CBCS SCHEME

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15MAT41

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 table can be provided.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Using Taylor's series method find, y(0.1) given that $\frac{dy}{dx} = x - y^2$, y(0) = 1 by considering upto third degree terms. **(05 Marks)**

b. Apply Runge Kutta method of fourth order to find an approximate value of y when x = 0.5 given that $\frac{dy}{dx} = \frac{1}{x+y}$ with $y(0.4) = 1$. Take h = 0.1. **(05 Marks)**

c. Evaluate y(0.4) by Milne's Predictor-Corrector method given that $\frac{dy}{dx} = \frac{y^2(1+x^2)}{2}$ and y(0) = 1, y(0.1) = 1.06, y(0.2) = 1.12, y(0.3) = 1.21. Apply the corrector formula twice. **(06 Marks)**

OR

2 a. Solve by Euler's modified method $\frac{dy}{dx} = \log_e(x+y)$; y(0) = 2 to find y(0.2) with h = 0.2. Carryout two modifications. **(05 Marks)**

b. Using Runge-Kutta method of fourth order find y(0.2) to four decimal places given that $\frac{dy}{dx} = 3x + \frac{y}{2}$; $y(0) = 1$. Take $h = 0.2$. **(05 Marks)**

c. Given $\frac{dy}{dx} = x^2(1+y)$; y(1) =1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979. Evaluate y(1.4) to four decimal places using Adam's-Bashforth predictor corrector method. Apply the corrector formula twice. **(06 Marks)**

Module-2

3 a. Given $\frac{d^2y}{dx^2} = y + x\frac{dy}{dx}$ with y(0) = 1, $y'(0) = 0$. Evaluate y(0.2) using Runge Kutta method of fourth order. Take h = 0.2. **(05 Marks)**

b. With usual notation prove that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\sin x$. **(05 Marks)**

c. Express $f(x) = 2x^3 - x^2 - 3x + 2$ in terms of Legendre polynomial. **(06 Marks)**

OR

4 a. Apply Milnes predictor corrector method to compute y(0.4) given that $\frac{d^2y}{dx^2} = 6y - 3x\frac{dy}{dx}$ and the following values: **(05 Marks)**

x	0	0.1	0.2	0.3
y	1	1.03995	1.138036	1.29865
y′	0.1	0.6955	1.258	1.873

b. State Rodrigue's formula for Legendre polynomials and obtain the expression for $P_4(x)$ from it. **(05 Marks)**

c. If α and β are the two roots of the equation $J_n(x) = 0$ then prove that $\int_0^1 xJ_n(\alpha x)J_n(\beta x)dx = 0$ if $\alpha \neq \beta$. **(06 Marks)**

Module-3

5 a. Derive Cauchy-Riemann equation in Cartesian form. **(05 Marks)**

b. Evaluate using Cauchy's residue theorem, $\int_C \frac{3z^2+z+1}{(z^2-1)(z+3)}dz$ where C is the circle $|z| = 2$. **(05 Marks)**

c. Find the bilinear transformation which maps the points $-1, i, 1$ onto the points 1, i, -1 respectively. **(06 Marks)**

OR

6 a. Find the analytic function, $f(z) = u + iv$ if $v = r^2\cos 2\theta - r\cos\theta + 2$. **(05 Marks)**

b. Evaluate $\int_C \frac{e^{2z}}{(z-1)(z-2)}dz$ where C is the circle $|z| = 3$ using Cauchy integral formula. **(05 Marks)**

c. Discuss the transformation $\omega = e^z$. **(06 Marks)**

Module-4

7 a. Find the constant C such that the function,

$$f(x) = \begin{cases} Cx^2 & \text{for } 0 < x < 3 \\ 0 & \text{Otherwise} \end{cases}$$ is a probability density function.

Also compute $P(1<X<2)$, $P(X \leq 1)$, $P(X>1)$. **(05 Marks)**

b. Out of 800 families with five childrens each, how many families would you expect to have (i) 3 boys (ii) 5 girls (iii) either 2 or 3 boys (iv) at most 2 girls, assume equal probabilities for boys and girls. **(05 Marks)**

c. Given the following joint distribution of the random variables X and Y.

