$$

$$\tan(A-B)/2 = \cot(P/2) * \frac{\sin(a-b)/2}{\sin(a+b)/2}$$

Note: Here the symbols have their usual meanings.

The University of Asia Pacific
Department of Civil Engineering
Mid-Term Examination Spring- 2009
Program: B.Sc. Engineering (Civil)

Course Title: Introduction to Civil & Environmental Engineering | Course Code: CE 107 | Credit: 2.00

Time: 1 hour | Full Marks: 20

Answer all questions.

(2+2+2=6)

1. a. Give the names in details of the following codes with their related fields,

   i. AASHTO ii. ACI iii. ASTM iv. BNBC

   b. Define the following terms:

   i. Height of the Building ii. Floor Area Ratio (FAR)

   iii. High rise building iv. Road width

   c. How can you ensure satisfactory quality of brick in the field?

(8)

2. The University of Asia Pacific is planning to construct a seven storied building under its own supervision. As its fund is limited, the university wants to take loan from a financial institution. Financial institution provides maximum 70% loan of the total construction cost. Estimate the total construction cost and the amount of money to be borrowed as per the PWD schedule (enclosed). The particulars of the building are as follows:

Sl No	Particulars	Specifications
01	Land Size	60 m x 90 m
02	Road width	20 m
03	Building type	Educational (B-2) (Standard)
04	Allowable Bearing Capacity (Q_a)	3.0 ksf
05	Floor Level	Seven
06	Plinth Area	2000 Square meter
07	Type pf structure	RCC Frame Structure , Concrete with Stone Chips, fc=22-25 MPa
08	Ground Floor	50% Car Parking and 50% habitation
09	Lime terracing, RCC cornice and parapet	0.92 m height
10	Roof top RCC water tank including beams and supports etc	13,000 Gallons
11	For mosaic work in all rooms including stair, tiles in bathrooms and normal finishing	Tk.950 per square meter
12	Underground water reservoir, distribution line, water pump, pump house, WASA charge	1,20,000 Gallons
13	Boundary wall	RCC frame

(0.5+0.5+0.5+0.5+1+1+2=6)

3. The land area of a residential plot is 50 m x 80 m. The front road width is 18.0 m. If the land owner wants to construct a residential building in his plot then,
   (i) What will be the minimum front set back?
   (ii) What will be the minimum back and side set backs?
   (iii) What is the Floor Area Ratio (FAR) as per RAJUK?
   (iv) What is the maximum allowable ground coverage (plinth area) as per RAJUK?
   (v) Find the maximum number of floor levels that can be constructed.
   (vii) If he wants to construct twenty storied building, then what will be the ground coverage?

Table: FAR, Maximum Allowable Land Use and Minimum Width of Adjacent Road (Source: RAJUK)

Building Occupancy Type		1300to≤2600 Sq. metre			≥ 2600 Sq. metre		
		FAR	Max^{m} Land Use (%)	Min^{m} Road Width (m)	FAR	Max^{m} Land Use (%)	Min^{m} Road Width (m)
Type A : Residential (1,2)	A1-A4	4.5	45	12	6.0	40	18
	A5	5.0	50	12	-	50	18
Type B : Educational	B1	3.5	50	12	4.5	50	12
	B2	2.5	50	12	3.0	50	12
Type F : Office	F1	10.0	50	12	NR	50	18
Type C : Organizational Type Type D : Health related	C1-C4 D1-D2	5.0	50	12	NR	50	18
Type E : Assembly Centre	E1-E5	3.25	50	18	4.0	50	18
Type F : Shop and Commercial	F2-F3	3.25	50	18	4.0	50	18
Type G : Industry Type H : Storage Type D : Dangerous/ Hazardous Type K : Miscellaneous	G1-G2 H1-H2 J1-J2 K1-K2	3.5	55	12	4.0	50	12

Table: Side Setback above 10 Storied or Building Height Greater Than 33.00 m

Size of the plot (sqm)	Minimum back setback (m)	Side setback(m)
Any size	1.50	3.0

The University of Asia Pacific
Department of Civil Engineering
Midterm Examination Spring 2009

Course # : CE-203 | Course Title: Engineering Geology & Geomorphology
Full Marks: 40 (4 X 10 = 40) | Time: 1 hour

Answer any **four (4)** questions of your choice out of the following **five (5)**

1a) Draw a schematic diagram of the rock cycle, provide two examples of each type of rock and discuss (in brief) metamorphic rock according to the cycle. 8

1b) Mention (names only) different principle zones of the earth from geologic point of view. 2

2a) What is diastraphism? Show with a neat sketch, different geometric parameters of a fold. Classify folds (mentionsnames only) based on their origin. 4.5

