CBCS SCHEME

USN | | | | | | | | | | |

15MAT41

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Mathematics – IV

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Using Taylor's series method solve $\frac{dy}{dx} = x^2 + y^2$ with y(0) = 1 and hence find y(0.1) and consider upto 3rd degree. **(06 Marks)**

b. Using modified Euler's method solve $\frac{dy}{dx} = 1 + \frac{y}{x}$ with y(1) = 2 then find y(1.2) in two steps. **(05 Marks)**

c. Given $\frac{dy}{dx} = \frac{x+y}{2}$, give that y(0) = 2, y(0.5) = 2.636, y(1) = 3.595 and y(1.5) = 4.968 then find value of y at x = 2 using Milne's predictor and corrector formulae. **(05 Marks)**

OR

2 a. Using modified Euler's method solve $\frac{dy}{dx} = x + \sqrt{y}$, with y(0) = 1 then find y(0.2) with h = 0.2. **(06 Marks)**

b. Solve $\frac{dy}{dx} = \frac{y-x}{y+x}$, with y(0) = 1 and hence find y(0.1) by taking one steps using Runge-Kutta method of fourth order. **(05 Marks)**

c. Given $\frac{dy}{dx} = \frac{(1+x^2)y^2}{2}$, given that y(0) = 1, y(0.1) = 1.06. y(0.2) = 1.12 and y(0.3) = 1.21 then evaluate y(0.4) using Adam's – Bash forth method. **(05 Marks)**

Module-2

3 a. Given $\frac{d^2y}{dx^2} = \frac{2dy}{dx} - y$, y(0) = 1, y'(0) = 2, evaluate y(0.1) and y'(0.1) using Runge-Kutta method of fourth order. **(06 Marks)**

b. Solve the Bessel's differential equation : $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$ leading to $J_n(x)$. **(05 Marks)**

c. Express $x^3 + 2x^2 - 4x + 5$ in terms of Legendre polynomials. **(05 Marks)**

OR

4 a. Using Milne's method. obtain an approximate solution at the point x = 0.8 of the problem $\frac{d^2y}{dx^2} = 1 - 2y\frac{dy}{dx}$ using the following data :

x	0	0.2	0.4	0.6
y	0	0.02	0.0795	0.1762
y'	0	0.1996	0.3937	0.5689

(06 Marks)

b. If α and β are two distinct roots of $J_n(x) = 0$ then P-T $\int_0^1 x\, J_n(\alpha x)\, J_n(\beta x)\, dx = \{0$ if $\alpha \neq \beta$. **(05 Marks)**

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

Module-3

5 a. State and prove Cauchy-Riemann equation in Cartesian form. **(06 Marks)**

b. Find analytic function f(z) whose imaginary part is $v = \left(r - \frac{1}{r}\right)\sin\theta$. **(05 Marks)**

c. Discuss the transformation of $\omega = e^z$. **(05 Marks)**

OR

6 a. State and prove Cauchy's integral formula. **(06 Marks)**

b. Emulate $\oint_c \frac{e^{2z}}{(z+1)(z-2)} dz$ where c is $|z| = 3$ using Cauchy's residue theorem. **(05 Marks)**

c. Find the bilinear transformation which maps z = –1, 0, 1 into ω = 0, i, 3i. **(05 Marks)**

Module-4

7 a. Derive mean and variance of the binomial distribution. **(06 Marks)**

b. A random variable x has the following probability mass function.

x	0	1	2	3	4	5
P(x)	k	3k	5k	7k	9k	11k

i) find k ii) find $p(x < 3)$ iii) find $p(3 < x \leq 5)$. **(05 Marks)**

c. The joint distribution of two random variable x and y as follows :

x \ y	–4	2	7
1	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$
5	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$

Compute : i) E(x) and E(y) ii) E(xy) iii) cov(xy). **(05 Marks)**

OR

8 a. 2% of the fuses manufactured by a firm are found defective. Find the probability that a box containing 200 fuses contains. i) no defective fuses ii) 3 or more defective fuses. **(06 Marks)**

b. In a test on 2000 electric bulbs. It was found that the life of a particular brand was distributed normally with an average life of 2040 hours and S.D 60 hours. Estimate the number of bulbs likely to burn ($P(0 < z < 1.83) = 0.4664$ $P(1.33) = 0.4082$, $P(2) = 0.4772$) i) more than 2150 ii) less than 1960 iii) more than 1920 but less than 2160 hours. **(05 Marks)**

c. The joint probability distribution of two random variable X and Y given by the following table:

