CBCS SCHEME

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17MAT41

Fourth Semester B.E. Degree Examination, June/July 2019
Engineering Mathematics - IV

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. If $y' + y + 2x = 0$, $y(0) = -1$ then find $y(0.1)$ by using Taylor's series method. Consider upto third order derivative term. **(06 Marks)**

b. Find $y(0.2)$ by using modified Euler's method, given that $y' = x + y$, $y(0) = 1$. Take $h = 0.1$ and carry out two modifications at each step. **(07 Marks)**

c. If $y' = \frac{1}{x+y}$, $y(0) = 2$, $y(0.2) = 2.0933$, $y(0.4) = 2.1755$, $y(0.6) = 2.2493$ then find $y(0.8)$ by Milne's method. **(07 Marks)**

OR

2 a. Use Taylor's series method to find $y(0.1)$ from $y' = 3x + y^2$, $y(0) = 1$. Consider upto fourth derivative term. **(06 Marks)**

b. Use Runge – Kutta method to find $y(0.1)$ from $y' = x^2 + y$, $y(0) = -1$. **(07 Marks)**

c. Use Adam – Bashforth method to find $y(0.4)$ from $y' = \frac{1}{2}xy$, $y(0) = 1$, $y(0.1) = 1.0025$, $y(0.2) = 1.0101$, $y(0.3) = 1.0228$. **(07 Marks)**

Module-2

3 a. Express $x^3 - 5x^2 + 6x + 1$ in terms of Legendre polynomials. **(06 Marks)**

b. Find $y(0.1)$, by using Runge – Kutta method , given that $y'' + xy' + y = 0$, $y(0) = 1$, $y'(0) = 0$. **(07 Marks)**

c. Solve Bessel's operation leading to $J_n(x)$. **(07 Marks)**

OR

4 a. Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$. **(06 Marks)**

b. Find $y(0.4)$ by using Milne's method, given that $y(0) = 1$, $y'(0) = 1$, $y(0.1) = 1.0998$, $y'(0.1) = 0.9946$, $y(0.2) = 1.1987$, $y'(0.2) = 0.9773$, $y(0.3) = 1.2955$, $y'(0.3) = 0.946$. **(07 Marks)**

c. State and prove Rodrigue's formula. **(07 Marks)**

Module-3

5 a. Derive Cauchy – Riemann equations in Cartesian coordinates. **(06 Marks)**

b. Find an analytic function $f(z) = u + iv$ in terms of z , given that $u = e^{2x}(x \cos 2y - y \sin 2y)$. **(07 Marks)**

c. Evaluate $\int_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$, c is $|z| = 3$ by residue theorem. **(07 Marks)**

OR

6 a. Prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$. **(06 Marks)**

b. Discuss the transformation $W = Z^2$. **(07 Marks)**

c. Find a bilinear transformation that maps the points ∞ , i , o in Z – plane into -1 , -i , 1 in W – plane respectively. **(07 Marks)**

Module-4

7 a. In a sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2, out of 1000 such samples , how many would be expected to contain atleast 3 defective parts? **(06 Marks)**

b. If X is a normal variate with mean 30 and standard deviation 5, find the probabilities that
i) $26 \le X \le 40$ ii) $X > 45$ iii) $|X - 30| > 5$.
Given that $\phi(0.8) = 0.288$, $\phi(2.0) = 0.4772$, $\phi(3) = 0.4987$, $\phi(1) = 0.3413$. **(07 Marks)**

c. The joint density function of two continuous random variables X and Y is given by

$$f(x, y) = \begin{cases} K\,xy, & 0 \le x \le 4, \quad 1 < y < 5 \\ 0, & \text{otherwise} \end{cases}$$

Find i) K ii) E(x) iii) E(2x + 3y). **(07 Marks)**

OR

8 a. Derive mean and standard deviation of the Poisson distribution. **(06 Marks)**

b. The joint probability distribution for two random variables X and Y as follows :

