CBCS Scheme

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15MAT41

Fourth Semester B.E. Degree Examination, June/July 2017
Engineering Mathematics–IV

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer FIVE full questions, choosing one full question from each module.***
2. ***Use of statistical tables are permitted.***

Module-1

1 a. Find by Taylor's series method the value of y at x = 0.1 from $\frac{dy}{dx} = x^2y - 1$, $y(0) = 1$ (upto 4th degree term). **(05 Marks)**

b. The following table gives the solution of $5xy' + y^2 - 2 = 0$. Find the value of y at x = 4.5 using Milne's predictor and corrector formulae. **(05 Marks)**

x	4	4.1	4.2	4.3	4.4
y	1	1.0049	1.0097	1.0143	1.0187

c. Using Euler's modified method. Obtain a solution of the equation $\frac{dy}{dx} = x + |\sqrt{y}|$, with initial conditions y = 1 at x = 0, for the range $0 \le x \le 0.4$ in steps of 0.2. **(06 Marks)**

OR

2 a. Using modified Euler's method find y(20.2) and y(20.4) given that $\frac{dy}{dx} = \log_{10}\left(\frac{x}{y}\right)$ with $y(20) = 5$ taking h = 0.2. **(05 Marks)**

b. Given $\frac{dy}{dx} = x^2(1+y)$ and y(1) = 1, y(1.1) = 1.233, y(1.2) =1.548, y(1.3) = 1.979. Evaluate y(1.4) by Adams-Bashforth method. **(05 Marks)**

c. Using Runge-Kutta method of fourth order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at x = 0.2 by taking h = 0.2 **(06 Marks)**

Module-2

3 a. Obtain the solution of the equation $2\frac{d^2y}{dx^2} = ux + \frac{dy}{dx}$ by computing the value of the dependent variable corresponding to the value 1.4 of the independent variable by applying Milne's method using the following data: **(05 Marks)**

x	1	1.1	1.2	1.3
y	2	2.2156	2.4649	2.7514
y′	2	2.3178	2.6725	3.0657

b. Express $f(x) = 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials. **(05 Marks)**

c. Obtain the series solution of Bessel's differential equation $x^2y'' + xy' + (x^2 + n^2)y = 0$ **(06 Marks)**

OR

4 a. By Runge-Kutta method solve $\frac{d^2y}{dx^2} = x\left(\frac{dy}{dx}\right)^2 - y^2$ for x = 0.2. Correct to four decimal places using the initial conditions y = 1 and $y' = 0$ at x = 0, h = 0.2. **(05 Marks)**

b. Prove that $J_{+\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\sin x$ **(05 Marks)**

c. Prove the Rodrigues formula,

$$\rho_n(x) = \frac{1}{2^n n!}\frac{d^n(x^2-1)^n}{dx^n}$$ **(06 Marks)**

Module-3

5 a. State and prove Cauchy's-Riemann equation in polar form. **(05 Marks)**

b. Discuss the transformation $W = e^z$. **(05 Marks)**

c. Evaluate $\int_C \left\{\frac{\sin(\pi z^2)+\cos(\pi z^2)}{(z-1)^2(z-2)}\right\}dz$

using Cauchy's residue theorem where 'C' is the circle $|z| = 3$ **(06 Marks)**

OR

6 a. Find the analytic function whose real part is, $\frac{\sin 2x}{\cosh 2y - \cos 2x}$. **(05 Marks)**

b. State and prove Cauchy's integral formula. **(05 Marks)**

c. Find the bilinear transformation which maps z = ∞, i, 0 into ω = -1, -i, 1. Also find the fixed points of the transformation. **(06 Marks)**

Module-4

7 a. Find the mean and standard deviation of Poisson distribution. **(05 Marks)**

b. In a test on 2000 electric bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and S.D of 60 hours. Estimate the number of bulbs likely to burn for,

(i) more than 2150 hours.
(ii) less than 1950 hours
(iii) more than 1920 hours and less than 2160 hours.