X \ Y	1	3	9
2	$\frac{1}{8}$	$\frac{1}{24}$	$\frac{1}{12}$
4	$\frac{1}{4}$	$\frac{1}{4}$	0
6	$\frac{1}{8}$	$\frac{1}{24}$	$\frac{1}{12}$

Find (i) E(X) (ii) E(Y) (iii) E(XY) (iv) COV(X, Y) (v) ρ(X, Y) **(06 Marks)**

OR

8 a. Obtain the mean and standard deviation of Poisson distribution. **(05 Marks)**

b. In a test on electric bulbs it was found that the life time of bulbs of a particular brand was distributed normally with an average life of 2000 hours and standard deviation of 60 hours. If a firm purchases 2500 bulbs find the number of bulbs that are likely to last for,
(i) More than 2100 hours (ii) Less than 1950 hours (iii) Between 1900 and 2100 hours.
Given that $\phi(1.67) = 0.4525$, $\phi(0.83) = 0.2967$ **(05 Marks)**

c. A fair coin is tossed thrice. The random variables X and Y are defined as follows:
X = 0 or 1 according as head or tail occurs on the first toss.
Y = number of heads
Determine (i) The distribution of X and Y (ii) Joint distribution of X and Y. **(06 Marks)**

Module-5

9 a. In a city A 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant. **(05 Marks)**

b. The nine items of a sample have the following values : 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these differ from the assumed mean 47.5. Apply student's t – distribution at 5% level of significance ($t_{0.05} = 2.31$ for 8 d.f) **(05 Marks)**

c. Find the unique fixed probability vector of the regular stochastic matrix $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ \frac{1}{2} & \frac{1}{2} & 0 \end{bmatrix}$. **(06 Marks)**

OR

10 a. A sample of 100 tyres is taken from a lot. The mean life of tyres is found to be 40,650 kms with a standard deviation of 3260. Can it be considered as a true random sample from a population with mean life of 40,000 kms (use 0.05 level of significance) Establish 99% confidence limits within which the mean life of tyres is expected to lie, (given $Z_{0.05} = 1.96$, $Z_{0.01} = 2.58$) **(05 Marks)**

b. In the experiments of pea breeding the following frequencies of seeds were obtained.

Round and Yellow	Wrinkled and Yellow	Round and Green	Wrinkled and Green	Total
315	101	108	32	556

Theory predicts that the frequencies should be in proportions 9 : 3 : 3 : 1. Examine the correspondence between theory and experiment.
$\left(\chi^2_{0.05} = 7.815 \text{ for } 3 \text{ d.f}\right)$ **(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 is to A. If C was the first person to throw the ball find the probabilities that after the 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, Dec.2019/Jan.2020
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define the degree of static and kinematic indeterminacies with examples. **(06 Marks)**

b. Find the forces in the members PQ, PR and RS of the truss shown in Fig.Q.1(b) using method of section. **(10 Marks)**

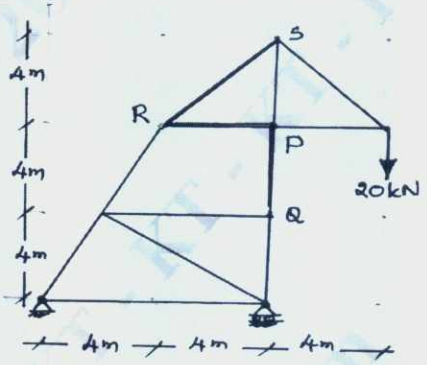

Fig.Q.1(b)

OR

2 a. Determine the Degrees of freedom for the structures shown in Fig.Q.2(a) (i) (ii) and (iii) with and without considering axial deformation. **(06 Marks)**

Fig.Q.2(a)(i)

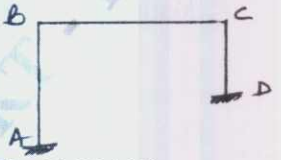

Fig.Q.2(a)(ii)