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 marginal distribution of X and Y and evaluate cov(XY). **(05 Marks)**

Module-5

9 a. Define: i) Null hypothesis ii) significance level iii) Type–I and Type–II error. **(06 Marks)**

b. Ten individual are chosen at random from a population and their height in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. Test the hypothesis that mean height of the universe is 66 inches. Given that ($t_{0.05} = 2.262$ for 9d.f) **(05 Marks)**

c. Find the unique fixed probability vector for the regular stochastic matrix :

$$A = \begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{bmatrix}.$$ **(05 Marks)**

OR

10 a. A coin is tossed 1000 times and head turns up 540 times. Decide on the hypothesis that the coin is unbiased. **(06 Marks)**

b. Four coins are tossed 100 times and following results were obtained :

No. of heads	0	1	2	3	4
Frequency	5	29	36	25	5

Fit a binomial distribution for the data and test the goodness of fit $\left(\chi^2_{0.05} = 9.49\right)$. **(05 Marks)**

c. A student's study habit are as follows. If he studies one night, he is 70% sure not to study the next night. On the other hand if he does not study one night he is 60% sure not to study the next night. In the long run how often does he study? **(05 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV42

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Explain briefly about different types of structural forms with the aid of neat sketches. **(06 Marks)**

b. What is linear and non-linear structural system? **(03 Marks)**

c. Analyse the pin jointed plane truss as shown in Fig.Q1(c) by method of joints and hence tabulate the member forces. **(07 Marks)**

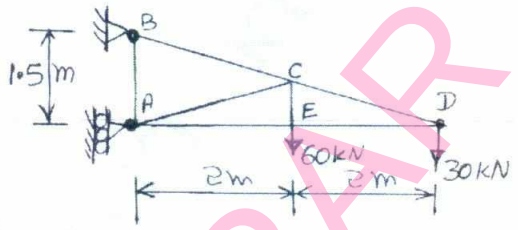

Fig.Q1(c)

OR

2 a. Explain briefly the following :
i) Conditions of equilibrium
ii) Determinate and indeterminate structures
iii) Degree of freedom. **(06 Marks)**

b. List the assumptions made in the analysis of pin jointed plane truss. **(03 Marks)**

c. Determine the force in the members CD, DF, EF and CF for the pin jointed plane truss as shown in Fig.Q2(c) by the method of sections. **(07 Marks)**

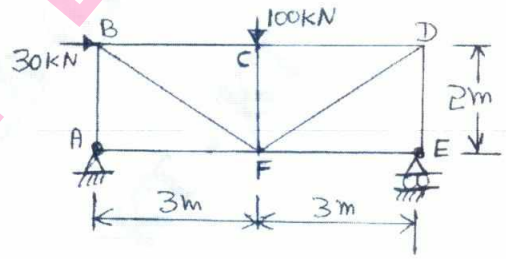

Fig.Q2(c)

Module-2

3 a. Derive the second order differential expression $EI\frac{d^2y}{dx^2} = m$ with usual notations. **(06 Marks)**

b. Calculate the deflection at point C and slope at point A for the beam loaded as shown in Fig.Q3(b) by moment area method. **(07 Marks)**

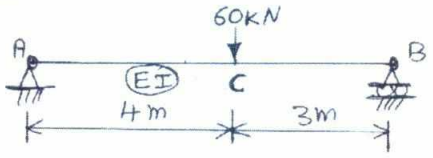

Fig.Q3(b)

c. State the moment area theorems. **(03 Marks)**

OR

4 a. Calculate the deflections at points C and D and maximum deflection and its location for the beam as shown in Fig.Q4(a) by Machaulay's method. Take value of EI = 17000 kN-m^2. **(09 Marks)**

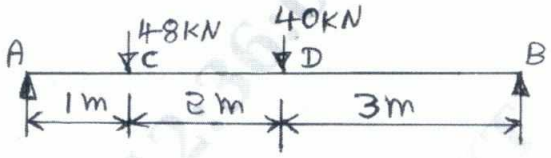

Fig.Q4(a)

b. Calculate the maximum deflection and slope in the beam loaded as shown in Fig.Q4(b) by conjugate beam method. **(07 Marks)**

