COLLEGE OF ENGINEERING PUNE

(An Autonomous Institute of Government of Maharashtra)

END SEMESTER EXAMINATION, Nov 2011

(CE 503) Earth Dam and Retaining Structures

Program : First Year M. Tech. (Civil)
Year: 2011-12; Semester I
Duration: 03 hrs (04 PM to 07 PM)

Specialization: Geotechnical Engineering
Date: 23.11.2011
Max. Marks: 50
Weightage: 100%

Instructions:

1. **All questions are compulsory.**
2. **Figures to right indicate full marks.**
3. **Draw neat figures wherever required.**
4. **Mobile phones and Programmable Calculators are not permitted.**

Q1 a) Explain analysis of sheet pile wall in mixed soils. (06)

b) Explain the procedure of design of cantilever sheet pile wall. (04)

Q2 Explain the following in case of drainage system for an earth dam.

i) Basic requirements to be satisfied by the filter materials. (01)

ii) Various drainage features with their necessity and suitability. (05)

iii) Design procedure for filter and graded filter. (04)

Q3 a) Explain in detail Kozeny's contribution in the seepage analysis of an earthen dam. (05)

b) What is flow net? (01)

How is it constructed? (01)

What are the uses of it? (02)

Draw typical flow net for a homogeneous earth dam having horizontal filter only. (02)

c) For seepage through anisotropic soil derive an expression for,
(i) Discharge, (ii) Deflection of flow lines at the interface of dissimilar soils. (04)

Q4 Write notes on the following. (15)

a) Electrical resistivity test for detecting seepage from the dam.
b) Coffer dam.
c) Importance of pore water pressure in an earth dam design.
d) Gabion Wall.
e) Analysis and design of braced excavation.

----------Paper Ends----------

College of Engineering, Pune
End Semester Exam – Nov. 2011
F.Y. M.Tech (Civil) Geotechnical Engg.
(CE-501)- Soil Engineering I

Day & Date- Monday, 21th Nov. 2011 | Time: - 4.00 pm to 7.00 pm
Maximum Marks: 50 | Duration – Three hrs.

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Draw neat figures wherever necessary.

Q. 1 A. With the help of neat sketch, explain the significance of rheological model formed by coupling of spring and dashpot in parallel. Obtain the strain-time variation when yield stress model is connected in series with this model. (5)

B. The load from a continuous footing of 1.6m width, which may be considered to be a strip load of considerable length is 160 KN/m^2. Determine the maximum principal stress at 1.2 m depth below the footing if the point lies (i) directly below the edge of the footing
(ii) 0.5 m away from the edge of the footing. (5)

Q. 2 A. Derive an expression for consolidation settlement of a saturated over consolidated clay layer subjected to 1D primary consolidation. (6)

B. Obtain the effective stress path for normally consolidated clay tested in consolidated undrained triaxial test. (4)

Q. 3 A. With the help of neat sketch, state the salient features of Virgin's compression curve. (4)

B. Deduce the expression for vertical stress at depth 'z' due to a concentrated load 'Q' using Westergaard's analysis. (6)

Q. 4 A. What are the different types of soil erosion caused by water? (5)

B. In a consolidation test on a soil, voids ratio of sample decreases from 1.24 to 1.12 when the pressure is increased from 200 to 400 KN/m^2. (5)

Coefficient of permeability of soil during this pressure increment is 8.5×10^{-8} cm/sec. Calculate coefficient of consolidation in m^2/ yr. Also compute the time taken in days for 90% consolidation of the layer of this soil 5m thick in field and sandwiched between an impervious layer beneath and pervious layer at the top.

Q. 5 A. How the isomorphous substitution affects the characteristics of clay minerals. (5)

B. With the help of neat sketch, explain the method to compute Hvorslev shear parameters. (5)

College of Engineering, Pune
End Semester Exam – Nov. 2011
F.Y. M.Tech (Civil) Geotechnical Engg.
(GE-507)- Geotechnical Aspects in Earthquake Engineering

Day & Date- Saturday, 19th Nov. 2011 — Time: - 4.00 pm to 7.00 pm
Maximum Marks: 50 — Duration – Three hrs.