X \ Y	-2	-1	4	5
1	0.1	0.2	0	0.3
2	0.2	0.1	0.3	0

Find i) Expectations of X, Y , XY ii) SD of X and Y iii) Covariance of X, Y iv) Correlation of X and Y. **(07 Marks)**

c. In a certain town the duration of shower has mean 5 minutes. What is the probability that shower will last for i) 10 minutes or more ii) Less than 10 minutes iii) Between 10 and 12 minutes. **(07 Marks)**

Module-5

9 a. A group of boys and girls were given in Intelligence test. The mean score , SD score and numbers in each group are as follows : **(06 Marks)**

	Boys	Girls
Mean	74	70
SD	8	10
X	12	10

Is the difference between the means of the two groups significant at 5% level of significance? Given that $t_{0.05} = 2.086$ for 20 d.f.

b. The following table gives the number of accidents that take place in an industry during various days of the week. Test if accidents are uniformly distributed over the week.

Day	Mon	Tue	Wed	Thu	Fri	Sat
No. of accidents	14	18	12	11	15	14

Given that $X^2 = 11.09$ at 5% level for 5 d.f. **(07 Marks)**

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17CV42

Fourth Semester B.E. Degree Examination, June/July 2019
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Differentiate between statically determinate and indeterminate beams with an example for each. **(06 Marks)**

b. Define degree of freedom. What is the degree of freedom for a i) Fixed support ii) Hinged support. **(04 Marks)**

c. Determine static and kinematic indeterminancy for the following shown in Fig.Q.1(c). **(10 Marks)**

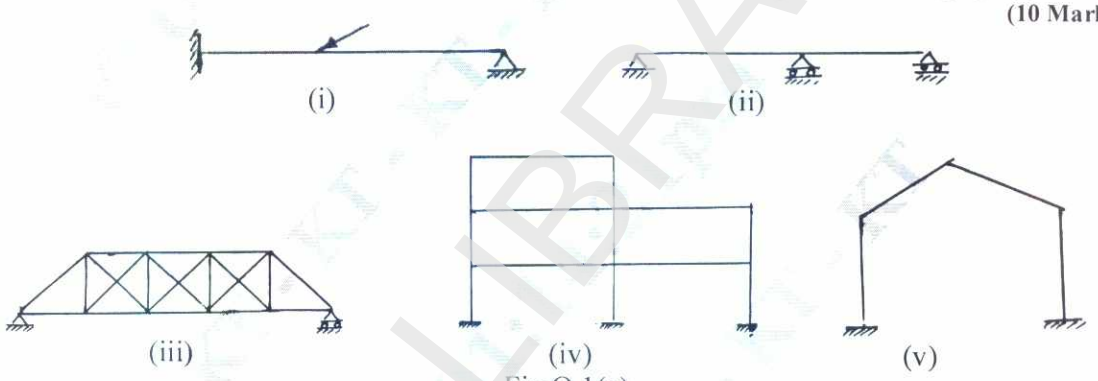


Fig.Q.1(c)

OR

2 a. Determine the forces in all the members of the truss shown in Fig.Q.2(a) use the method of joints. **(12 Marks)**

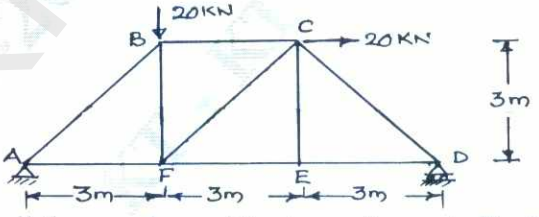


Fig.Q.2(a)

b. Determine the forces in all the members of the truss shown in Fig.Q.2(b) by the method of section. **(08 Marks)**