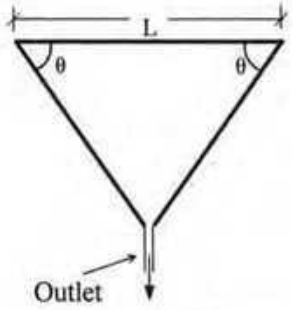
2b) Define fold, fault and joint. Classify fault (mention names only) according to the direction of movement. Draw a neat sketch of oblique fault. 5.5

3a) Write down the factors affecting drainage pattern. Classify drainage patterns (mention names only). Write a short note (with a neat sketch) on rectangular pattern of drainage system. 7

3b) Define infiltration and percolation. With a sketch show different components (routes/ways) of total flow (runoff) 3

4a) Write down (names only) the factors affecting runoff. 2.5

4b) In the following basin, for what value of θ, the flow rate (Q) or runoff (Q) will be the maximum for the basin? Also find the FF and CC of the basin for maximum runoff. 6



4c) Write down the assumptions used in rational formula. 1.5

5a) Prove that $d \propto v^2$; where symbols carry their usual meanings. 4.5

5b) For a stream having triangular X-section and B <<<<< D, prove that --- $\tau \propto B$, where------ 2
τ = tractive pressure along the stream B = width of stream
D = depth of stream

5c) Two rivers (river A and river B) are having the following parameters – 3.5

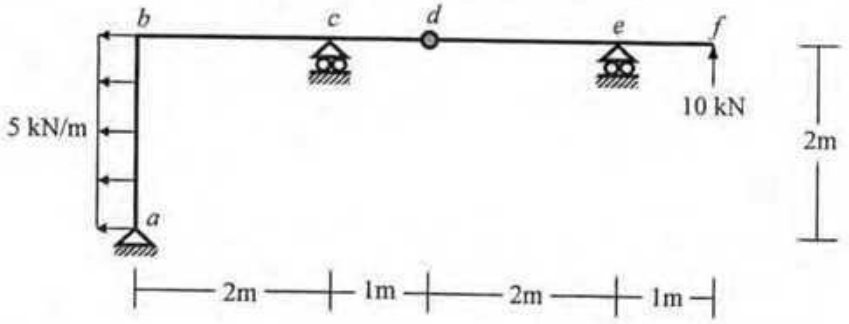
Slope of river A is ½ of the slope of river B
X-sectional area of river A is twice the X-sectional area of river B
Perimeter of tractive zone of river A is three times the perimeter of tractive zone of river B

Mention (if all other factors affecting erosion remain constant) which river will exhibit more erosion? Justify your answer.

The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2009 (Set A)

Course #: CE 311 — Course Title: Structural Engineering I
Full Marks: 40 (= 4 × 10) — Time: 1 hour

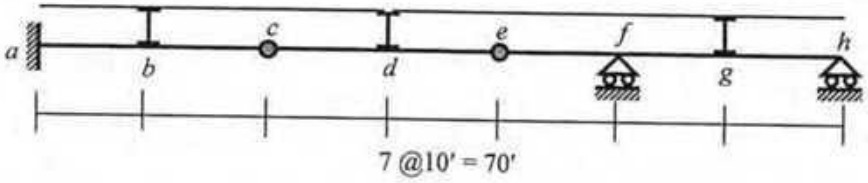
1. Determine the degree of statical indeterminacy (dosi) of the frame *abcdef* shown below and also draw its Axial Force, Shear Force and Bending Moment diagrams.



d is an Internal Hinge

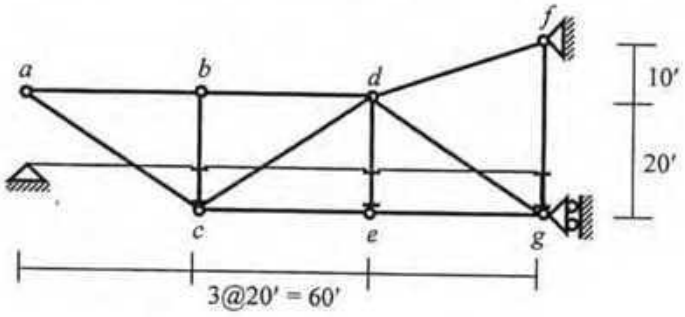
2. Draw the influence lines of X_a, M_b and $V_{c(Left)}$ for the frame *abcdef* shown in Question 1, if the unit load moves over (i) beam *bf*, (ii) column *ab*.