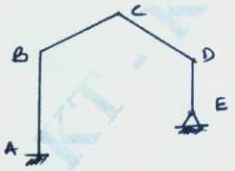

Fig.Q.2(a)(iii)

b. Analyze the truss shown in Fig.Q.2(b) and tabulate the values. **(10 Marks)**

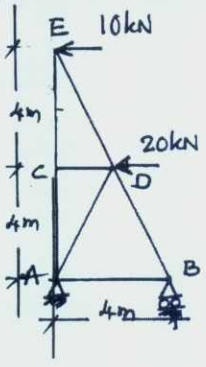

Fig.Q.2(b)

Module-2

3 a. Determine the maximum deflection at the free end of a cantilever beam subjected to udl of w/mt run over its entire span 'L' with constant EI. Use Macaulay's method. **(06 Marks)**

b. For the simply supported beam loaded as shown in Fig.Q.3(b). Find the slope at A and B and deflection at 'E'. Take EI = 4000 kN-m^2. Use moment area method. **(10 Marks)**

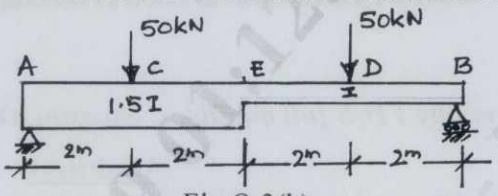

Fig.Q.3(b)

OR

4 a. Derive the differential equation of deflected curve for the beam with usual notations. **(04 Marks)**

b. For the simply supported beam loaded as shown in Fig.Q.4(b). Taking E = 200GPa, I = 7 × 10^{8}mm^4. Find the magnitude and location of Max. deflection in the beam. Use Conjugate Beam Method. **(12 Marks)**

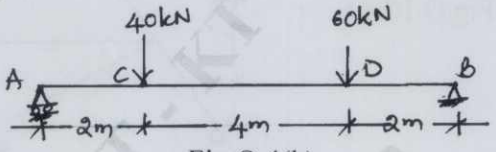

Fig.Q.4(b)

Module-3

5 a. Derive the expression for the strain energy stored in a member due to axial force. **(04 Marks)**

b. Using castigliano's approach find the vertical and horizontal deflection at 'C' of abent loaded as shown in Fig.Q.5(b). Take EI = 15000 kN/m^2. **(12 Marks)**

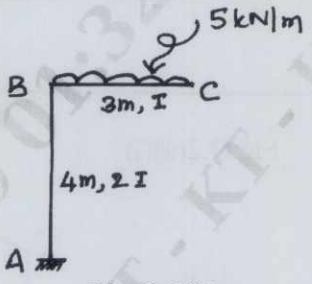

Fig.Q.5(b)

OR

6 a. Determine the horizontal movement at support B of the steel truss loaded as shown in Fig.Q.6(a) by unit load method. Take A = 1000mm^2, E = 200Gpa. **(10 Marks)**

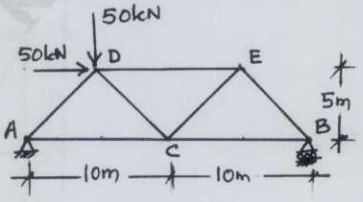

Fig.Q.6(a)

b. Determine the deflection at the mid span of a simply supported beam subjected to a point load 'W' at its mid span using strain energy method. **(06 Marks)**

Module-4

7 a. Show that the bending moment is zero at all sections of a parabolic arch when it is subjected to udl over its entire span. **(06 Marks)**

b. A suspension cable has span of 120m and dips by 10m and carries a load of 10kN/m over its entire span. Find:

i) The length of the cable

ii) Maximum and minimum tension in the cable with its location and direction.

iii) What could be the force transmitted to the supporting tower when the cable passes over a smooth pulley fixed on top of the tower. Assume angle of back stay as 30° to vertical. **(10 Marks)**

OR

8 A three hinged parabolic arch of span 30m has its left and height supports at 12m and 4m below crown point. The arch carries a load of 80kN at distance of 4m to the left of crown C and an udl of 15kN/m between crown and right support. Find the B.M. under the point load, maximum bending moment on the right portion of the arch. Also find normal thrust and radial shear at the point load. **(16 Marks)**

Module-5

9 a. Establish the expression for load position to get maximum bending moment at a section which is at a distance of 'a' from left support 'A' in a simply supported beam AB of span 'L' and traversed by a udl w/mt run which is shorter span. **(06 Marks)**

b. A beam has a span of 20m subjected to two point loads 80kN and 40kN 2m apart rolls from left to right with 40kN load leading. Draw ILD for reaction at B, BM and SF at section 5m from left support, hence find the maximum values of above quantities. **(10 Marks)**