[A(1.833) = 0.4664, A(1.5) = 0.4332, A(2) = 0.4772] **(05 Marks)**

c. The joint probability distribution of two random variables x and y is as follows:

x/y	-4	2	7
1	1/8	1/4	1/8
5	1/4	1/8	1/8

Determine:

(i) Marginal distribution of x and y.
(ii) Covariance of x and y
(iii) Correlaiton of x and y. **(06 Marks)**

OR

8 a. The probability that a pen manufactured by a factory be defective is $\frac{1}{10}$. If 12 such pens are manufactured what is the probability that, (i) Exactly 2 are defective (ii) at least 2 are defective (iii) none of them are defective. **(05 Marks)**

b. Derive the expressions for mean and variance of binomial distribution. **(05 Marks)**

c. A random variable X take the values -3, -2, -1, 0, 1, 2, 3 such that $P(x = 0) = P(x < 0)$ and $P(x = -3) = P(x = -2) = P(x = -1) = P(x = 1) = P(x = 2) = P(x = 3)$. Find the probability distribution. **(06 Marks)**

Module-5

9 a. In 324 throws of a six faced 'die' an odd number turned up 181 times. Is it reasonable to think that the 'die' is an unbiased one? **(05 Marks)**

b. Two horses A and B were tested according to the time (in seconds) to run a particular race with the following results:

Horse A:	28	30	32	33	33	29	34
Horse B:	29	30	30	24	27	29	

Test whether you can discriminate between the two horses.($t_{0.05}$=2.2 and $t_{0.02}$=2.72 for 11 d.f) **(05 Marks)**

c. Find the unique fixed probability vector for the regular stochastic matrix, $A = \begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$ **(06 Marks)**

OR

10 a. Define the terms: (i) Null hypothesis (ii) Type–I and Type–II error (iii) Confidence limits. **(05 Marks)**

b. Prove that the Markov chain whose t.p.m $P = \begin{bmatrix} 0 & 2/3 & 1/3 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{bmatrix}$ is irreducible. Find the corresponding stationary probability vector. **(05 Marks)**

c. Three boys A, B, C are throwing ball to each other. A always throws the ball to B and B always throws the ball to C. C is just as likely to throw the ball to B as to A. If C was the first person to throw the ball find the probabilities that after three throws (i) A has the ball. (ii) B has the ball. (iii) C has the ball. **(06 Marks)**

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CBCS Scheme

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15CV42

Fourth Semester B.E. Degree Examination, June/July 2017
Analysis of Determinate Structure

Time: 3 hrs. Max. Marks: 80

Note: 1. *Answer FIVE full questions, choosing one full question from each module.*
2. *Assume any missing data, if any.*

Module-1

1 a. Briefly explain different forms of structures. **(03 Marks)**

b. State the assumptions made in the analysis of truss. **(04 Marks)**

c. Find the forces in the numbered members of the loaded truss shown Fig.Q1(c) using method of sections.

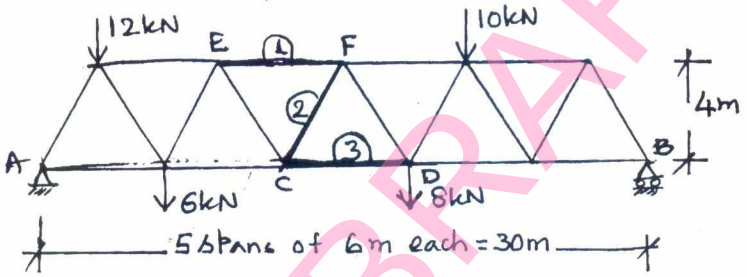

Fig.Q1(c) **(09 Marks)**

OR

2 a. Explain statically determinate and indeterminate structures with examples. **(04 Marks)**

b. Analyze the loaded truss shown in Fig.Q2(b) by method of joints and tabulate the results neatly.

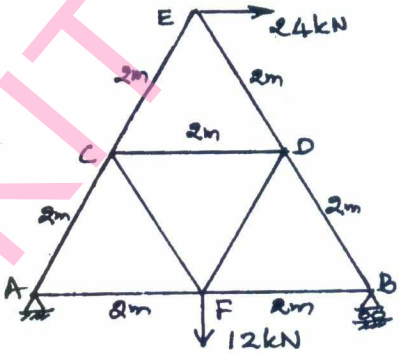

Fig.Q2(b) **(12 Marks)**

Module-2

3 a. Derive the differential equation of deflected curve for the beam. **(04 Marks)**

b. Determine the maximum deflection at the free end of a cantilever beam subjected point load W at free end of span 'L' with constant EI. Use Macaulay's method. **(06 Marks)**

c. Using conjugate beam method, find the deflection at end of a cantilever beam of span 'L' subjected udl of ω/mt run over entire span. EI constant. **(06 Marks)**

OR

4 a. State first and second moment area theorems. **(04 Marks)**

b. Find the ratio of deflection at C and D for the simply supported beam shown in Fig.Q4(b). Take E = 200 GPa, I = 6×10^7 mm^4. Use Macaulay's method.