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Draw neat figures wherever necessary

Q. 1 A. Obtain graphical solution of seismic active earth pressure on retaining wall using pseudostatic analysis. (5)

B. How will you carry out detailed analysis of gravity dam subjected to earthquake excitation using FEM? (5)

Q. 2 A. With the help of neat sketches, explain the use of compaction grouting and dynamic compaction techniques for mitigation of seismic hazard. (6)

B. Compare non-linear dynamic system with the corresponding linear system for a specific earthquake. (4)

Q. 3 A. How the liquefaction potential is evaluated using "cyclic strain approach"? (5)

B. How instability failure caused by earthquake is assessed using Normalized Strength approach? (5)

Q. 4 A. With the help of neat sketch, explain the response of damped free vibration SDOF system (5)

B. What are the salient features of movement of Indian plate caused due to earthquake? (5)

Q. 5 A. Based on the responses of two identical, anisotropically consolidated triaxial specimens of loose saturated sand, obtain the flow liquefaction surface under cyclic loading. (5)

B. How different types of accelerometers are used to measure strong ground motion characteristics? (5)

College of Engineering, Pune
End Semester Exam, MTech (Geotech)
November 2011 (Year 2011-12, Semester I)

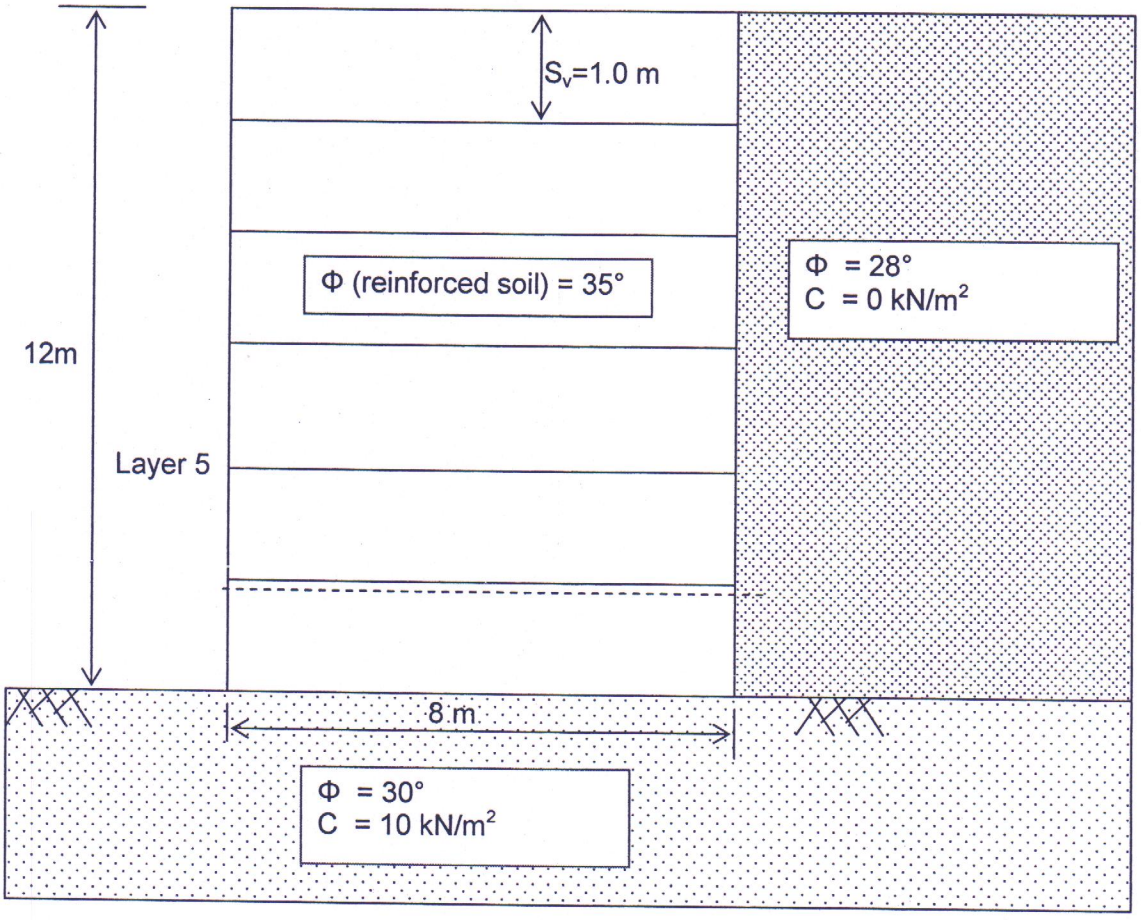
Subject: Reinforced Earth and Geotextiles