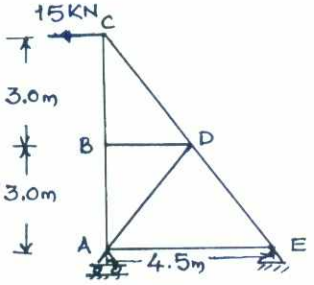


Fig.Q.2(b)

Module-2

3 a. Derive moment curvature equation for deflection. **(04 Marks)**

b. Determine the slope and deflection at free end of a cantilever beam subjected to point load 'W' at free end and of span 'L' with constant EI use Maculay's method. **(08 Marks)**

c. Using Conjugate beam method Determine the maximum deflection and slopes at support for a simply supported beam subjected to udl of w/m run over a span of L m with constant EI. **(08 Marks)**

OR

4 a. Determine the slope at left support and deflection at mid span of simply supported beam subjected to the loads as shown in Fig.Q.4(a) by using Maculay's method take EI = 200MN-m^2. **(10 Marks)**

b. Determine the slope at A and deflection at mid span for the above beam shown in Fig.Q.4(b) by using moment area method EI = 200 MN-m^2. **(10 Marks)**

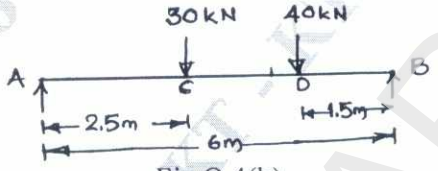


Fig.Q.4(b)

Module-3

5 a. Obtain an expression for strain energy stored in a member when it is subjected to bending moment. **(06 Marks)**

b. Find the deflection at C due to a point load acting as shown in Fig.Q.5(b) by using strain energy method. **(06 Marks)**

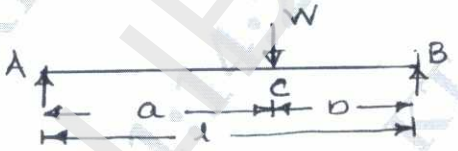
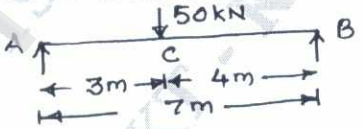


Fig.Q.5(b)

c. Find the deflection under the concentrated load for the beam shown in Fig.Q.5(c), by using Castiglino's theorem. Take E = 2 × 10^8 kN/m^2 and I = 14 × 10^{-6} m^4. **(08 Marks)**



OR

6 a. Determine the horizontal and vertical deflection at the free end of bracket shown in Fig.Q.6(a). **(10 Marks)**

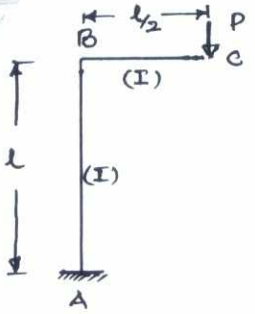


Fig.Q.6(a)

b. Determine the slope and deflection at free end of cantilever by using unit load method take $E = 2 \times 10^5$ N/mm^2 and $I = 12 \times 10^6$ mm^4 Refer Fig.Q.6(b). **(10 Marks)**

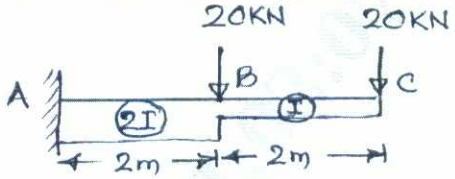


Fig.Q.6(b)

Module-4

7 a. A three hinged parabolic arch of span 20m and rise 4m carries a udl of 20kN/m run on the left half of the span find the maximum BM for the arch and also determine normal thrust and radial shear at a point 5m from left support. **(10 Marks)**

b. Show that the shape of cable is parabolic when the supports are at the same level and is subjected to udl of w force/unit length over the entire span also find the length of the cable. **(10 Marks)**