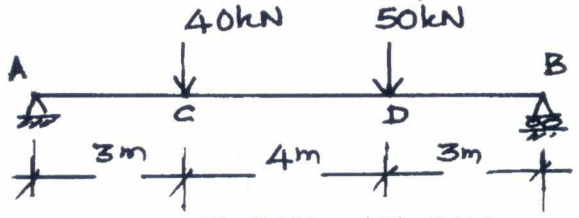

Fig.Q4(b) and Fig.Q4(c) **(05 Marks)**

c. Find the maximum deflection for the simply supported beam loaded as shown in Fig.Q4(c). Use moment-area method. **(07 Marks)**

Module-3

5 a. Derive the expression for the strain energy stored in a beam due to flexure. **(04 Marks)**

b. Find the horizontal and vertical deflection at the free end 'c' of a bent frame loaded as shown in Fig.Q5(b). Using unit load approach. Take EI = 15000 kN-m^2.

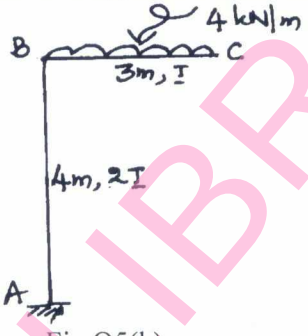

Fig.Q5(b) **(12 Marks)**

OR

6 a. For the truss shown in Fig.Q6(a), determine the vertical deflection at C by strain energy method. Take E = 210 GPa and A = 5×10^4 mm^2.

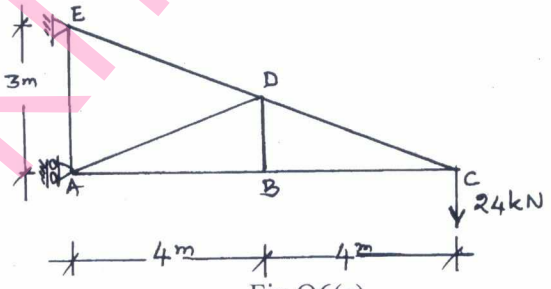

Fig.Q6(a) **(09 Marks)**

b. A cantilever beam is loaded as shown in Fig.Q6(b). Compute the deflection at point C by unit load approach. Take E = 200 GPa, I = 8×10^7 mm^4.

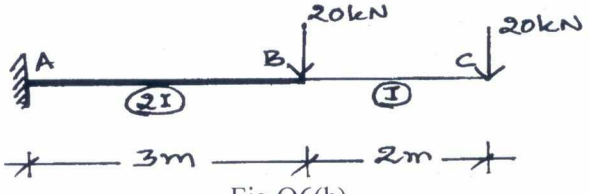

Fig.Q6(b) **(07 Marks)**

Module-4

7 a. A three hinged parabolic arch of span 30 m, rise 5m is subjected to uniformly distributed load of 20 kN/m for left half of the span. Determine support reactions at the springing levels. Also determine normal thrust, radial shear and bending moment at a section 8 m from left support. **(09 Marks)**

b. A suspension cable of span 100 m and slip 10 m carries a udl of 8 kN/m of horizontal span over the entire span. Find the maximum and minimum tension in the cable and where they occur in the cable. Find the length of cable. **(07 Marks)**

OR

8 a. A flexible suspension cable of weight 12 kN/m hangs between two vertical walls 60 mt apart, left being at a point 10 m below the right point. A point load of 200 kN is attached to cable in such a manner that the point of attachment of load is 20 m horizontally from left end wall and 5 m below the left hand support. Find the maximum and minimum tension in the cable. **(08 Marks)**

b. A parabolic arch of span 24 m with a central rise of 4 m is subjected to a point load of 30 kN at 6 m from left support and a udl of 15 kN/m over the right half of the span. Sketch BMD, also find normal thrust and radial shear at 10 m from right support. **(08 Marks)**

Module-5

9 a. What are the uses of influence line diagram? **(03 Marks)**

b. A simply supported beam of span 8m in traversed by a udl of 10 m long with intensity 20 kN/m. Draw the influence line diagram for:

i) Reaction at left support
ii) S.F at 3 mt from left support
iii) BM at 3 mt from left support.