Duration: 3 hours

Max. Total marks: 50

Note: Assume suitable data wherever necessary.

Q-1: A cross section of RE wall is shown in Fig.1. Reinforcement consists of geogrid layers having a design tensile strength of 30 kN/m. Check wedge stability at the 5th layer of reinforcement (5 m from the top surface). The Interface friction angle between soil and reinforcement = 30°. **(Max Marks 10)**

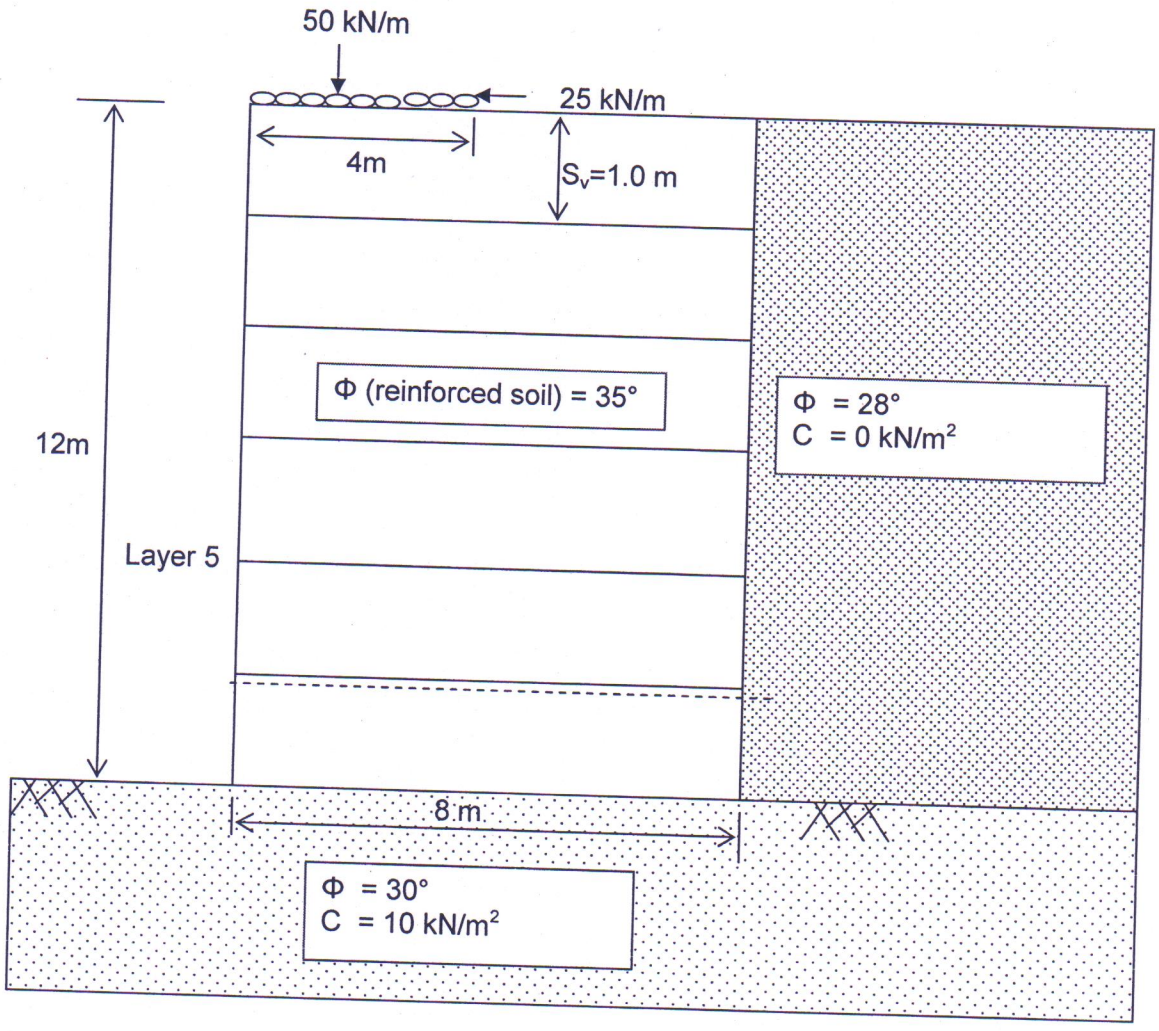


Note : γ = 18 kN/m^3 for all types of the soils present in Fig.1.

Fig.1 RE wall (Fig. Not to the scale)

Q-2: A cross section of RE wall is shown in Fig.2. Reinforcement consists of geogrid layers having a design tensile strength og 30 kN/m. Check wedge stability at the 5th layer of reinforcement (5 m from the top surface). The Interface friction angle between soil and reinforcement = 30°.

(Max Marks 15)