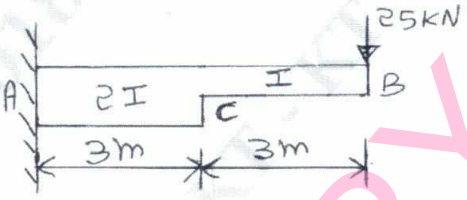

Fig.Q4(b)

Module-3

5 a. Derive the expression for strain energy stored in an prismatic element subjected to pure bending moment. **(05 Marks)**

b. Explain briefly what is complimentary strain energy. **(02 Marks)**

c. Determine the vertical and horizontal deflection point C for the mill bent as shown in Fig.Q5(c) by unit load method. **(09 Marks)**

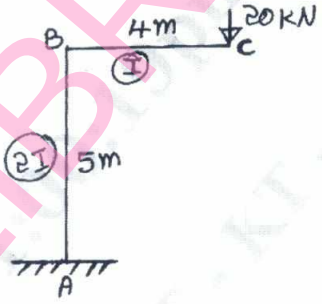

Fig.Q5(c)

OR

6 a. State Castigliano's theorems I and II. **(03 Marks)**

b. Determine the vertical deflection at point C for the pin jointed plane truss as show in Fig.Q6(b) by strain energy method. Cross section are of each member is 5000mm^2 and E = 2 × 10^5 N/mm^2. **(07 Marks)**

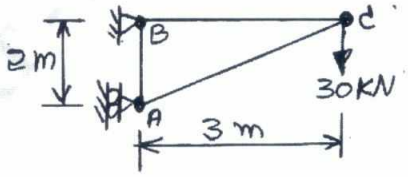

Fig.Q6(b)

c. Determine the deflection at point C for the beam loaded as shown in Fig.Q6(c) by unit load method. **(06 Marks)**

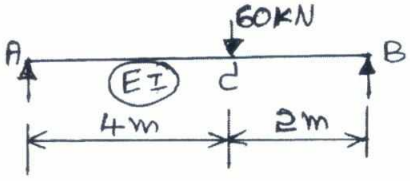

Fig.Q6(C)

Module-4

7 a. A three hinged parabolic arch is having a span of 36m. It is subjected to uniformly distributed load of intensity 30kN/m from left support hinge to crown hinge. Determine the normal thrust, radial shear and bending moment at quarter span point located from left support. **(08 Marks)**

b. A cable is suspended from two points 'A' and 'B' which are 80m apart. 'A' is positioned 5m below 'B'. The lowest point on the cable is 10m below point 'A'. The cable supports a uniformly distributed load of intensity 20kN/m over the entire span. Calculate reaction at supports and maximum tension in the cable. **(08 Marks)**

OR

8 a. Calculate the support reactions, normal thrust and radial shear at point 'D' for a three hinged parabolic arch as shown in Fig.Q8(a). **(08 Marks)**

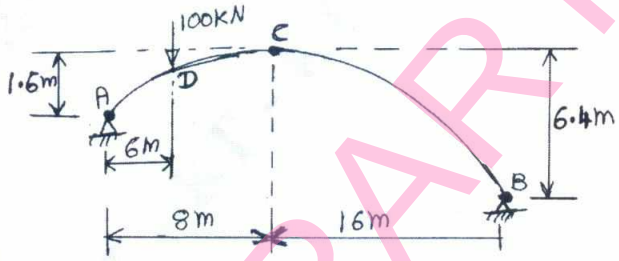

Fig.Q8(a)

b. A three hinged stiffening girder of suspension bridge of span 120m is subjected to two point loads of 480 kN and 600 kN at distances of 25m and 80m from the left support respectively. The dip of the cable is 12m. Calculate maximum tension in the cable and shear force, bending moment values for the stiffening girder at 40m from the left support. **(08 Marks)**

Module-5

9 a. Determine the shear force at a section located 3m from left support by constructing influence line diagram for the beam with loading as shown in the Fig.Q9(a). **(07 Marks)**

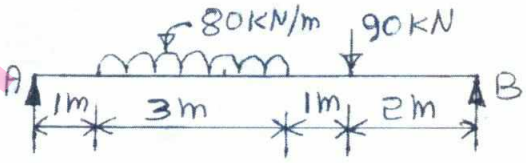

Fig.Q9(a)

b. A system of wheel loads move from left end to right end as shown in Fig.Q9(b) on a beam simply supported and having a span of 10m. Calculate the maximum bending moment which can occur at a section located 4.0m from the left end. **(07 Marks)**