OR

10 a. Wheel loads shown in Fig.Q.10(a) moves from left to right on a S.S. beam of 12m span. Find the absolute maximum BM any where in the beam and also find equivalent udl to be placed over the entire span. **(08 Marks)**

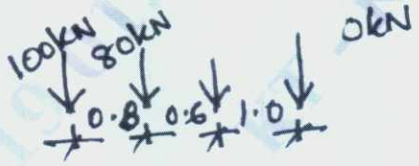

Fig.Q.10(a)

b. Draw the ILD for axial force in member 1 of the truss shown Fig.Q.10(b) and hence find its maximum tensile/ compressive value when a udl of 10kN/m of length traverse from left to right. **(08 Marks)**

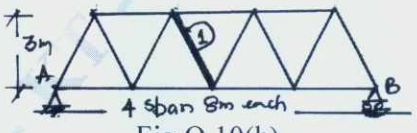

Fig.Q.10(b)

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15CV43

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Applied Hydraulics

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Missing data may be suitably assumed.

Module-1

1 a. Explain dimensional homogeneity with examples. **(05 Marks)**

b. State Buckingham's π-theorem and also describe Buckingham's π-theorem. **(05 Marks)**

c. Find the expression for the power P, developed by a pump when P depends upon the head H, the discharge Q and specific weight 'W' of the fluid. **(06 Marks)**

OR

2 a. What are the types of similarities to be established for complete similarity to exist between the model and its prototype? **(06 Marks)**

b. A 1:64 model is constructed of an open channel in concrete which has Manning's N = 0.014. Find the value of N for the model. **(05 Marks)**

c. Explain the term: Buoyancy, force and centre of Buoyancy and meta centre. **(05 Marks)**

Module-2

3 a. Discuss the various types of flow through channels. **(05 Marks)**

b. Derive Manning's equation for flow through open channel. **(05 Marks)**

c. An earthen channel with a base width 2m and side slope 1 horizontal to 2 vertical carries water with a depth of 1m. The bed slope is 1 in 625. Calculate the discharge if mannings roughness is 0.03. Also calculate the average shear stress at the channel boundary. **(06 Marks)**

OR

4 a. Explain with a neat sketch of specific energy curve. Also derive an expression for critical depth, critical velocity and minimum specific energy. **(10 Marks)**

b. A rectangular channel which is laid on a bottom slope of 0.0064 is to carry 20 m^3/s of water. Determine the width of the channel when the flow is in critical condition. Take Manning's coefficient = 0.015. **(06 Marks)**

Module-3

5 a. Derive an expression for depth of hydraulic jump in terms of upstream Froude number. **(08 Marks)**

b. The depth of flow of water, at a certain section of a rectangular channel of 2m wide, is 0.3m. The discharge through the channel is 1.5m^3/s. Determine whether a hydraulic pump will occur, and if so, find its height and loss of energy per Newton of water. **(08 Marks)**

OR

6 a. Derive GVF equation in the form $\frac{dh}{dx} = \frac{i_b - i_e}{(1 - Fr^2)}$, where $\frac{dh}{dx}$ = slope of free surface, i_b = bed slope, i_e = energy line slope, h = depth of flow and v = velocity of flow. State the assumptions made. **(09 Marks)**

b. Find the free surface slope in a rectangular channel of width 20m, having depth of flow 5m. The discharge through the channels is $50m^3/s$. The longitudinal bed slope is 1 in 4000. Take C = 60. **(07 Marks)**

Module-4

7 a. Derive an expression for force exerted by a jet strikes the moving curved vane at the centre and also work done by the jet. **(09 Marks)**

b. A jet of water of diameter 75mm strikes a curved vane at its centre with a velocity of 20m/s. The curved vane is moving with a velocity of 8m/s in the direction of the jet. The jet is deflected through an angle of 165°. Assume the plate is smooth. Find: i) Force exerted on the plate in the direction of jet, ii) Power of the jet and iii) Efficiency of the jet. **(07 Marks)**