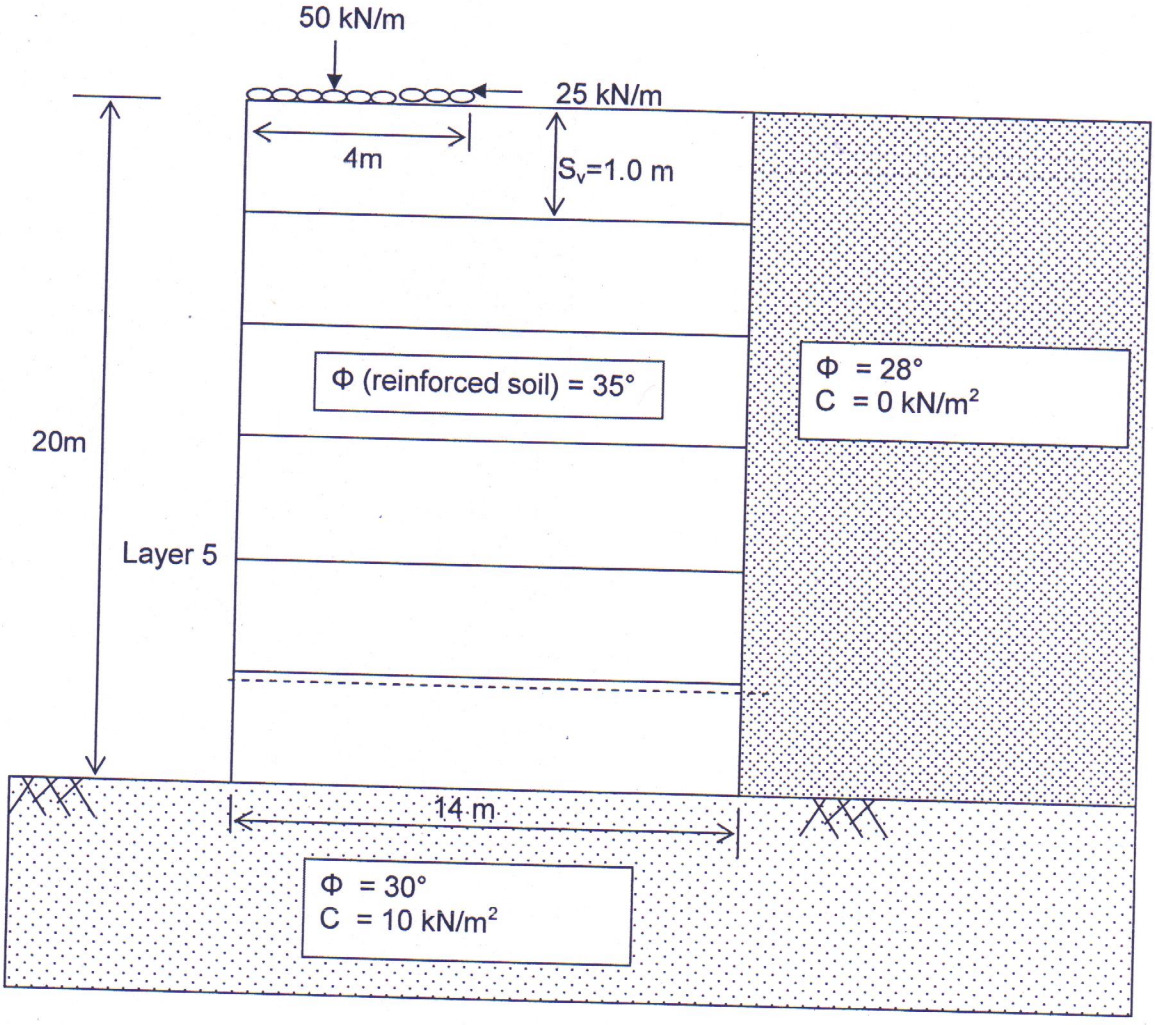


Note : $\gamma = 18$ kN/m^3 for all types of the soils present in Fig.2.

Fig.2 RE wall (Fig. Not to the scale)

Q-3: A cross section of RE wall is as shown in Fig.3. Reinforcement consists of metallic strip layers. The centre to centre spacing of strips in horizontal direction (i.e. along the length) is 0.5 m. The strip is 20 mm wide and 1 mm thick. Neglect the corrosion losses. The allowable tensile strength of strip is 100 N/mm^2. Check the internal stability (in terms of tensile failure and pull out resistance), of the reinforcement at the 5^{th} layer, with respect to **line 2** as defined in the BS code. The Interface friction angle between soil and reinforcement = 20°. **(Max Marks 15)**

Q-5: Discuss the procedure of slope stability analysis of the RE slope. **(Max Marks 10)**



Note : $\gamma = 18\ kN/m^3$ for all types of the soils present in Fig.3.

Fig.3 RE wall (Fig. Not to the scale)

COLLEGE OF ENGINEERING PUNE

(Formerly Government College of Engineering, Pune)

END SEMESTER EXAMINATION, Nov 2011

(CE 505) Finite Element Methods in Geomechanics

Program : First Year M. Tech. (Civil)
Year: 2011-12; Semester I
Duration: 03 hrs (04 PM to 07 PM)

Specialization: Geotechnical Engineering
Date: 25.11.2011
Max. Marks: 50
Weightage – 100%