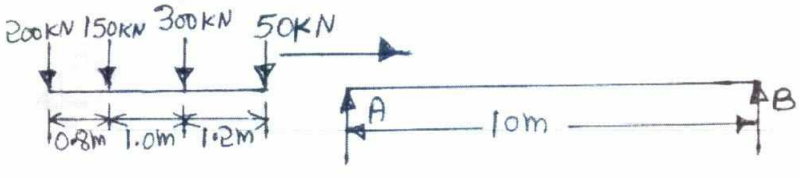

Fig.Q9(b)

c. Explain briefly what is influence line diagram. **(02 Marks)**

OR

10 a. Determine the influence line diagrams for the forces in the members U_1U_2, U_2U_3, L_2L_3, U_2L_2 and U_2L_3 for the part truss as shown in Fig.10(a). **(10 Marks)**

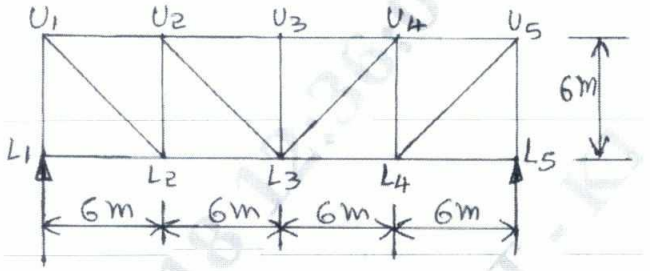

Fig.Q10(a)

b. A moving load travels from left to right on a girder of span 10m as shown in Fig.Q10(b). Determine the absolute maximum benign moment acting in the girder. **(06 Marks)**

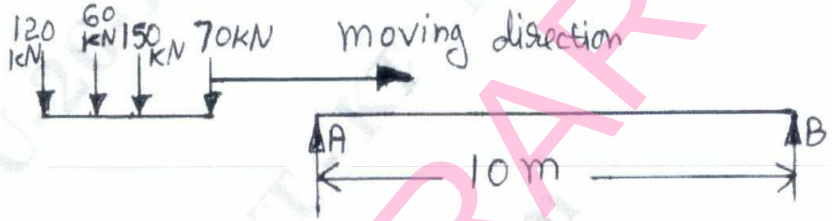

Fig.Q10(b)

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV43

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. State and prove the Buckingham's π – Theorem. Why this theorem is considered superior over the Rayleigh's method. **(08 Marks)**

b. The discharge though a water is $1.5m^3/s$ find the discharge though the model of the weir if the horizontal dimension of the model is $\frac{1}{50}$ the horizontal dimension of the protype and vertical dimension of the model is $\frac{1}{10}$ the vertical dimension of the prototype. **(08 Marks)**

OR

2 a. Derive an expression for the Reynolds's number Froude number's **(08 Marks)**

b. A rectangular pontoon is 5m long 3m wide and 1.20m high. The depth of immersion of the pontoon is 0.80m in sea water. If the centre of gravity is 0.6m above the bottom of the pontoon, determine the meta centric height. The density for sea water is $1025 kg/m^3$. **(08 Marks)**

Module-2

3 a. Derive an expression for the most economical trapezoidal section. **(08 Marks)**

b. The discharge of water through a rectangular channel of width 8m is $15m^3/s$ when the depth of flow of water is 1.2m, calculate
(i) Specific energy of the flowing water
(ii) Critical depth and critical velocity
(iii) Value of minimum specific energy. **(08 Marks)**

OR

4 a. What is specific energy curve? Draw it and derive expressions for critical depth and critical velocity. **(08 Marks)**

b. A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the slopes of the bed is 1 in 1500. The area of the section is $40m^2$. Find the dimensions of the section. If it is most economical. Determine the discharge of the most economical section if c = 50. **(08 Marks)**

Module-3

5 a. Explain the term standing wave. Derive an expression for the depth of standing wave in terms of the u/s Fronde number. **(08 Marks)**

b. Find the slope of the free water surface in a rectangular channel of width 20m having depth of flow 5m. The discharge through the channel is $50m^3/s$. the bed of the channel is having a slope of 1 in 4000. Take the value of Chezy's constant c = 60. **(08 Marks)**