Find the maximum values of above quantities. **(13 Marks)**

OR

10 a. A beam has a span of 20 m. Draw influence line for BM and SF at a section 8m from the left support and determine the maximum BM and SF for this section due to two point loads 80 kN and 40 kN at a fixed distance of 2m apart rolling from left to right with 80 kN load leading. **(06 Marks)**

b. Draw influence line for shear force and bending moment at a section 5 m from left support of a simply supported beam, 25 m long. Hence calculate the maximum SF and BM at this section due to uniformly distributed rolling load of 8m long with intensity 5 kN/m. **(10 Marks)**

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CBCS Scheme

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15CV43

Fourth Semester B.E. Degree Examination, June/July 2017
Applied Hydraulics

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. What is meant by dimensionally homogeneous equation? Explain with an example. **(04 Marks)**

b. Define i) Center of buoyancy ii) Metacenter. How these are used to identify the equilibrium condition of floating bodies? **(06 Marks)**

c. In a 1:30 model of spillway, the velocity and discharge are 1.5m/s and $2m^3/s$. Find the corresponding velocity and discharge in prototype. **(06 Marks)**

OR

2 a. Using Buckingham π-theorem, derive the following relationship

$$R = \rho V^2 D^2 . \phi\left[\frac{\mu}{\rho VD}, \frac{H}{D}\right]$$

Where R = Resistance, ρ = density, V = Velocity of flow, D = diameter, μ = Viscosity, H = hight. **(07 Marks)**

b. Define :
i) Geometric similarity ii) Kinematic similarity and iii) Dynamic similarity. **(06 Marks)**

c. A body of cross-sectional area $2m^2$ and depth 5m has specific gravity 0.8. Determine the depth of immersion of the body. **(03 Marks)**

Module-2

3 a. Derive Chezy's equation for discharge through uniform flow in open channel. **(08 Marks)**

b. A 3m wide rectangular channel carries $2.4m^3/s$ discharge at a depth of 0.7m. Determine:
i) Specific energy at 0.7m depth
ii) Critical depth
iii) Alternate depth to 0.7. **(08 Marks)**

OR

4 a. For the most economical trapezoidal section show that half of top width is equal to side slope length. **(08 Marks)**

b. A rectangular channel 6m wide and 1m depth of water has a bed slope of 1 in 900 and is having n = 0.012. Determine the discharge. What will be the dimensions of the channel for maximum discharge with amount of lining being kept constant? Also compute percentage increase in discharge. **(08 Marks)**

Module-3

5 a. Derive the relationship between conjugate depths in case of hydraulic jump on a horizontal floor. **(08 Marks)**

b. A rectangular channel with bottom width 4m and bed slope 0.0008 has a discharge of $1.5m^3/s$. In a GVF in this channel the depth at a certain section is 0.3m. If n = 0.016, determine the type of profile. **(08 Marks)**

OR

6 a. Explain the classification of surface profiles in an open channel with neat sketches. **(10 Marks)**

b. A rectangular channel 8m wide discharges water with a depth of 0.4m and 6m/s velocity. Find the formation of hydraulic jump and if so, determine jump height and energy loss in meters. **(06 Marks)**

Module-4

7 a. Show that the maximum efficiency of jet striking at the center of a symmetrical single curved vane is $\left(\frac{16}{27}\right)$. vane is semicircular. **(08 Marks)**

b. A Pelton wheel turbine has to be designed for the following :
Data: Power = 6000kW, Net head = 300m, Speed = 550rpm, Jet ratio = 1/10, Overall efficiency = 85%, C_v = 0.98, Speed ratio is 0.46. Determine diameter of runner and jet, discharge and number of jets required. **(08 Marks)**

OR

8 a. Draw a neat sketch of a layout of hydroelectric power plant and explain the functions of each component. Also define different heads. **(08 Marks)**

b. A jet of water moving at 30m/s impinges on a series of curved vanes moving with a velocity of 15m/s. The jet makes an angle of 30° to the direction of motion of vane when entering and leaves at an angle of 120° to the direction of motion of vanes. Draw the velocity triangles at inlet and outlet and find :
i) The vane angle at inlet and outlet
ii) Workdone per N of water
iii) Hydraulic efficiency. **(08 Marks)**