Instructions:

1. **All questions are compulsory.**
2. **Figures to right indicate full marks.**
3. **Draw neat figures wherever required.**
4. **Mobile phones and Programmable Calculators are not permitted.**

Q 1 A) Explain modulus of subgrade reaction approach applied to the laterally loaded piles. (04)

B) Explain step by step development of stiffness matrix formulation for laterally loaded pile. (06)

Q 2 A) Explain procedure of finite element analysis of a laterally loaded pile. (06)

B) Write note on "p – y curves". (04)

Q3 A) Derive elements of elemental stiffness matrix for a horizontal interface element under plane strain condition. (05)

B) Assemble the overall stiffness matrix for thin cantilever beam of homogeneous material discretized into a total four, 2D, three noded triangular elements. (07)

C) Explain isoparametric elements. (03)

Q4 A) Explain discretization of a body with special reference to (07)

(i) Natural subdivisions of discontinuities.
(ii) Need for refinement of mesh.
(iii) Geometric approximations.
(iv) Notations and its effect on band width.
(v) Very large bodies.
(vi) Infinite bodies.
(vii) Automated mesh generation.

B) Write note on (08)

a) Reducible net and convergence.
b) Element aspect ratio.
c) Mesh refinement versus higher order elements.
d) Jacobian matrix.