OR

6 a. Explain Back water curve and Afflux. **(04 Marks)**

b. A sluice gate discharge water in to a horizontal rectangular channel with a velocity of 6m/s and a depth of flow is 0.4m. the width of the channel is 8m. Determine whether a hydraulic jump will occur and if so, find its height and loss of energy per kg of water. Also determine the power lost in the hydraulic jump. **(12 Marks)**

Module-4

7 a. Derive an expression for the impulse momentum equation. **(08 Marks)**

b. A Pelton wheel is working with a gross head of 500m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is $2.0m^3/s$. The angle of deflection of the jet is 165°. Determine the power given by the water to the runner and also hydraulic efficiency of the Pelton wheel. Take speed ratio = 0.45 and $C_v = 1.0$. **(08 Marks)**

OR

8 a. Obtain an expression for the work done per second by water on the runner of a pelton wheel. Hence derive an expression for maximum efficiency of the pelton wheel. **(08 Marks)**

b. A jet of water of diameter 50mm, having a velocity of 20m/s strikes a curved vane which is moving with a velocity of 10m/s in the direction of the jet. The jet leaves the vane at an angle of 60° to the direction of motion of vane at out let. Determine :

i) The force exerted by the jet on the vane in the direction of motion

ii) Work done per second by the jet. **(08 Marks)**

Module-5

9 a. By means of a neat sketch, explain the Francis Turbine. **(08 Marks)**

b. Find the power required to derive a centrifugal pump which delivers $0.04m^3/s$ of water to a height of 20m through a 15cm diameter pipe and 100m long. The overall efficiency of the pump is 70% and coefficient of friction f = 0.15 in the formula $h_f = \frac{4flv^2}{2gd}$ **(08 Marks)**

OR

10 a. Define specific speed of a centrifugal pump. Derive on expression for the specific speed. **(08 Marks)**

b. The following data is given for a Francis Turbine, Net head H = 60m speed, N = 700rpm ; shaft power = 294.3kW ; $\eta_0 = 84\%$, $\eta_4 = 93\%$ flow ratio = 0.20 ; breadth ratio n = 0.1 ; outer diameter of the runner = 2 × inner diameter of runner. The thickness of vanes occupy 5% of circumferential area of the runner, velocity of flow is constant at inlet and outlet and discharge is radial at outlet. Determine :

i) Guide blade angle

ii) Runner vane angles at inlet and outlet

iii) Diameters of runner at inlet and outlet

iv) Width of wheel at inlet. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV/CT44

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. Briefly explain the manufacturing of cement by dry process using flow chart. **(08 Marks)**

b. What are Bogue's compounds? Briefly explain their contribution towards gaining of strength of cement. **(08 Marks)**

OR

2 a. List the types of cement and briefly explain the properties and application of any four types of cement. **(08 Marks)**

b. What are admixtures, classify them and briefly explain their role in concrete technology? **(08 Marks)**

Module-2

3 a. Define workability and briefly explain the factors influencing workability of concrete. **(08 Marks)**

b. What are the effect of segregation and bleeding on the property of hardened concrete? **(08 Marks)**

OR

4 a. Explain the process of hydration of cement, its significance and the chemical reactions involved. **(08 Marks)**

b. Enumerate the need of compaction in concreting and list the methods of compaction. **(08 Marks)**

Module-3

5 a. List the factors that affect the strength of hardened concrete and explain briefly any two of them. **(08 Marks)**

b. Define:
i) Elastic stain in concrete
ii) Elastic modulus
iii) Creep
iv) Shrinkage. **(08 Marks)**

OR

6 a. What is maturity of concrete and briefly explain its significance in the gaining of strength of concrete? **(08 Marks)**

b. List the tests that can be conducted on hardened concrete to check its strength and explain any one of them. **(08 Marks)**

Module-4

7 Design a concrete Mix for M_{xx} grade of concrete as per IS 10262-2009 with following data:

i) Design stipulations

- Characteristic compressive strength required in field at 28 days - 20 MPa
- Max size of aggregate (angular) - 20mm
- Degree of workability - 0.9 compaction factor
- Degree of quality control - Good
- Type of exposure - Mild

ii) Test data for materials

- Specific gravity of cement - 3.15
- Specific gravity of coarse aggregates - 2.60
- Specific gravity fine aggregates - 2.60
- Water absorption for coarse aggregate - 0.50%
- Water absorption for fine aggregates - 1.0%
- Surface moisture for coarse aggregates - Nill
- Surface moisture for fine aggregates - 2.0%
- Sieve analysis of coarse aggregates - Confirming to table 2 of IS: 383
- Sieve analysis of fine aggregates - Confirming to zone – II of IS: 383