3. Draw the influence lines of R_a, R_h, $V_{d(Right)}$, M_f and M_g for the plate girder shown below.



c and *e* are Internal Hinges

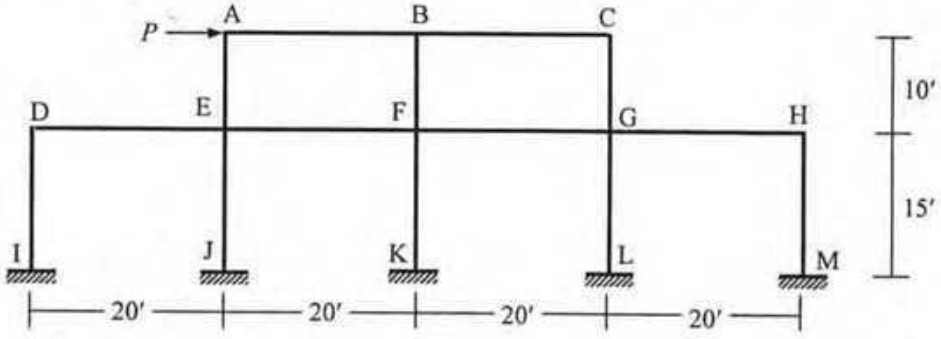
4. Determine the degree of statical indeterminacy (dosi) of the truss shown below and also draw the influence lines for the reaction at support *g* and forces in members *cb*, *cd* and *ce*.



The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2009 (Set A)

Course #: CE 313 — Course Title: Structural Engineering II
Full Marks: 40 (= 4 × 10) — Time: 1 hour

1. For the frame loaded as shown below, the maximum bending moment in column FK is 50 k-ft.
   (i) Calculate the applied load P using the *Portal Method*,
   (ii) Draw the SFD and BMD of the beams DE and EF for the value of P calculated in (i), using the *Cantilever Method* [Assume each column to have equal cross-sectional area].



2. For the frame described in Question 1 ($P = 0$), draw SFD and BMD of beams FG, GH and AFD and BMD of column GL for a uniformly distributed vertical load of 1.5 k/ft on each beam, using (i) approximate locations of inflection points, (ii) ACI coefficients.

3. (i) For the Mill Bent ABCDEF shown below, use Portal Method to draw the BMD of column ABC.

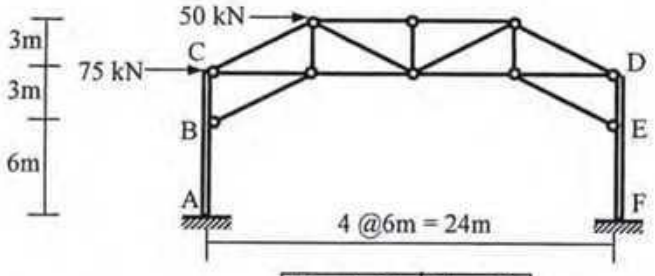


Fig. for Question 3(i)

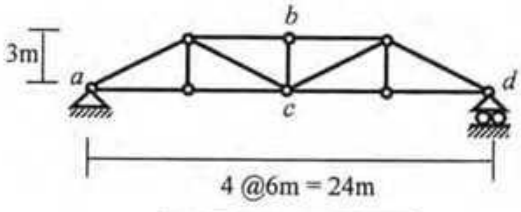
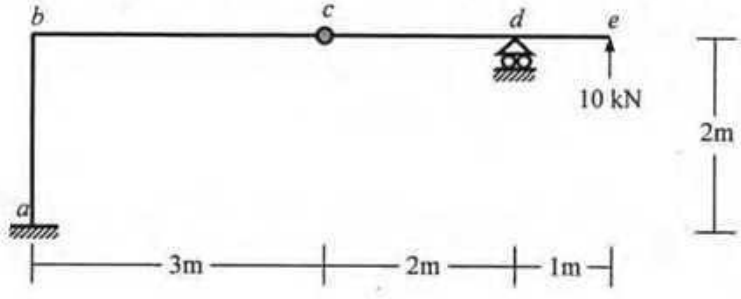


Fig. for Question 3(ii)

   (ii) For the truss *abcd* shown above, calculate the horizontal deflection of support d if the temperature of all the bottom cords drop by 20°C [Given: $\alpha = 10 \times 10^{-6}$/°C].

4. Use the *Unit Load Method* to calculate the horizontal deflection at d (considering flexural and shear deformations) of the frame loaded as shown below [Given: EI = 20×10^3 kN-m^2, GA* = 600×10^3 kN].