----------**Paper Ends**----------

College of Engineering, Pune
End-Semester Exam – November 2011
F.Y. M.Tech (Civil Environment and Water Resources)
EW-501- Surface Hydrological System

Day & Date- Friday 25th November 2011 | Time: - 4.00 to 7.00 pm
Maximum Marks: 100 | Duration – Three hrs.

Instructions

1. Attempt **any five** questions out of six.
2. Each question has A and B; each of which has 10 Marks
3. Assume suitable data if required.
4. Use of scientific calculator is allowed.
5. Draw diagrams where necessary.

Q. 1 (A) A catchment covering an area of 150 sq. km has the following classification: **(10)**

Area Type	Percentage	Runoff Coeff (A)	Runoff Coeff (B)
A:Urban	20 %	0.25	0.30
B:Forest	35%	0.45	0.50
C: Industrial	30%	0.90	0.80
D: Concrete Pavement	15%	0.85	0.90

The average annual rainfall over the entire catchment is 90 cm.
Find the annual runoff (cu. m) from the catchment using the runoff coefficient set A and set B separately.

(B) i). Why statistical methods have to be used in flood analysis?
ii). Why flood forecasting is essential ? **(10)**

Q. 2 (A) The catchment area of an irrigation reservoir is 70 sq. km. The surface area of the reservoir is 2 sq. km. Uniform precipitation over the catchment was100 mm. Irrigation canal carried water from the reservoir at a uniform rate of 1.0 cu m per second in the month of October. The seepage loss is 50 percent of the evaporation loss. Find the daily rate of evaporation (mm/day/sq. m **(10)**

(B) i) What are the causes of flood?
ii) Give a list of flood control measures ? **(10)**

Q. 3 (A) The following table gives the mean monthly inflow in a tank during the year 2005. **(10)**

Month	01	02	03	04	05	06	07	08	09	10	11	12
Mean Flow Cu. m/s	60	45	35	25	15	22	50	80	105	90	80	70

Calculate the monthly cumulative storage.

(B) i) Which weather parameters are measured and reported daily by the IMD?
ii) Which method is used to present a "smoothened" graph for a rapidly time-varying set of data with large fluctuations? **(10)**
iii) Why is runoff less than precipitation?
iv) Which instrument(s) is used to measure the following?
Infiltration, Atmospheric Pressure, Wind speed, River discharge, Evaporation

Q. 4 (A) Draw schematic diagram of Hydrological Cycle.
Show all hydrological processes.
Why is it called a "cycle"?
Show arrows indicating how all the processes are interconnected. **(10)**

(B) Describe the difference between Flood Hydrograph and Unit Hydrograph.
Draw sketches of both.
Write names of segments of flood hydrograph.
Label axes and write units. **(10)**

Q. 5 (A) i) Describe water conservation measures at domestic and state levels.
ii) How basin characteristics affect flood in a river?
iii) What are the forms in which surface water is found? **(10)**

(B) i) Explain the terms Isohytes on land surface and Isovels for river cross-section
Draw sketches, write numbers and units
ii) What are the uses of fresh water?
Why is it essential to conserve fresh water?
iii) What are the causes of surface water pollution and what are the remedial measures? **(10)**

Q. 6 (A) i). What is the significance of Base Flow in River Hydrology?
ii) Draw a sketch showing three methods of base flow separation using plotted hydrograph.
iii) What is the fundamental difference in hydrological data collection technique in the past and present time? **(10)**

i) What are the types of hydrological data essential for planning and construction of a dam?
Write the parameter and against that write how the data are used.
ii) What are the most common reasons for failure of an earth dam?
iii). What is meant by Storm Track and Landfall Point? **(10)**

College of Engineering, Pune.
Department of Mathematics.
Advanced Numerical Methods
End Semester Examination

Time: 3 hours. Marks: 50

Date: 27/11/2011

Instructions:

1. All questions are compulsary.
2. Use separate answer sheets for sections A and B.
3. Figures to the right indicate maximum marks.
4. Use of non-programmable calculators and statistical tables is allowed.