OR

8 a. A cable of span 20m and central dip 4m carries a udl of 20kN/m over the whole span. Find: i) Maximum tension in the cable ii) Minimum tension in the cable iii) Length of cable iv) Horizontal and vertical forces transmitted on to the supporting pier if the cable passed over a smooth frictionless pulley. **(10 Marks)**

b. Show that the parabolic shape is a funicular shape for a three hinged arch subjected to udl over its entire span. **(10 Marks)**

Module-5

9 a. Define influence line diagram, what are the uses of ILD? **(04 Marks)**

b. A simple girder of 20m span is traversed by a moving udl of length 6m with an intensity of 20kN/m from left to right. Find the maximum bending moment and maximum positive and negative shear force at section 4m from left support also find the absolute maximum bending moment that may occur any where in the girder. [Ref.Fig.Q.9(b)] **(16 Marks)**

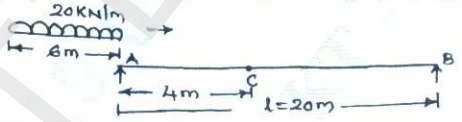


Fig.Q.9(b)

OR

10 a. Draw the unit load influence line diagrams for the reactions at supports of a simply supported beam. **(04 Marks)**

b. A simply supported beam shown in Fig.Q.10(b) is subjected a set of four concentrated loads which move from left to right. Determine: i) Maximum bending moment and shear force at a section of 6m from left support ii) Absolute maximum shear force and absolute maximum bending moment. Use influence line principle. **(16 Marks)**

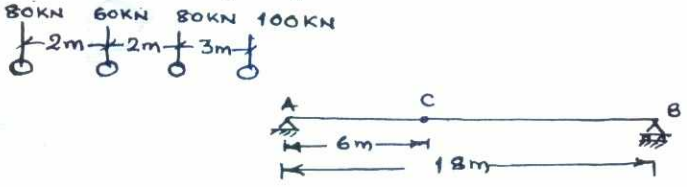


Fig.Q.10(b)

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CBCS SCHEME

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Fourth Semester B.E. Degree Examination, June/July 2019
Applied Hydraulics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain Dimensionally Homogeneous equation. Give any two examples. **(10 Marks)**

b. Using Buckingham's π – theorem, show that the velocity through a circular orifice is given by $V = \sqrt{2gH}\ \phi\left[\frac{D}{H}, \frac{\mu}{\rho VH}\right]$, where H is head causing flow, μ is coefficient viscosity, ρ = mass density and g = gravitational acceleration. **(10 Marks)**

OR

2 a. Derive an expression for kinematic and dynamic similarities. **(04 Marks)**

b. In the model test of a spillway the discharge and velocity of flow over the model were $2m^3/s$ and 1.53 m/s respectively. Calculate the velocity and discharge over the prototype which is 36 times the model size. **(08 Marks)**

c. A solid cylinder 2m in diameter and 2m high is floating in water with its axis vertical. If the specific gravity of the material of cylinder is 0.65, find its metacentric height. State also whether the equilibrium is stable or unstable. **(08 Marks)**

Module-2

3 a. Explain various types of flows in channel. **(10 Marks)**

b. A canal of trapezoidal section has bed width of 8m and bed slope of 1 in 4000. If the depth of flow is 2.4m and side slopes of the channel are 1H to 3V, then determine the average velocity and the discharge carried by the channel. Also compute the average shear stress at the channel boundary. Take C = 56. **(10 Marks)**

OR

4 a. Obtain the conditions of most economical trapezoidal section in which side slope is constant. **(10 Marks)**

b. A 8m wide channel conveys $15m^3/s$ of water at a depth of 1.2m. Obtain the following :
i) Specific energy of the flowing water.
ii) Critical depth, Critical velocity and minimum specific energy.
iii) Froude number and state whether flow is subcritical or supercritical. **(10 Marks)**