(16 Marks)

OR

8 What is the significance of concrete mix design and explain the steps involved in it? **(16 Marks)**

Module-5

9 a. Write short notes on : i) Ferro cement ii) Self compacting concrete. **(08 Marks)**

b. What is RMC? How its manufactured? Explain briefly. **(08 Marks)**

OR

10 a. What is light weight concrete? State its advantages. **(08 Marks)**

b. Write note on fibre reinforced concrete. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV45

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 : i) Void ratio ii) Porosity iii) Degree of saturation iv) Air content. **(08 Marks)**

b. Explain the procedure to determine density of soil by core cutter method and sand replacement method. **(08 Marks)**

OR

2 a. Explain Atterberg's limits. **(06 Marks)**

b. The liquid and plastic limits of a given soil sample are 65% and 40% respectively. Compute its consistency index, liquidity index, flow index and toughness index. Given that the water content in the soil sample decreases from 80% to 40% for a ten fold increase in the number of blows required to close the groove in the standard liquid limit apparatus. **(10 Marks)**

Module-2

3 a. Explain with neat sketches, the soil structure. **(08 Marks)**

b. Describe the three principal clay minerals. **(08 Marks)**

OR

4 a. What are the objectives of compaction? **(04 Marks)**

b. List the factors affecting compaction. **(04 Marks)**

c. Following are the observations of compaction test:

Water content %	Weight of wet soil (N)
7.7	16.67
11.5	18.54
14.6	19.92
17.5	19.52
19.5	19.23
21.2	18.83

If the volume of compaction mould is 950 CC and G = 2.65, determine the dry unit weight and OMC. **(08 Marks)**

Module-3

5 a. Explain the laboratory method of determination of permeability by constant head method and variable head method. **(08 Marks)**

b. The following details refer to a test to determine the permeability of soil.
Thickness of specimen = 25mm
Diameter of stand pipe = 10mm
Initial head = 1000mm
Final head = 800mm
Determine the permeability of soil. If the void ratio of sample is 0.75, what is the permeability of same soil at a void ratio of 0.9? **(08 Marks)**

OR

6 a. What are the important properties of flow nets? **(04 Marks)**

b. The porosity of a certain sample of sand was 50% in the loose state and 34% in the dense state. The specific gravity is 2.70. Estimate the critical hydraulic gradients in loose and dense states. **(04 Marks)**

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

Module-4

7 a. Explain Mass-Spring analogy. **(08 Marks)**

b. What are the assumptions made in Terzaghis theory of one-dimensional consolidation? **(08 Marks)**

OR

8 a. Explain compressibility of soil and volume change. **(04 Marks)**

b. Differentiate between normally consolidated soil and over-consolidated soil. **(04 Marks)**

c. A saturated specimen of clay had undergone consolidation under a pressure of $200kN/m^2$ in an oedometer test. The thickness of the specimen was found to be 21.18mm and its water content 12%. Subsequently, with a further increase in pressure of $100kN/m^2$, the thickness of specimen at the end of 24 hrs was reduced by 1.18mm. Compute the coefficient of volume compressibility and compression index of soil G = 2.7. **(08 Marks)**

Module-5

9 a. Explain Mohr's Coulombs failure theory and draw the failure envelope for different soils. **(08 Marks)**

b. What are the factors affecting the shear strength of soil? **(04 Marks)**

c. What are the advantages and disadvantages of direct shear test? **(04 Marks)**

OR

10 a. Explain triaxial compression test and what are the advantages of triaxial test. **(08 Marks)**

b. Following results are obtained from a direct shear test on a soil at failure,

Normal load (N)	100	200	300	400
Shear load (N)	90	181	270	362

Size of the box = 6cm × 6cm. Determine shear strength parameters. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV46