SectionA

(1) a) Express the function $f(x) = 2x^3 + 3x^2 - 5x + 4$ in factorial polynomials and also find its successive differences.

b) Find $\Delta\left[\frac{2^x}{(x+1)!}\right]$. [7]

(2) The following data gives the melting point of an alloy of lead and zinc, where t is the temperature in degree celsius and p is the percentage lead in the alloy.

p %	60	70	80	90
t	226	250	270	304

Find the melting point of alloy containing 84% of lead, using Newton-Gregory backward difference formula. [7]

(3) Find $f'(x)$, $f''(x)$ and $f'''(x)$ of the function tabulated below, at $x = 1.5$

x	1.5	2	2.5	3	3.5	4
f(x)	3.375	7.0	13.625	24.0	38.875	50.0

[7]

OR

(3) The speed, v meters per second, of a car t seconds after it starts, is shown in the following table:

t	0	12	24	36	48	60	72	84	96	108	120
v	0	3.60	10.08	18.90	21.60	18.54	10.26	5.40	4.50	5.40	9.00

Find the total distance covered by the car using Simpson's $\frac{3}{8}$ th rule. [7]

(4) Use Milne's Predictor-Corrector method to find $y(1.4)$. Given that : $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, $y(1.3) = 1.799$ and

$$\frac{dy}{dx} = x^2(1 + y)$$

[7]

OR

(4) Use any method you know, to get the exact solution of the set of following equations

$$4x + y - z = 13$$
$$3x + 5y + 2z = 21$$
$$2x + y + 6z = 24$$

[7]

(5) Solve Poisson's equation

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 8x^2y^2$$

for the sqaure mesh $x = -2$ to 2 and $y = -2$ to 2 taking mesh length $h = 1$ with $u(x, y) = 0$ on the boundary of the mesh. [7]

OR

(5) a) State and prove orthogonality property of Bessel functions $J_n(x)$.

b) Prove Rodrigue's formula

$$P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n}[(x^2 - 1)^n]$$

and express $x^3 + 3x + 2$ in terms of Legendre's polynomial $P_n(x)$. [7]

SectionB

Solve one of the Two Questions

Question 1

A] The task of identifying images in an overhead reconnaissance photograph is imprecise.

You are now ready to design computer software to do image processing to locate objects within a scene. Define two fuzzy sets representing a car and a truck image.

Fuzzy set for Car = 0.5/truck + 0.4/motorcycle + 0.3/boat + 0.9/car + 0.9/house

Fuzzy set for Truck = 1/truck + 0.1/motorcycle + 0.4/boat + 0.4/car + 0.2/house

Find the following:

a) Car ∩ Truck ; b) Car ∪ Truck

Formulation of the expression for writing computer software is needed.

B] Differentiate between Computing With Words and Fuzzy logic

Question 2

In the field of computer networking there is an imprecise relationship between the level of use of a network communication bandwidth and the latency experienced in peer – to – peer communications. Let $\underline{X}$ be a fuzzy set of use levels (in terms of the percentage of full band width used) and $\underline{Y}$ be a fuzzy set of latencies (in milliseconds)

$\underline{X}$ = {0.2 / 10 + 0.5 / 20 +0.8 /40 +1.0 /60 + 0.6 /80 + 0.1 / 100}

$\underline{Y}$ = {0.3/ 0.5 + 0.6 / 1 + 0.9 /1.5 +1.0 /4 + 0.6 / 8 + 0.3 / 20}

Find X x Y

You have been given a second fuzzy set of bandwidth usage -

$\underline{Z}$ = {0.3 /10 + 0.6 /20 + 0.7 /40 + 0.9 / 60 + 1 / 80 + 0.5 / 100}

Find $S = Z_{1*6} \circ R_{6*6}$ using a. Max-min composition b. Max-product composition

a) Using the Hebb rule find the weights required to perform the following classification

(1 1 1 1) and (-1, 1, -1, -1) are member of class (with target value 1)