OR

8 a. Explain with a sketch the general layout of a hydro-electric power plant. **(05 Marks)**

b. Discuss the classification of turbines. **(05 Marks)**

c. Determine the power given by the jet of water to the runner of a Pelton wheel which is having tangential velocity as 20m/s. The net head at the turbine is 50m and discharge through the jet of water is $0.03\ m^3/s$. The side clearance angle is 15° and $C_v = 0.98$. **(06 Marks)**

Module-5

9 a. With a neat sketch explain working principle of Kaplan turbine and also mention the main components. **(08 Marks)**

b. A Kaplan turbine develops 24647.60kW power at an average head of 39m. Assuming the speed ratio of 2, flow ratio of 0.6, diameter of the bars equal to 0.35 times the diameter of the runner and an overall efficiency of 90%, calculate the diameter, speed and specific speed of the turbine. **(08 Marks)**

OR

10 a. Obtain an expression for the work done by impeller of a centrifugal pump on water per second per unit weight of water. **(06 Marks)**

b. Define the terms: suction head, delivery head, static head and manometric head. **(04 Marks)**

c. A centrifugal pump is to be discharge $0.118m^3/s$ at a speed of 1450 rpm against head of 25m. The impeller diameter is 250mm, its width at outlet is 50mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. **(06 Marks)**

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CBCS SCHEME

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15CV/CT44

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Concrete Technology

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Any missing data may be suitably assumed.
3. IS-10262 mix design code is allowed.

Module-1

1 a. Explain the importance of conducting the soundness test on cement and the procedure of conducting the soundness test. **(08 Marks)**

b. Explain bulking of aggregates and grading of aggregates. **(08 Marks)**

OR

2 a. Explain the effect of chemical admixtures on fresh and hardened properties of concrete. **(12 Marks)**

b. What are Bogue's compound? Explain. **(04 Marks)**

Module-2

3 a. Explain slump test done to find out workability of concrete. **(08 Marks)**

b. Explain segregation and bleeding of concrete. **(08 Marks)**

OR

4 a. Explain manufacture of concrete in detail. **(12 Marks)**

b. Explain methods of curing of concrete. **(04 Marks)**

Module-3

5 a. Define durability of concrete. Explain how concrete is made durable against
 i) Sulphate attack
 ii) Freezing and Thawing
 iii) Corrosion of steel
 iv) Chloride attack. **(12 Marks)**

b. Explain briefly, rebound hammer test and ultrasonic pulse velocity test. **(04 Marks)**

OR

6 a. Distinguish between:
 i) Creep and shrinkage
 ii) Plastic shrinkage and drying shrinkage **(10 Marks)**

b. Discuss the factors affecting strength of concrete. **(06 Marks)**

Module-4

7 Design a concrete mix for a concrete of M45 grade as per IS10262:2009, with following stipulations.

i) Grade designation = M45
ii) Type of cement OPC 53 conforming to IS12269
iii) Maximum nominal size of aggregate = 20mm
iv) Minimum cement content = 360kg/m^3
v) Maximum water cement ratio = 0.45
vi) Workability = 125mm (slump)
vii) Exposure condition = severe
viii) Method of placing = pumping
ix) Degree of supervision = good
x) Type of aggregate = angular aggregate
xi) Maximum cement content = 450kg/m^3
xii) Chemical admixture = super plasticizer (capable of reducing water content upto 20% max)
xiii) Fine aggregate = conforming to grading zone – I. **(16 Marks)**

OR

8 Design a concrete mix for M20 grade concrete as per IS10262-2009 with following data:

I. Design stipulation:
  i) Maximum size of aggregate (angular) = 20mm
  ii) Degree of workability = 100mm (slump)
  iii) Degree of quality control = Good
  iv) Type of exposure = Mild
II. Test data for materials
  i) Specific gravity of cement = 3.15
  ii) Specific gravity of coarse aggregate = 2.60
  iii) Specific gravity of fine aggregate = 2.60
  iv) Water absorption of coarse aggregate = 0.50%
  v) Water absorption of fine aggregate = 1.0%
  vi) Sieve analysis of fine aggregate = zone-II. **(16 Marks)**