Module-3

5 a. Derive an expression for loss of energy head for hydraulic jump. **(10 Marks)**

b. In a rectangular channel of 0.5m width, a hydraulic jump occurs at a point where depth of water flow is 0.15m and Froude number is 2.5 obtain the following :
i) Sp. Energy ii) Critical and subsequent depths iii) Loss of head and iv) Energy dissipated. **(10 Marks)**

OR

6 a. Derive an expression for length of Back water curve. **(10 Marks)**

b. In a rectangular channel of width 24m and depth of flow 6m, the rate of flow of water is 86.4 m^3/S. If the bed slope of the channel is 1 in 4000 then find the slope of the free surface of water. Take C = 60. **(10 Marks)**

Module-4

7 a. Derive an expression for impulse momentum equation. **(05 Marks)**

b. Derive an expression for thrust exerted by the jet strikes a stationary curved vane at one end tangentially when the vane is symmetrical. **(07 Marks)**

c. A jet of water from a nozzle is deflected through 60^0 from its original direction by curved vane which enters tangentially without shock with a velocity of 30m/s and leaves with a mean velocity of 25m/s. If the mass issued from nozzle per second is 0.8 kg/s, calculate the magnitude and direction of the resultant force on the vane, if the vane is stationary. **(08 Marks)**

OR

8 a. Explain classification and efficiencies of turbines. **(10 Marks)**

b. A pelton wheel is to be designed for the following specifications :
Shaft power = 11,772 kW ; Head = 380m ; Speed = 750 r.p.m ; Overall efficiency = 86%
Jet diameter is not to exceed one – sixth of the wheel diameter. Determine
i) Wheel diameter ii) No. of jets required iii) Diameter of the jet.
Take $K_{V_1} = 0.985$ and $K_{u_1} = 0.45$. **(10 Marks)**

Module-5

9 a. With the help of neat sketches, explain Francis inward flow reaction turbine. **(10 Marks)**

b. Calculate the diameter and speed of the runner of a Kaplan turbine developing 6000 kW under an effective head of 5m. Overall efficiency of the turbine is 90%. The diameter of boss is 0.4 times the external diameter of the runner. The turbine speed ratio is 2.0 and flow ratio 0.6. What is the specific speed of the turbine? **(10 Marks)**

OR

10 a. Explain with neat sketches, components and working of a centrifugal pump. **(10 Marks)**

b. A centrifugal pump impeller runs at 80 r.p.m and has outlet vane angle of 60°. The velocity of flow is 2.5m/s throughout and diameter of impeller at exit is twice that at inlet. If the manometric head is 20m and the manometric efficiency is 75%, determine
i) The diameter of impeller at the exit ii) Inlet vane angle. **(10 Marks)**

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17CV/CT44

Fourth Semester B.E. Degree Examination, June/July 2019
Concrete Technology

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the constituents of cement with their percentage and functions. **(10 Marks)**

b. Define Fineness modulus. Explain test procedure to determine the Fineness modulus and Importance of Fineness modulus. **(10 Marks)**

OR

2 a. What are Bogue's compounds? Briefly explain their contribution towards gaining of strength of cement with graph. **(10 Marks)**

b. What is an Admixture? What are the effects of air entrainment and Retarders on the properties of concrete? **(10 Marks)**

Module-2

3 a. Define Workability. Briefly explain the factors which affects the workability of concrete. **(10 Marks)**

b. What is the Importance of curing in concrete? Briefly discuss any two methods. **(10 Marks)**

OR

4 a. Mention the various stages of manufacturing of concrete. Discuss any two stages. **(10 Marks)**

b. Explain good and bad practices of making and using fresh concrete. **(10 Marks)**

Module-3

5 a. Explain the factors affects the strength of concrete. **(10 Marks)**

b. Write short notes on : i) Shrinkage of concrete ii) Creep. **(10 Marks)**

OR

6 a. What is durability of concrete? Explain the factors affecting the durability of concrete. **(10 Marks)**

b. Mention various non – destructive testing of concrete. Explain any two methods in brief. **(10 Marks)**

Module-4

7 Design a concrete mix for M_{25}.

a. Grade designation : M_{25}.
b. Type of cement : OPC 43 grade
c. Max. Nominal size of aggregates 20mm down
d. Min. cement content : 300 kg/m^3
e. Water cement ratio : 0.50
f. Workability : 75mm slap
g. Exposure condition : Moderate (RCC)
h. Method of concrete placing : Manual
i. Max. cement content : 450 kg/m^3
j. Chemical admixture : NIL
k. Fine aggregate zone : Zone 2.