Module-5

9 a. Define :
i) Unit head ii) Unit discharge iii) Unit power **(03 Marks)**

b. Derive the expression for minimum starting speed of a centrifugal pump. **(06 Marks)**

c. A Kaplan turbine runner is to be designed to develop 7350kW power under a head of 5.5m with $\eta_0 = 85\%$. Boss diameter = $\frac{1}{3}$ diameter of runner, speed ratio = 2.1, Flow ratio = 0.7.
Determine :
i) Diameter of runner and boss, ii) Speed. **(07 Marks)**

OR

10 a. Define draft tube. Explain its function. Draw the neat sketches of types of draft tubes. **(06 Marks)**

b. Define: i) Manometric head ii) Static head iii) Suction head iv) Delivery head. **(04 Marks)**

c. A centrifugal pump runs at 1000rpm and delvers water against a head of 15m. The impeller diameter and width at the outlet are 0.3m and 0.05m respectively. The vanes are curved back at 30° $\eta_{man} = 92\%$. Find discharge. **(06 Marks)**

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15CV/CT44

Fourth Semester B.E. Degree Examination, June/July 2017
Concrete Technology

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer FIVE full questions, choosing one full question from each module.***
2. ***Use of IS – 10262 – 2009 is permitted.***

Module-1

1 a. Write the chemical composition of cement. Write the flow chart for dry process. **(08 Marks)**

b. Explain the importance of size, shape and texture of aggregate. **(08 Marks)**

OR

2 a. Explain the role of Admixtures in Concrete Technology. **(08 Marks)**

b. Name any four types of cement. State the properties and applications of any two types of cement. **(08 Marks)**

Module-2

3 a. Define Workability. Explain the factors influencing workability of concrete. **(08 Marks)**

b. Write note on Segregation and Bleeding. **(08 Marks)**

OR

4 a. Why curing is needed to concrete? Explain curing methods. **(08 Marks)**

b. Why compaction is required to concrete? Explain Compaction methods by vibration. **(08 Marks)**

Module-3

5 a. Explain the factors influencing the strength of concrete. **(08 Marks)**

b. Write note on : i) Creep ii) Shrinkage of concrete. **(08 Marks)**

OR

6 a. Explain Maturing concept of concrete. **(08 Marks)**

b. The strength of a sample of fully matured concrete is found to be 40MPa. Find the strength of identical concrete at the age of 7 days when cured at an average temperature during day time at 20^0C and night time at 10^0C. Take A = 32 , B = 54.Use % strength of concrete at maturity = $A + B \log_{10}\left(\frac{\text{maturity}}{1000}\right)$. **(08 Marks)**

Module-4

7 Design a concrete mix for M_{20} grade of concrete with the following design stipulation as per IS 10262 – 2009 guide lines.

a. Grade designation: M20.
b. Type of cement : Ultra Tech PPC.
c. Maximum size of Aggregate [MSA] : 20mm
d. Minimum cement content : 320 kg/m^3.
e. Maximum W/C ratio : 0.55.
f. Workability : 50 – 75mm (slump)

g. Exposure condition : Mild
h. Degree of supervision : Good.
i. Type of Aggregate : Crushed angular aggregate.
j. Max. cement content : 450 kg/m^3.
k. Chemical Admixture : Not recommended.
l. Specific gravity of cement : 3.05.
m. Specific gravity of Coarse Aggregate : 2.68.
n. Specific gravity of Fine Aggregate : 2.66.
o. Water absorption of Coarse Aggregate : 0.85%.
p. Water absorption of Fine Aggregate : 1.15%.
q. Free (surface) moisture of Coarse Aggregate : NIL.
r. Free moisture of Fine Aggregate : NIL.
s. Sieve Analysis of Coarse Aggregate : Conforming to table 2 of IS : 383.
t. Sieve Analysis of Fine Aggregate : Conforming to zone – II of IS : 383. **(16 Marks)**

OR

8 What is meant by concrete mix design? Write the steps involved in the method of mix design (IS -10262 - 2009). **(16 Marks)**

Module-5

9 a. Explain the materials used for self – compacting concrete. **(08 Marks)**
b. State the advantages and disadvantages of RMC. **(08 Marks)**

OR

10 a. Explain the fiber types used in Fiber Reinforced Concrete. **(08 Marks)**
b. State the advantages of Light Weight Concrete. **(08 Marks)**

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CBCS Scheme

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15CV45

Fourth Semester B.E. Degree Examination, June/July 2017

Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

Note: **1.** ***Answer FIVE full questions, choosing one full question from each module.***
2. ***Assume missing data, if any, suitably.***