Module-5

9 a. Discuss in detail
  i) Light weight concrete
  ii) Fiber reinforced concrete **(10 Marks)**

b. Explain the properties of fibers used in concrete. **(06 Marks)**

OR

10 a. Explain the test conducted on self compacting concrete. **(10 Marks)**

b. List the advantages and disadvantages of RMC. **(06 Marks)**

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CBCS SCHEME

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15CV45

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define : Void ratio , Porosity , Degree of saturation and Air content. **(04 Marks)**

b. Derive the expression for dry density of soil in the form

$$\gamma_d = \frac{(1-n_a)G.\gamma_w}{1+wG}$$ with usual notations. **(06 Marks)**

c. Define Liquid limit , Relative consistency and Toughness index. **(06 Marks)**

OR

2 a. State Stoke's law. List the assumptions **(04 Marks)**

b. Explain with the help of particle size distribution curves : Well graded soil , Poorly graded soil and Gap graded soil. **(06 Marks)**

c. A fully saturated soil sample has a water content of 35% and specific gravity of 2.65. Determine its porosity , saturated unit weight and dry unit weight. **(06 Marks)**

Module-2

3 a. What are the different types of clay minerals commonly found in soils? Explain any one with their structure. **(06 Marks)**

b. The observations of a standard proctor test are as follows :

Dry density , KN/m^3	16.16	17.06	18.61	18.95	18.78	17.13
Water content , %	5	8.81	11.25	13.05	14.40	19.25

i) Plot the compaction curve and determine OMC and $\gamma_{d\,max}$.

ii) Also compute void ratio and degree of saturation at optimum condition. Take G = 2.77. **(10 Marks)**

OR

4 a. Differentiate between Standard and Modified Proctor's tests. **(04 Marks)**

b. Discuss the effect of compaction on different properties of soil. **(06 Marks)**

c. Explain Electrical diffuse double layer and Adsorbed water. **(06 Marks)**

Module-3

5 a. Differentiate between : i) Seepage velocity and discharge velocity
ii) Coefficient of permeability and coefficient of percolation. **(04 Marks)**

b. Derive an expression for the determination of coefficient of permeability by falling head permeameter. **(06 Marks)**

c. An earthen dam 300m long is built on an impervious foundation with a horizontal filter under the d/s slope. The horizontal and vertical permeability's of the soil are 5×10^{-5} m/sec and 2×10^{-5} m/sec respectively. The full reservoir level is 20m above the downstream filter. The flow net consists of 4 flow channels and 16 equipotential drops. Estimate the seepage loss in litres per day per unit length of the dam. **(06 Marks)**

OR

6 a. What is a Flownet? Briefly explain the characteristics and uses of flownets. **(08 Marks)**

b. A clay structure of thickness 8m is located at a depth of 6m below the ground surface, it is overlayed by fine sand, the water table is located at a depth of 2m below ground surface. For fine sand submerged unit weight is 10.2 kN/m^3. The moist unit weight of sand located above water table is $16kN/m^3$. For clay layer G = 2.76 and w = 25%. Compute the effective stress at the middle of clay layer. **(08 Marks)**

Module-4

7 a. What are Curve fitting methods used in consolidation test? Explain anyone with a neat sketch. **(08 Marks)**

b. A bed of compressible clay, 4m thick has pervious sand at top and an impervious rock at the bottom. In a consolidation test on an undisturbed sample of clay from this deposit, 90% settlement was reached in 4 hours. The sample was 20mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement. **(08 Marks)**

OR

8 a. Differentiate compaction from consolidation. **(04 Marks)**

b. Define the terms : Coefficient of compressibility , Coefficient of consolidation and Compression index. **(06 Marks)**

c. Explain the significance of preconsolidation pressure. Describe Casagrande's method of determining it. **(06 Marks)**

Module-5

9 a. Explain Mohr – Coulomb failure theory. **(04 Marks)**

b. Explain Sensitivity and Thixotropy of clay. **(06 Marks)**

c. A shear vane of 75mm diameter and 110mm length was used to measure the shear strength of a soft clay. If a torque of 600 N-m was required to shear the soil, calculate the shear strength. The vane was then rotated rapidly to cause remoulding of the soil. The torque required in the remoulded state was 200 N-m. Determine the sensitivity of the soil. **(06 Marks)**