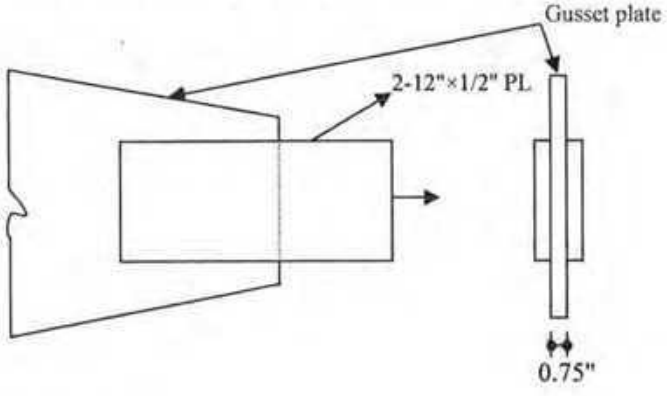
c is an Internal Hinge

The University of Asia Pacific
Department of Civil Engineering
Mid Term Examination Spring 2009

Course #: CE 417 — Course Title: Structural Engineering VI
Full Marks: 40 — Time : 1 hr

There are **three** questions in this paper. Answer any **two.**

01(a) Determine the number of bolts required and an appropriate layout to transmit DL =80 kips and LL= 200 kips through 2-12"×1/2" PL to a 0.75" gusset plate. (08)
Given: F_y=36 ksi, F_u=58 ksi, Allowable bolt shear stress= 21 ksi, Bolt dia=¾"
Solve the problem by AISC/ASD method.
(Don't need to check the capacity for tearing across the bolts.)



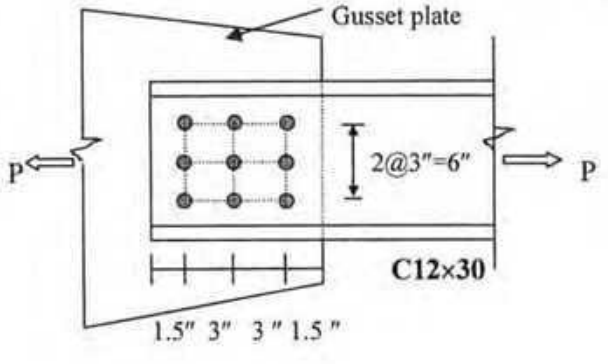
(b) Write short note on : (09)
i. Block shear failure ii) Slip critical connection in bolted connection
iii. Fatigue of Structural steel

(c) List common ASTM structural bolt and write their minimum tensile strength. (03)

02(a) Determine the design load, P by LRFD for a single channel C12×30 (Gross area, A_g=8.82 in^2, web thickness, t_w=0.510") connected a 0.5" thick gusset plate as shown below. Holes are for 7/8"diameter bolts and the plate is made from A36 structural steel. Assume design shearing strength in the bolts = 48 ksi. Investigate all failure modes (16)

Given: Design strength on gross area, $\phi_t P_n = 0.9 F_y A_g$
Design strength on effective net area, $\phi_t P_n = 0.75 F_u A_e$

Design strength for block shear, $\phi R_n = \begin{cases} 0.75(0.60F_yA_{gv} + F_uA_{nt}) \\ 0.75(0.60F_uA_{nv} + F_yA_{gt}) \end{cases}$



The University of Asia Pacific
Department of Civil Engineering
Mid Semester Examination Spring 2009

Course #: CE 433 — Course Title: Environmental Engineering IV
Full Marks: 100 — Time: 1 hour

1. Answer ANY TWO of the following THREE questions: **(9 × 2)**

(i) Mention the different categories of pesticides. What are the major groups of synthetic organic insecticides? Give one example from each group.

(ii) What are the major sources and sinks of dissolved oxygen (DO) in river water? Which of these source(s) are considered in the simple DO model?

(iii) The BOD_5 of a wastewater sample is 400 mg/L at 20 °C. If K=0.25/day at 20°C, calculate the BOD_5 at 25°C.

2. A sewage outfall discharges into a surface stream with a maximum flow rate of 0.50 m^3/s, a BOD_5 of 40 mg/l, a dissolved oxygen concentration of 1 mg/l and a temperature of 27°C. The stream (upstream from the point of discharge) is found to have a minimum flow rate of 1.25 m^3/s, a BOD_5 of 1.5 mg/l, a dissolved oxygen concentration of 6.0 mg/l, and a temperature of 22 °C. Complete mixing of wastewater and stream is almost instantaneous. Velocity of the mixture is 0.20 m/s and the average depth of stream is 2.60 m. Laboratory determined BOD rate constant of the mixture is 0.22 per day. **(34)**

Find the minimum value of dissolved oxygen (DO) and the distance downstream at which the DO is minimum.
(Given: Saturation value of DO is given by:
C_s (mg/l) = $14.62 - 0.394T + 0.007714T^2 - 0.0000646T^3$; T in °C)

3. A lake with a surface area of 80×10^6 m^2 is fed by a stream having an average flow rate of 16.0 m^3/s and an average total phosphorus concentration of 0.01 mg/L. It also receives treated wastewater from a sewage treatment plant at the rate of 0.30 m^3/s having 4.9 mg/L phosphorus. The phosphorus settling rate in the lake is 12.0 m/year. **(22)**

(i) Estimate the average phosphorus concentration in the lake,

(ii) Is the phosphorus concentration in the lake sufficient to cause algal bloom in the lake? Explain.