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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. With the help of a neat sketch of a simple circular curve? Explain: i) Tangent length; ii) Length of long chord; iii) Length of curve; iv) Summit distance; v) Vertex distance; vi) Intersection angle. **(06 Marks)**

b. Two tangents intersect at a chainage (59 + 60), the deflection angle being 50°30′. Calculate the necessary data for setting out a curve of 15 chains radius to connect the two tangents, if it is intended to set out the curve by Rankine's method of deflection angles. Take the peg interval equal to 100 links, the length of the chain being 20m (100 links). Draw the curve table. **(10 Marks)**

OR

2 a. With the help of neat sketch, explain the elements of a compound cure. **(06 Marks)**

b. A road bend which deflects 80° is to be designed for a maximum speed of 100km per hour, a maximum centrifugal ratio 1/4 and a maximum rate to the change of acceleration of 30cm/sec^3, the curve consisting of a circular arc combined with two spirals. Calculate: i) The radius of circular arc ii) The required length of transition iii) The total length of composite curve and iv) The chainages of the beginning and end of transition curve, and of the junctions of the transition curves with the circular arc, if the chainage of the point of intersection is 42862 metres. **(10 Marks)**

Module-2

3 a. Explain orders of triangulation. **(06 Marks)**

b. Explain any four points to be kept in mind while selecting triangulation stations. **(04 Marks)**

c. From an eccentric station S, 12.25 metres to the west of the main station B, the following angles were measured. $\angle BSC = 76°25'32''$, $\angle CSA = 54°32'20''$. The stations S and C are to the opposite sides of line AB. Calculate the correct angle ABC if the lengths of AB and BC are 5286.5 and 4932.2m respectively. **(06 Marks)**

OR

4 a. Explain: i) Observed value of a quantity; ii) Most probable value; iii) Observation equation; iv) Conditioned equation; v) Indirect observation; vi) Normal equation. **(06 Marks)**

b. Adjust the following angles closing horizon.

$\angle A = 110° 20' 48''$ _____ wt 4

$\angle B = 92° 30' 12''$ _____ wt 1

$\angle C = 56° 12' 00''$ _____ wt 2

$\angle D = 100° 57' 04''$ _____ wt 3 **(10 Marks)**

Module-3

5 a. Define the terms:
i) The Zenith and Nadir
ii) The celestial poles and equator
iii) The sensible horizon
iv) The visible horizon
v) The altitude (α)
vi) Co-latitude. **(06 Marks)**

b. Find the shortest distance between two points A and B given that the latitudes of A and B are 15° 0′ N and 12° 6′ N and their longitudes are 50°12′E and 54° 0′ E respectively. Find also the direction of B on the great circle route. Radius of Earth = 6370 km. **(10 Marks)**

OR

6 a. State that properties of a spherical triangle. **(05 Marks)**

b. Show that one nautical mile is equal to 1.852 km. **(04 Marks)**

c. Calculate the distance in 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. **(07 Marks)**

Module-4

7 a. Define the terms: i) Camera axis; ii) Picture plane; iii) principal plane; iv) print ; v) Fuducial axis; vi) Film base. **(06 Marks)**

b. Three points 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	-16.38mm
c	+48.26mm	+36.72mm

The focal length of lens is 120.80mm. Determine the azimuths of the lines OB and OC if that of OA is 354° 30′. The axis of camera was level at the time of exposure at the station O. **(10 Marks)**

OR

8 a. Derive a relation for the scale of a vertical photograph. **(06 Marks)**

b. A vertical photograph was taken at an altitude of 1200 metres above the mean sea level. Determine the scale of photograph for terrain lying at elevation of 80 metres and 300 metres, if the focal length of camera is 15cm. **(10 Marks)**

Module-5

9 a. Enumerate three types of measurement of distance with instruments used. **(06 Marks)**

b. With sketches explain properties of electromagnetic waves and electromagnetic spectrum. **(10 Marks)**

OR

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

b. Explain the applications of remote sensing in civil engineering. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15MATDIP41

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
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 matrix $A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ **(05 Marks)**

b. Solve by Gauss elimination method:
$2x + y + 4z = 12 \quad 4x + 11y - z = 33 \quad 8x - 3y + 2z = 20$ **(05 Marks)**

c. Find all the eigen values of the matrix
$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ **(06 Marks)**