OR

10 a. What are the advantages and disadvantages of direct shear test over triaxial test? **(08 Marks)**

b. A direct shear test was carried out on a cohesive soil sample and the following results were obtained :

Normal stress, kN/m^2	150	250
Shear stress at failure kN/m^2	110	120

What would be the deviator stress at failure, if a triaxial test is carried out on the same soil with a cell pressure of $150kN/m^2$. **(08 Marks)**

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CBCS SCHEME

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15CV46

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Advanced Surveying

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define the following terms with a neat sketch
i) Back Tangent ii) Point of Tangency iii) Compound curve iv) Transition curve. **(08 Marks)**

b. Two tangents AB and BC interact at point B at chainage 150.50m. Calculate all the necessary data for setting out a circular curve of radius 100m and deflection angle of 30° by the method of offsets from the longchord. **(08 Marks)**

OR

2 a. Explain the linear method of setting out simple curve by the method of taking offsets from chord produced. **(08 Marks)**

b. Explain condition of an ideal transition curve. **(04 Marks)**

c. Calculate the length of transition curve required in order to attain a maximum super elevation of 15cm. Assuming a rate of super elevation of 3cm/s and speed of vehicle 50km/h. **(04 Marks)**

Module-2

3 a. Explain briefly the various types of signals. **(08 Marks)**

b. Write short notes on the following :
i) Field checks in triangulation
ii) Indivisibility of stations. **(08 Marks)**

OR

4 a. Define the following terms :
i) Systematic error ii) Conditioned quantity iii) Residual error iv) Weight. **(04 Marks)**

b. Explain principle of least squares **(04 Marks)**

c. Explain laws of accidental errors. **(08 Marks)**

Module-3

5 a. Define the following terms :
i) The celestial Horizon ii) Hour angle
iii) The Right Ascension iv) The Ecliptic. **(04 Marks)**

b. Explain the Horizon system. **(04 Marks)**

c. Calculate the distance is kilometers between two points A and B along the parallel of Latitude, given that
(i) Latitude of A 28°42′ N ; longitude of A 31°12′ W
Latitude of B 28°42′ N ; longitude of B 47°24′ W
(ii) Latitude of A 12°36′S ; longitude of A 115°6′ W
Latitude of B 12°36′S ; longitude of B 150°24′ E **(08 Marks)**

OR

6 a. Explain Dependent Educational system. **(04 Marks)**

b. Explain with a neat sketch zones of the Earth. **(04 Marks)**

c. Calculate the Sun's azimuth and hour angle at sunset at a place in latitude 42°30′ N, when its declination is 22°12′ N **(08 Marks)**

Module-4

7 a. Define the following terms :
i) Camera axis ii) Nodart point iii) Print iv) Film base. **(04 Marks)**

b. Explain camera position by Resection. **(04 Marks)**

c. Three point A, B and C were photographed and their coordinates with respect to the lines joining the collimation marks on the photograph are :

Point	X	Y
a	−35.52mm	+21.43mm
b	−8.48mm	−16.38 mm
c	+48.26mm	+36.72 mm

The focal length of the lens is 120.80mm determine the azimuths of the lines OB and OC if that of OA is 354°30′. The axis of the camera was level at the time of the exposure at the station O. **(08 Marks)**

OR

8 a. Define the following terms :
i) Tilted photograph ii) Flight line iii) Ground nadir point iv) Isocentre. **(04 Marks)**

b. Explain scale of a vertical photograph. **(04 Marks)**

c. Two point A and B having elevations of 500m and 300m respectively above datum appear on the vertical photograph having focal length of 20cm and flying altitude of 2500m above datum. Their corrected photographic co-ordinates are as follows :

Point	Photographic Co-ordinate	
	X(cm)	Y(cm)
a	+2.65	+1.36
b	−1.92	+3.65

Determine the length of the ground AB. **(08 Marks)**

Module-5

9 a. Explain Electromagnetic energy. **(04 Marks)**

b. Explain Energy interaction with earth surface features. **(04 Marks)**

c. Explain Applications of Remote sensing. **(08 Marks)**

OR

10 a. Explain components GIS. **(08 Marks)**

b. Explain the applications of total station. **(04 Marks)**

c. Give a brief description of GPS. **(04 Marks)**

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CBCS SCHEME

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15MATDIP41

Fourth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 by
$A = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$ by applying elementary row transformations. **(06 Marks)**

b. Find the inverse of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ using Caylery-Hamilton theorem. **(05 Marks)**

c. Solve the following system of equations by Gauss elimination method.
$2x + y + 4z = 12$, $4x + 11 - z = 33$, $8x - 3y + 2z = 20$ **(05 Marks)**