4. Answer ANY TWO of the following THREE questions **(13 × 2)**

(i) What do you understand by eutrophication? What are its adverse impacts? How can eutrophication be controlled?

(ii) Explain the water quality problems related to high concentrations of ammonia and algae at Saidabad water treatment plant (SWTP).

(iii) Explain how thermal pollution affects dissolved oxygen concentration of a water body.

The University of Asia Pacific
Department of Civil Engineering
Mid Term Examination – Spring 2009

Course # CE 451 Course Title: **Transportation Engineering II: Highway Design & Railways**

Full Marks: 60 Time: 1 hour

There are FOUR questions. Answer any THREE

1. (a) What are the functions of sleepers? (5)
   (b) Write short notes on "coning of wheel" and "Tilting of rail". (4+3)
   (c) What should be the techniques to improve embankment stability? (5)
   (d) List out common gauges with their dimensions. (3)

2. (a) Why Elastic Fastenings are necessary? What are the requirements of an Elastic Fastening? (3+3)
   (b) What is gauge? Why is it desirable to use uniform gauges in a country? (7)
   (c) Compare between Compressed air brakes and Vacuum air brakes. (4)
   (d) Draw a typical Left Hand Turn Out. (3)

3. (a) What are the requirements for an ideal rail section? (4)
   (b) As per functional consideration, classify the railway stations. Give a brief description of them. (8)
   (c) A 6 degrees curve branches off from a 5 degrees main curve in an opposite direction in the layout of a B.G. yard. If the speed on the branch line is restricted to 50 kmph, determine the speed restriction on the main line. Assume permissible deficiencies in cant as 76 mm. (8)

4. (a) What are the advantages and disadvantages of concrete sleeper? (6)
   (b) Write short notes (3+3)
       (i) Super Elevation
       (ii) Combination Fish Plates
   (c) Compute the steepest gradient that a train of 25 wagons with a locomotive can travel with the following data: (8)

Weight of each wagon	= 20 tones
Weight of locomotive	= 150 tones
Tractive effort of locomotive	= 15 tones
Rolling resistance of locomotive	= 3 kg/tone
Rolling resistance of wagon	= 3 kg/tone
Speed of the train	= 70 kmph

The University of Asia Pacific

Department if Civil

Mid-Semester Examination Spring-2009

Programme: B.Sc Engineering (2nd year 2nd semester)

Course Title: Basic Electrical Engineering; Course No.: ECE 201; Credit: 3.00

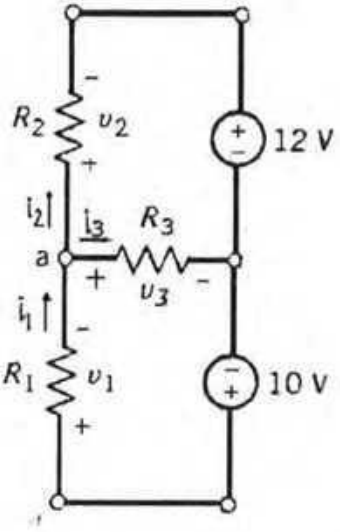
Time: 1.00 Hour. Full Marks: 60

There are **four (4)** questions. Answer any **three (3).** All questions are of equal value in the right margin indicate marks.

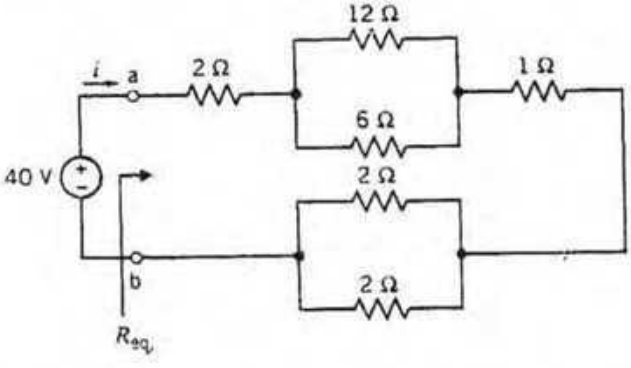
1. **a.** State Kirchhof's voltage law with necessary diagrams. **(10)**

b. In the circuits given below the anticipates using ohom's law. Find each current and voltages. When