OR

2 a. Find the values of K, such that the matrix A may have the rank equal to 3:
$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 4 & K \\ 1 & 4 & 10 & K^2 \end{bmatrix}$ **(05 Marks)**

b. Solve by Gauss elimination method
$x_1 - 2x_2 + 3x_3 = 2 \quad 3x_1 - x_2 + 4x_3 = 4 \quad 2x_1 + x_2 - 2x_3 = 5$ **(05 Marks)**

c. Find all the eigen values and corresponding eigen vectors of the matrix
$A = \begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$ **(06 Marks)**

Module-2

3 a. Find C.F of $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$. **(05 Marks)**

b. Solve the initial value problem $\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 29x = 0$

Subject to the conditions $x(0) = 0$, $\frac{dx}{dt}(0) = 15$. **(05 Marks)**

c. Using the method of undetermined coefficients, solve $(D^2 - 4D + 3)y = 20\cos x$ **(06 Marks)**

OR

4 a. Solve $(D^2 - 2D + 4)y = e^x \cos x$. **(05 Marks)**

b. Solve $(D^2 + 4)y = x^2 + 2^{-x}$. **(05 Marks)**

c. Using the method of variation of parameters, find the solution of $(D^2 - 2D + 1)y = e^x / x$. **(06 Marks)**

Module-3

5 a. Find the Laplace transform of $\frac{\cos 3t - \cos 4t}{t}$. **(05 Marks)**

b. Find $L\{t\sin^2 t\}$ **(05 Marks)**

c. Express the following function interms of Heaviside unit step function and hence find the Laplace transform where

$$f(t) = \begin{cases} t^2 & 0 < t \le 2 \\ 4t & t > 2 \end{cases}$$ **(06 Marks)**

OR

6 a. Find $L\left[\frac{e^{-t}.\sin t}{t}\right]$. **(05 Marks)**

b. Using Laplace transform evaluate $\int_0^\infty e^{-t} t \sin^2 3t dt$. **(05 Marks)**

c. If $f(t) = \begin{cases} t & 0 \le t \le a \\ 2a - t & a \le t \le 2a \end{cases}$ $f(t+2a) = f(t)$, show that $L[f(t)] = \frac{1}{s^2}\tan h\left(\frac{as}{2}\right)$. **(06 Marks)**

Module-4

7 a. Find inverse Laplace transform of $\frac{s+5}{s^2 - 6s + 13}$. **(05 Marks)**

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

c. Solve by using Laplace transform method $y''(t) + 4y(t) = 0$, given that $y(0) = 2$, $y'(0) = 0$. **(06 Marks)**

OR

8 a. Find $L^{-1}\left[\frac{s^2}{(s^2+1)(s^2+4)}\right]$. **(05 Marks)**

b. Find $L^{-1}\left[\frac{(s+2)e^{-s}}{(s+1)^4}\right]$ **(05 Marks)**

c. Solve by using Laplace transform method $y'' + 5y' + 6y = 5e^{2x}$, $y(0) = 2$, $y'(0) = 1$. **(06 Marks)**

Module-5

9 a. There are 10 students of which three are graduates. If a committee of five is to be formed, what is the probability that there are (i) only 2 graduates (ii) atleast 2 graduates? **(05 Marks)**

b. In a school 25% of the students failed in the first language, 15% of the students failed in second language and 10% of the students failed in both. If a student is selected at random find the probability that :

i) He failed in first language if he had failed in the second language.

ii) He failed in second language if he had failed in the first language. **(05 Marks)**

c. In a bolt factory there are four machines A, B, C and D manufacturing respectively 20%, 15%, 25%, 40% of the total production. Out of these 5%, 4%, 3% and 2% are defective. If a bolt drawn at random was found defective what is the probability that it was manufactured by A or D. **(06 Marks)**

OR

10 a. From 6 positive and 8 negative numbers, 4 numbers are chosen at random (without replacement) and multiplied. What is the probability that the product is a positive number? **(05 Marks)**

b. Three students A, B, C write an entrance examination. Their chances of passing are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. Find the probability that (i) atleast one of them passes (ii) all of them passes. **(05 Marks)**

c. Three major parties A, B, C are contending for power in the elections of a state and the chance of their winning the election is in the ratio 1:3:5. The parties A, B, C respectively have probability of banning the online lottery $\frac{2}{3}$, $\frac{1}{3}$, $\frac{3}{5}$. What is the probability that there will be a ban on the online lottery in the state? What is the probability that the ban is from the party 'C'? **(06 Marks)**

* * * * *