A Cement : Type of cement = OPC 43 grade
Specific gravity : 3.15

B Coarse Aggregate : Specific gravity : 2.80
Water absorption : 1%
Free surface moisture : NIL

C Fine Aggregate : Specific gravity : 2.65
Water absorption : 2%
Free surface moisture : 2%

D Chemical Admixture – NIL. **(20 Marks)**

OR

8 Discuss the concept of mix design. Write step by step procedure for mix design using IS code. Also discuss the variables in proportioning of concrete. **(20 Marks)**

Module-5

9 a. What are requirements of RMC according QCI? Briefly discuss advantages and disadvantages of RMC. **(10 Marks)**

b. What is Light weight concrete? Discuss the uses and advantages of Light weigh concrete. **(10 Marks)**

OR

10 a. Enumerate the benefits of self compacting concrete. Explain any two test on self compacting concrete. **(10 Marks)**

b. List the types of Fibres used in FRC and discuss Factors affecting properties of FRC. **(10 Marks)**

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CBCS SCHEME

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17CV45

Fourth Semester B.E. Degree Examination, June/July 2019
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With the help of a three phase diagram, explain
i) Void ratio ii) Porosity iii) Water content iv) Degree of saturation. **(08 Marks)**

b. With usual notations, prove that
$e = \frac{WG}{Sr}$. **(06 Marks)**

c. Determine the Dry density , Void ratio, Porosity and degree of saturation. Given $\gamma_b = 26kN/m^3$, G = 2.67 and W = 16%. **(06 Marks)**

OR

2 a. Define Liquid limit, Plastic limit and Shrinkage limit. **(06 Marks)**

b. Explain the Indian Standard Soil classification system. **(08 Marks)**

c. A fine grained soil has a liquid limit of 54% and a plastic limit of 30%. Classify the soil as per IS classification. **(06 Marks)**

Module-2

3 a. Explain with sketches, the common clay minerals. **(08 Marks)**

b. Following are the results of a compaction test.

Weight of soil with mould (N)	29.25	30.95	31.50	31.25	30.70
Water Content (%)	10	12	14.3	16.1	18.2

Plot the compaction curve showing MDD and OMC. Given G = 2.70 , Volume of mould = 1000 cm^3. Weight of mould = 10N. **(12 Marks)**

OR

4 a. Explain Electrical Diffuse Double Layer. **(06 Marks)**

b. Distinguish between Standard proctor and Modified proctor compaction tests. **(04 Marks)**

c. For constructing an embankment, the soil is transported from a borrow area using a truck which can carry 6m^3 of soil at a time. Determine the number of truck loads of soil required to obtain 100m^3 of compacted earth fill and the volume of the borrow pit. Use the following details. **(10 Marks)**

Property	Borrow area	Truck loose	Field compacted	Soil Type
Bulk density (kN/m^3)	16.6	11.5	18.2	Well graded
Water content (%)	8	6	14%	-

Module-3

5 a. What is a Flow net? What are the uses and characteristics of flow nets? **(08 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. **(06 Marks)**

c. Compute the quantity of water seeping under a weir per day for which the flow net has been satisfactorily constructed. The coefficient of permeability is 2×10^{-2} mm/s. $n_f = 5$ and $n_d = 18$. The difference in water level between upstream and downstream is 3.0m. The length of the weir is 60m. **(06 Marks)**