Module-1

1 a. With the help of phase diagram of sol, define the terms:
i) Void ratio ii) Water content
iii) Degree of saturation iv) Unit weight of soil **(08 Marks)**

b. Following results were obtained from liquid limit test on a clay sample, whose plastic limit is 13% and natural water content is 18%. Determine the following:
i) Liquid limit ii) Flow index iii) Consistency index

Number of blows	5	16	23	42
Water content %	32	27.8	25.5	23.3

(08 Marks)

OR

2 a. Sketch a typical grain-size curve for (i) Well graded soil, (ii) Uniformly graded soil. Calculate uniformity coefficient and coefficient of curvature from the curve. **(04 Marks)**

b. Explain the salient features of I.S. plasticity chart for classification of fine grained soils. **(06 Marks)**

c. A partially saturated sample from a borrow pit has a natural water content of 14% and bulk unit weight of 19 kN/m^3. The specific gravity of solids is 2.70. Determine the void ratio, and degree of saturation. What will be the unit weight of the sample on saturation? **(06 Marks)**

Module-2

3 a. Distinguish between:
i) Primary and secondary valence bonds
ii) Dispersed and flocculent structures
iii) Structure of Kaolinite and Montmorillonite
iv) Isomorphism substitution and base exchange capacity **(10 Marks)**

b. Differentiate between standard and modified proctor tests. **(06 Marks)**

OR

4 a. Explain the factors affecting the degree of compaction. **(04 Marks)**

b. List the differences between compaction and consolidation. **(04 Marks)**

c. In a standard proctor test. Following results were obtained:

Mass of compacted soil in grams	1700	1890	2003	1960
Water content %	7.7	11.5	14.6	19.7

i) Draw the compaction curve showing OMC and maximum dry density.
ii) Determine the void ratio and degree of saturation.
Given, volume of mould = 950 cc and G = 2.65. **(08 Marks)**

Module-3

5 a. Define Darcy's law. Derive an expression to relate discharge velocity and seepage velocity. **(06 Marks)**

b. Explain the following terms:
i) Total stress ii) Neutral stress
iii) Effective stress iv) Quick sand condition **(06 Marks)**

c. An earthen dam is built on a impervious foundation with a horizontal filter under the downstream slope. The horizontal and vertical permeability of the soil material in the dam are respectively 4×10^{-5} m/sec and 1×10^{-5} m/sec. Full reservoir level is 20m above downstream filter. Flow net consists of 4 flow channels and 15 equipotential drops. Estimate the seepage loss per meter length of the dam. **(04 Marks)**

OR

6 a. List the properties and use of flow nets. **(04 Marks)**

b. In a falling head permeameter test, the initial head is 300 m it drops by 1 cm in 3 minutes. How much longer should the test to be continued, if the head is to drop to 180 m? **(04 Marks)**

c. Explain with neat sketch the method of locating the phreatic line in a homogenous earth dam with horizontal filter. **(08 Marks)**

Module-4

7 a. Explain mass-spring analogy of consolidation of soils. **(08 Marks)**

b. In a consolidation test, the void ratio of soil sample decreases from 1.20 to 1.10 when the pressure increases from 160 to 320 kN/m^2. Determine the coefficient of consolidation, if the coefficient of permeability is 8×10^{-7} mm/sec. **(08 Marks)**

OR

8 a. Explain under consolidated, normally consolidated and over consolidated soil. **(06 Marks)**

b. How preconsolidation pressure is determined by Casagrande's method? **(06 Marks)**

c. A soil sample 2 cm thickness take 20 minutes to reach 20% consolidation. Find the time for a clay layer 6 cm thick to reach 40% consolidation. Assume double drainage in both cases. **(04 Marks)**

Module-5

9 a. Briefly explain Mohr-Coulomb's shear strength theory. **(06 Marks)**

b. In a direct shear test on sand, sample failed at a shear strength of 70 kN/m^2 when normal stress was 100 kN/m^2. Determine angle of internal friction. Draw Mohr circle at failure. Mark major and minor principal planes. What are the values of major and minor principal stresses? **(10 Marks)**

OR

10 a. Mention the advantages and disadvantages of direct shear test. **(04 Marks)**

b. Classify shear tests based on drainage conditions. **(03 Marks)**

c. A soil has unconfined compression strength of 120 kN/m^2. In triaxial compression test, specimen of same soil (under similar conditions) when subjected to cell pressure of 40 kN/m^2, failed at an additional stress of 160 kN/m^2. Determine:
i) Shear strength parameters
ii) Angle made by failure plane with axial stress direction in case of triaxial test. **(09 Marks)**