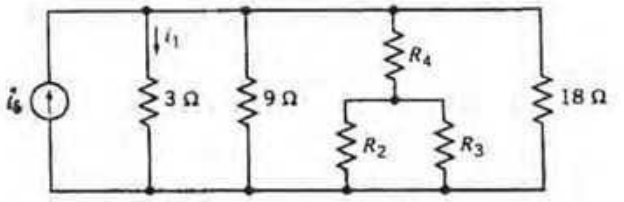
$R_1 = 8\Omega$; $V_2 = -10v$; $i_3 = 2A$; $R_3 = 1\Omega$. **(10)**



2. **a.** Determine R_{eq} and i for the circuit of figure shown below. **(10)**

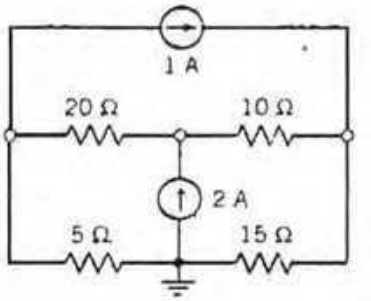


b. Consider the circuit shown in figure. Find the current i_1 when $R_4 = 2\Omega$; $R_2 = R_3 = 4\Omega$. **(10)**

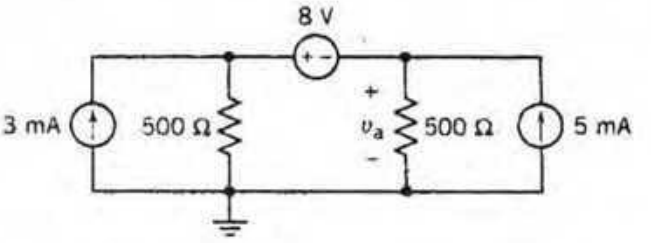


(a)

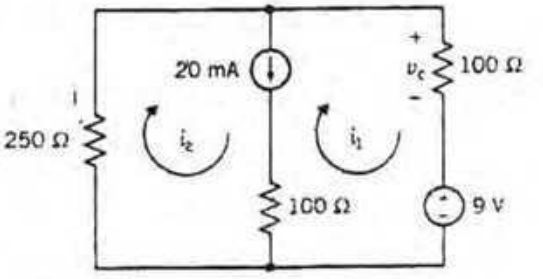
3. a. Determine the node voltages for the circuit of figure shown below. **(10)**



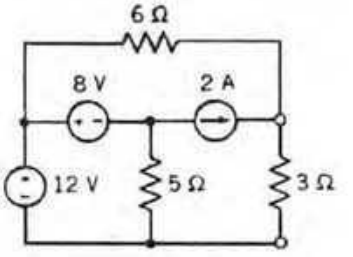
b. Determine the node voltage V_a for the circuit of figure shown below. **(10)**



4. a. Find V_c for the circuit shown in figure. **(10)**



b. Determine the value of the voltage across 3Ω resistance of the figure shown below. **(10)**



The University of Asia Pacific
Mid -term Exam Fall 2009
Course- HSS 101-English Language-1

Time -1 hour **Marks-40 (20)**

Q. 1. Write a biography of the person using the information given below. 10

Name : William Jefferson Clinton
Date of Birth : 19-7-46
Place of Birth : Hope, Arkansas (USA)

Education:
School- Boys Nation High School
1968- Graduated from Georgetown University
1973- Received a law degree from Yale University

Family Members : Wife- Hillary R. Clinton
Daughter- Chelsea Clinton

Achievements :

1978 became Governor of Arkansas
1992 elected President of the United States
1996 reelected President of the United States

Other Accomplishments:
(While in the office) increased investment in education, provided tax relief for working families, expanded access to technology, etc.

Present occupation:
2000- Public service through the William J. Clinton Foundation

Q.2. The following extract is about Toshi Suzuki who is from Japan. Read and complete the questions. 5

"I work for Pentax cameras, in the export department. I don't have a lot of free time, but I have one special hobby-taking photographs, of course I like taking photographs of flowers, especially in spring. Sometimes, after work, I relax in a bar near my office with friends. My friend, Shigeru, likes singing pop songs in the bar. This has a special name, "Karaoke". I don't sing- I'm too shy."

a. When ---------- Toshi like---------- photographs of flowers?
b. In ---------- department---------- he----------?
c. ---------- he relax?
d. Who ---------- relax----------?
e. Why ----------sing ---------- bar?