OR

2 a. Find the rank of the matrix $\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ by reducing it to echelon form. **(06 Marks)**

b. Find the eigen values of $A = \begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$ **(05 Marks)**

c. Solve by Gauss elimination method: $x + y + z = 9$, $x - 2y + 3z = 8$, $2x + y - z = 3$ **(05 Marks)**

Module-2

3 a. Solve $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = 0$ **(05 Marks)**

b. Solve $y'' - 4y' + 13y = \cos 2x$ **(05 Marks)**

c. Solve by the method of undetermined coefficients $y'' + 3y' + 2y = 12x^2$ **(06 Marks)**

OR

4 a. Solve $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^x$ **(05 Marks)**

b. Solve $y'' + 4y' - 12y = e^{2x} - 3\sin 2x$ **(05 Marks)**

c Solve by the method of variation of parameter $\frac{d^2y}{dx^2} + y = \tan x$ **(06 Marks)**

Module-3

5 a. Find the Laplace transform of
i) $e^{-2t} \sin h\, 4t$ ii) $e^{-2t}(2\cos 5t - \sin 5t)$ **(06 Marks)**

b. Find the Laplace transform of $f(t) = t^2$ $0 < t < 2$ and $f(t + 2) = f(t)$ for $t > 2$. **(05 Marks)**

c. Express $f(t) = \begin{cases} t & 0 < t < 4 \\ 5 & t > 4 \end{cases}$ interms of unit step function and hence find L[f(t)]. **(05 Marks)**

OR

6 a. Find the Laplace transform of i) t cosat ii) $\dfrac{\cos at - \cos bt}{t}$ **(06 Marks)**

b. Given $f(t) = \begin{cases} E & 0 < t < a/2 \\ -E & a/2 < t < a \end{cases}$ where f(t + a) = f(t). Show that $L[f(t)] = \dfrac{E}{S}\tanh\left(\dfrac{as}{4}\right)$. **(05 Marks)**

c. Express $f(t) = \begin{cases} 1 & 0 < t < 1 \\ t & 1 < t \le 2 \\ t^2 & t > 2 \end{cases}$ interms of unit step function and hence find L[f(t)]. **(05 Marks)**

Module-4

7 a. Find the inverse Laplace transform of i) $\dfrac{2s-1}{s^2+4s+29}$ ii) $\dfrac{s+2}{s^2+36} + \dfrac{4s-1}{s^2+25}$ **(06 Marks)**

b. Find the inverse Laplace transform of $\log\sqrt{\dfrac{s^2+1}{s^2+4}}$ **(05 Marks)**

c. Solve by using Laplace transforms $y'' + 4y' + 4y = e^{-t}$, given that y(0) = 0, y′(0) = 0. **(05 Marks)**

OR

8 a. Find the inverse Laplace transform of $\dfrac{1}{(s+1)(s+2)(s+3)}$. **(06 Marks)**

b. Find the inverse Laplace transform of $\cot^{-1}\left(\dfrac{s+a}{b}\right)$. **(05 Marks)**

c. Using Laplace transforms solve the differential equation $y''' + 2y'' - y' - 2y = 0$ given y(0) = y′(0) = 0 and y″(0) = 6. **(05 Marks)**

Module-5

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

b. The 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)**

c. The probability that a team wins a match is 3/5. If this team play 3 matches in a tournament, what is the probability that i) win all the matches ii) lose all the matches. **(05 Marks)**

OR

10 a. If A and B are any two events of S, which are not mutually exclusive then $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. **(06 Marks)**

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

c. The probability that a person A solves the problem is 1/3, that of B is 1/2 and that of C is 3/5. If the problem is simultaneously assigned to all of them what is the probability that the problem is solved? **(05 Marks)**

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