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15CV46

Fourth Semester B.E. Degree Examination, June/July 2017
Advanced Surveying

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1 a. Explain the following along with a neat sketch : **(08 Marks)**
i) Forward tangent ii) Point of curve iii) Deflection angle iv) Apex distance.

b. Two tangents intersect at a chainage of 1190m, the deflection angle 36^0. Compute all the data necessary to set out a curve of radius 300m by deflection angle method. The peg interval is 30m. Tabulate the results. **(08 Marks)**

OR

2 a. A reverse curve is to be set out to connect two parallel railway line 30m apart. The distance between the tangent points is 150m. Both the arcs have the same radius. The curve is set out by method of ordinates from long chord taking a peg interval of 10m. Calculate the necessary data for setting the curve. **(08 Marks)**

b. List the requirements of a transition curve (any four). **(04 Marks)**

c. With a neat sketch, list any four vertical curves. **(04 Marks)**

Module-2

3 a. Mention the points to be considered in the selection of triangular station. **(06 Marks)**

b. Triangulation station B was used in measuring angles and the instrument was necessary to shift to a satellite station S due south of main station B at a distance of 12.2m from it. The line BS bisects the exterior angle A, B, C and the angles ASB and BSC were observed to be 30^0 20' 30" and 29^0 45' 6". When the station B was observed angles CAB and ACB were observed to be 59^0 18' 26" and 60^0 26' 12". The side AC computed to be 4248.5m from the adjacent triangle. Determine the correct value of the angle ABC. **(10 Marks)**

OR

4 a. Explain the three kinds of errors. **(03 Marks)**

b. The observed values of P, Q and R at a station the angles being subjected to the condition that P + Q = R.
P = 30^0 12' 28.2" ; Q = 35^0 48^0 12.6" ; R = 66^0 0' 44.4" **(08 Marks)**
Find the most probable value of P, Q and R.

c. Explain the probability curve. **(05 Marks)**

Module-3

5 a. Define the following terms :
i) Zenith and Nadir ii) Prime vertical iii) Hour angle. **(03 Marks)**

b. Mention the properties of a spherical triangle. **(05 Marks)**

c. Find the shortest distance between two points A & B, given
A latitude – 18^0 24' N longitude 36^0 18 E
B latitude – 68^0 32' N longitude 126^0 34 E. **(08 Marks)**

OR

6 a. Define the following : i) Vertical circle ii) Azimuth iii) Altitude. **(03 Marks)**

b. Explain Ecliptic and Solstices. **(05 Marks)**

c. Find the shortest distance between two places A & B given that the longitudes of A and B are 15^0 0' N and 12^0 6' N and longitudes are 50^0 12' E and 54^0 0' E respectively. **(08 Marks)**

Module-4

7 a. Define the following terminologies :
i) Exposure station ii) Picture plane iii) Perspective centre. **(03 Marks)**

b. Mention the general features of Photographic images. **(07 Marks)**

c. Find the number of photographers (size 250 × 250mm) required to cover over a area of 20km × 16km of the longitudinal overlap is 60% and the side overlap is 30% scale the photograph is 1cm = 150m. **(06 Marks)**

OR

8 a. Derive an expression for relief displacement on a vertical photograph. **(05 Marks)**

b. Explain the procedure for aerial survey. **(05 Marks)**

c. A vertical photograph was taken at a altitude of 1200 meters above mean sea level. Determine the scale of the photograph for a terrain lying at elevations of 80 meters and 300 meters if the focal length of the camera is 15cm. **(06 Marks)**

Module-5

9 a. Mention the advantages of total station and also discuss the working principles of the same. **(08 Marks)**

b. Define Remote sensing. Explain the stages of idealized remote sensing system. **(08 Marks)**

OR

10 a. What is GIS? Enumerate on GIS applications in civil engineering. **(08 Marks)**

b. Explain the basic principles of GPS and its application in surveying. **(08 Marks)**

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CBCS Scheme

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15MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2017
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Find the rank of the matrix :

$$\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$$ by elementary row transformations. **(06 Marks)**

b. Solve the following system of equations by Gauss elimination method :

$2x + y + 4z = 12$
$4x + 11y - z = 33$
$8x - 3y + 2z = 20.$ **(05 Marks)**

c. Find all the eigen values and eigen vector corresponding to largest eigen value of the matrix :