The University of Asia Pacific

Mid-Term Examination, Spring-2009
Course Title: Bangladesh Studies: History of Bengal
Course No- HSS 111(b), HSS 211(b)
Department of BBA, CSE, CE & EEE
Credit: 2.00

Full Marks: 20 Times: **1hr.**

Answer any four of the following questions: 4X5 =20

1.	What is Janapad? Give a short description of Vanga Janapada.	5
2.	Write a brief account of Gaur Janapada.	5
3.	a) Who was Sasanka? b) What was his success in North Indian politics?	2 3
4.	a) Give a definition of Matsyanayam. b) How did Gopala make an end of this Matsyanayam situation?	2 3
5.	Give a brief description of Sena dynasty in ancient Bengal.	5
6.	a) Describe Ikthiyar uddin Bakthiyar Khaljis early career. b) Shortly discuss the Ikthiyar uddin Muhammad Bakhtiyar Khalji's success.	2 3

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Mid-Semester Examination, Spring-2009
Program: BArch, BBA, BSc Engineering (CE, CSE, EEE)

Course Title: Bangladesh Studies: Society and Culture **Course Code: HSS 111(a)**
Credit: 2:00 **HSS 211(a) [for CE]**

Time: 1:00 Hour **Full Marks: 20**

All Questions are of equal value

Answer <u>any four</u> of the following

1. What is sociology? Discuss its focus.

2. "Sociology is not a normative science." Discuss with example.

3. What are the branches of sociology? Discuss on any two branches of sociology.

4. Discuss the steps of sociological investigation.

5. Discuss the characteristics of Anthropological method. Why is it appropriate for the study of Bangladesh society and culture?

6. Write short notes on <u>any two</u>:

    a. Society
    b. Institution
    c. Culture

The University of Asia Pacific
Department of Interdepartmental Courses
Mid Semester Examination Spring '2009
Program: B.Sc. Engineering (CE)

Course Title: MTH-I **Course Code: MTH-101** **Credit: 3.00**

Time: 1 hr **Full Marks: 20**

Answer any four of the following: **$4 \times 5 = 20$**

1. (a) Explain what is meant by the statement 'the function f(x) is continuous at x=a.'

   (b) A function f(x) is defined as follows:-

   $$f(x) = 3 + 2x \text{ for } -\frac{3}{2} < x \le 0$$

   $$= 3 - 2x \text{ for } 0 < x < \frac{3}{2}$$

   Show that f(x) is continuous at $x = 0$, but $f'(0)$ does not exist.

2. Find the $\frac{dy}{dx}$ of (i) $y = x^{\cos^{-1}x}$, (ii) $\log(xy) = x^2 + y^2$.

3. If $y = \tan^{-1} x$, then show that

   (i) $(1+x^2)y_1 = 1$

   (ii) $(1+x^2)y_{n+1} + 2nxy_n + n(n-1)y_{n-1} = 0$.

   Find also the value of $(y_n)_0$

4. Work out the following Integrals (Any two)

   (i) $\int \frac{7x-9}{x^2-2x+35}dx$; (Ii) $\int \frac{dx}{a+b\cos x}$; (iii) $\int \frac{dx}{\sqrt{(x-\alpha)(\beta-x)}}$ where $\beta > \alpha$

5. Evaluate $\int \frac{dx}{x(a+bx^n)}$ by using suitable substitution.

6. (i) Sketch the graph of the curve $r = \cos 2\theta$ and find area of a loop and then all the loops by integration.

   (ii) Sketch the region bounded by the graphs of $y = 4 - x^2$ and $y = x^2 - 4$. Then find the area of the region by integration.

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Mid-term Examination Spring-2009
Program: B.Sc. Engineering (CE)

Course Title: Math-II **Course Code: MTH-103** **Credit: 3.00**
Time: 1hr. **Full Marks: 20**

There are **six** questions, Answer any **four** (All questions carry equal marks)

Q1. a) Represent graphically, i) a force of 10N in a direction 30° north of east.
ii) a force of 15N in a direction 30° east of north.

b) Prove that diagonals of a parallelogram bisect each other.

Q2. a) Find the angle between $\mathbf{A} = 2\mathbf{i} + 2\mathbf{j} - \mathbf{k}$ and $\mathbf{B} = 6\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$.
b) Find the projection of the vector $\mathbf{A} = \mathbf{i} - 2\mathbf{j} + \mathbf{k}$ on the vector $\mathbf{B} = 4\mathbf{i} - 4\mathbf{j} + 7\mathbf{k}$.