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}.$$ **(05 Marks)**

OR

2 a. Solve the following system of equations by Gauss elimination method :

$x + y + z = 9$
$2x + y - z = 0$
$2x + 5y + 7z = 52.$ **(06 Marks)**

b. Reduce the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ into its echelon form and hence find its rank. **(05 Marks)**

c. Find the inverse of the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ using Cayley – Hamilton theorem. **(05 Marks)**

Module-2

3 a. Solve $(D^2 - 4D + 13)y = \cos 2x$ by the method of undetermined coefficients. **(06 Marks)**

b. Solve $(D^2 + 2D + 1)y = x^2 + 2x$. **(05 Marks)**

c. Solve $(D^2 - 6D + 25)y = \sin x$. **(05 Marks)**

OR

4 a. Solve $(D^2 + 1)y = \tan x$ by the method of variation of parameters. **(06 Marks)**

b. Solve $(D^3 + 8)y = x^4 + 2x + 1$. **(05 Marks)**

c. Solve $(D^2 + 2D + 5)y = e^{-x} \cos 2x$. **(05 Marks)**

Module-3

5 a. Find the Laplace transforms of :

i) $e^{-t}\cos^2 3t$ ii) $\frac{\cos 2t - \cos 3t}{t}$. **(06 Marks)**

b. Find:

i) $L\left[t^{-5/2} + t^{5/2}\right]$ ii) $L[\sin 5t \cdot \cos 2t]$. **(05 Marks)**

c. Find the Laplace transform of the function : $f(t) = E\sin\left(\frac{\pi t}{\omega}\right)$, $0 < t < \omega$, given that $f(t+\omega) = f(t)$. **(05 Marks)**

OR

6 a. Find :

i) $L\left[t^2 \sin t\right]$ ii) $L\left[\frac{\sin 2t}{t}\right]$. **(06 Marks)**

b. Evaluate : $\int_0^\infty \frac{\cos 6t - \cos 4t}{t}\,dt$ using Laplace transform. **(05 Marks)**

c. Express $f(t) = \begin{cases} \sin 2t, & 0 < t < \pi \\ 0, & t > \pi \end{cases}$, in terms of unit step function and hence find L[f(t)]. **(05 Marks)**

Module-4

7 a. Solve the initial value problem $\frac{d^2y}{dx^2} + \frac{5dy}{dx} + 6y = 5e^{2x}$, $y(0) = 2$, $y'(0) = 1$ using Laplace transforms. **(06 Marks)**

b. Find the inverse Laplace transforms : i) $\frac{3(s^2-1)^2}{2s^2}$ ii) $\frac{s+1}{s^2+6s+9}$. **(05 Marks)**

c. Find the inverse Laplace transform : $\log\left[\frac{s^2+4}{s(s+4)(s-4)}\right]$. **(05 Marks)**

OR

8 a. Solve the initial value problem :

$\frac{d^2y}{dt^2} + \frac{4dy}{dt} + 3y = e^{-t}$ with $y(0) = 1 = y'(0)$ using Laplace transforms. **(06 Marks)**

b. Find the inverse Laplace transform : i) $\frac{1}{s\sqrt{5}} + \frac{3}{s^2\sqrt{5}} - \frac{8}{\sqrt{5}}$ ii) $\frac{3s+1}{(s-1)(s^2+1)}$. **(05 Marks)**

c. Find the inverse Laplace transform : $\frac{2s-1}{s^2+4s+29}$. **(05 Marks)**

Module-5

9 a. State and prove Baye's theorem. **(06 Marks)**

b. A can hit a target 3 times in 5 shots, B 2 times in 5 shots and C 3 times in 4 shots. They fire a volley. What is the probability that i) two shots hit ii) atleast two shots hit? **(05 Marks)**

c. Find $P(A)$, $P(B)$ and $P(A \cap \overline{B})$, if A and B are events with $P(A \cup B) = \frac{7}{8}$, $P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{5}{8}$. **(05 Marks)**

OR

10 a. Prove that $P(A \cup B) = P(A) + (B) - P(A \cap B)$, for any two events A and B. **(06 Marks)**

b. Show that the events $\overline{A}$ and $\overline{B}$ are independent, if A and B are independent events. **(05 Marks)**

c. Three machines A, B and C produce respectively 60%, 30%, 10% of the total number of items of a factory. The percentage of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability that the item was produced by machine C. **(05 Marks)**

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