Q3.a) If $F(x,y,z) = xy^2z$ and $\mathbf{A} = xz\mathbf{i} - xy^2\mathbf{j} + yz^2\mathbf{k}$, find $\frac{\partial^3}{\partial x^2 \partial z}\left(F\vec{A}\right)$ at the point (2,-1,1).

b) Given $\mathbf{R} = \sin t\mathbf{i} + \cos t\mathbf{j} + t\mathbf{k}$, find i) $d\mathbf{R}/dt$ ii) $d^2\mathbf{R}/dt$ iii) $\left|d\vec{R}/dt\right|$ iv) $\left|d^2\vec{R}/dt\right|$

Q4.a) Define The Vector differential operator, The Gradient.
b) Find the directional derivative of $\varphi = x^2yz + 4xz^2$ at (1,-2,-1) in the direction $2\mathbf{i} - \mathbf{j} - 2\mathbf{k}$.

Q5.a) Evaluate $\int_0^{\pi/2}\left(3\sin u\,\hat{i} + 2\cos u\,\hat{j}\right)du$

b) If $F = (2x+y)i + (3y-x)j$, evaluate $\int_c \vec{F}.d\vec{r}$ where c is the curve in the xy-plane consisting of the straight lines from (0,0) to (2,0) and then to (3,2).

Q6. Evaluate $\iint_s \vec{A}.\vec{n}ds$, where $\vec{A} = z\hat{i} + x\hat{j} - 3y^2z\hat{k}$ and s is the surface of the cylinder $x^2+y^2 = 16$ included in the first octant between $z = 0$ and $z = 5$

THE UNIVERSITY OF ASIA PACIFIC
Department of Interdepartmental Courses
Mid-term Examination Spring-2009
Program: B.Sc. Engineering (CE)

Course Title: Math-IV **Course Code: MTH-203** **Credit:3.00**
Time: 1hr. **Full Marks: 20**

There are **six** questions, Answer any **four** (All questions carry equal marks

Q1.a) Form the differential equation of which, $c(y+c)^2 \frac{dy}{dx} = 3x^2$ is the complete Integral.

b) Find the differential equation of all circles passing through the origin and having their centers on the y-axis.

Q2.a) Solve $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$

b) Solve $(x-y)^2 \frac{dy}{dx} = a^2$

Q3.a) State and prove the first translation property.

b) Find i) $L\{t^2e^{4t}\}$ ii) $L\{e^{4t}\sinh 5t\}$ iii) $L\{e^{-3t}(3\cos 6t - 5\sin 6t)\}$ iv) $L\{e^{-2t}\sin 4t\}$

Q4. Find a) $L^{-1}\left\{\frac{5s+4}{s^3} - \frac{2s-18}{s^2+9} + \frac{24-30\sqrt{s}}{s^4}\right\}$ b) $L^{-1}\left\{\frac{3s+7}{s^2-2s-3}\right\}$

Q5.Solve $Y''' - 3Y'' + 3Y' - Y = t^2e^t$,where $Y(0) = 1, Y'(0) = 0, Y''(0) = -2$

Q6. Solve $Y''(t) + Y(t) = 8\,\mathrm{Cost}$, where $Y(0) = 1, Y'(0) = -1$

The University of Asia Pacific
Department of Interdepartmental Courses
Mid Semester Examination Spring- 2009
Program: B.Sc Engineering (CSE/CE/ARCH)

Course Title: Physics I | Course Code: PHY-101 | Credit: 3.00
Time: 1.00 Hour | Full Mark: 40

There are Six Questions. Answer any Four

1. Find out the relation between elastic constants K, Y & σ and prove that 10

$$K=\frac{Y}{3(1-2\sigma)}$$

2. (a) Prove that work done per unit volume, $w = \frac{1}{2}$ x stress x strain for shearing strain energy. 6

(b) Find the work done in stretching a wire of 2 sq mm cross-section and 3 m long through 6mm. [$Y=2X10^{12}$ N/m^2] 4

3. (a) Find the force in a metallic bar due to contraction or expansion. 5

(b) A steel rod of cross-sectional area 4.3 cm^2 is heated to 120^{0}C and then prevented from contracting when it is cooled to 30^{0}C. Find the force exerted. [$Y=3.2X10^{12}$ N/m^2 & $\alpha=12x10^{-6}/^0C$] 5

4. What is called bending moment? Prove that bending moment = $\frac{YI_g}{R}$, where the terms have their usual meanings. 10

5. (a) State and explain the Zeroth law thermodynamics. 2

(b) State and explain the first law of thermodynamics. 2

(c) Show that $C_v = \left(\frac{\partial U}{\partial T}\right)_v$ and $C_p = \left(\frac{\partial H}{\partial T}\right)_p$ 6

6. (a) Show that the adiabatic curve is steeper than the isothermal curve at a point where the points intersect each other. 5

(b) Show that work done during an isothermal process is

$$W = RT \times 2.3026 \times \log_{10}\frac{P_1}{P_2}$$ 5