OR

6 a. With the help of neat sketches, derive an equation to determine permeability by the following Laboratory method and also state their suitability.
i) Constant Head Permeability Test ii) Falling Head Permeability Test. **(14 Marks)**

b. What are the factors affecting permeability? Explain them briefly. **(06 Marks)**

Module-4

7 a. Explain with neat sketch, the mass spring analogy. **(08 Marks)**

b. Explain normally consolidated soil and over consolidated soil. **(06 Marks)**

c. The thickness of a normally consolidated clay layer is 3.0m. The initial void ratio of the sample is 1.0 and its liquid limit is 60%. The overburden pressure at the middle of the clay layer was 154 kN/m^2. Due to construction of a building the increase in effective stress is 92.4kN/m^2. Determine the consolidation settlement of the clay layer. **(06 Marks)**

OR

8 a. Explain with a sketch, determination of Pre – consolidation pressure by Casagrande's method. **(06 Marks)**

b. Explain Square root of time fitting method. **(06 Marks)**

c. A 20m thick isotropic clay stratum overlies an impervious rock. The coefficient of consolidation of soil is 5×10^{-2} $mm^{2/s}$. Find the time required for 50% and 90% consolidation. Time factors are 0.2 and 0.85 for 50% and 90% consolidations respectively. **(08 Marks)**

Module-5

9 a. Explain Mohr – Coulomb failure theory of soil. **(06 Marks)**

b. What are the factors affecting the shear strength of soil? **(06 Marks)**

c. In a shear test conducted on a river sand, the following results were obtained.

Normal Force (N)	80	160	240	320	400	480
Shear Force (N)	50	101	149	201	248	302

Determine 'e' and 'ϕ'. **(08 Marks)**

OR

10 a. With the help of neat sketches, derive an equation to determine shear strength by Vane shear test. **(08 Marks)**

b. In a triaxial test on two identical soil samples, the following data was obtained.

Test No.	Cell pressure (KN/m^2)	Maximum deviation stress (KN/m^2)	Maximum principal stress (KN/m^2)
1	50	120	-
2	100	-	332

Compute shear parameters. **(12 Marks)**

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17CV46

Fourth Semester B.E. Degree Examination, June/July 2019
Advanced Surveying

Time: 3 hrs. Max. Marks: 100

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) Intersection angle
iv) Point of curve v) Point of tangency vi) Deflection angle. **(06 Marks)**

b. Define degree of a curve. Establish the relationship between degree of a curve and its radius. **(04 Marks)**

c. 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 inteneded 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. What is transition curve? List the function and essential requirements of an ideal transition curve. **(06 Marks)**

b. Two straights BA and AC are intersected by a line EF. The angle BEF and EFC are 130° and 140° respectively. The radius of the first arc is 500m and that second arc 300m. Find the chainages of the tangent points and the points of compound curvature given that the chainage of the intersection point 'A' is 3200m. **(07 Marks)**

c. Two parallel railway lines are to be connected by a reverse curve. Each section having the same radius. If the lines are 12 meters apart and the maximum distance between tangent points measured parallel to the straights is 48meters, find the maximum allowable radius. If however, both the radii are to be different, calculate the radius of the second branch if that of the first branch is 60meters. Also, calculate the lengths of both the branches. **(07 Marks)**

Module-2

3 a. List the various factors that are to be considered in the selection of site for baseline and station in triangulation survey. **(06 Marks)**

b. Write a note on classification of triangulation system. **(06 Marks)**

c. From a satellite station 'S' which is 14m 'A', angles measured to 3 triangulations stations are as follows :
$\angle CSA = 32°45'48''$, $\angle BSC = 68°26'36''$ the length of sides, AC and AB are 5678m and 1441m respectively. Find the angle of BAC. **(08 Marks)**

OR

4 a. Explain the sources and kinds of errors. **(04 Marks)**

b. State and explain law of weights. **(08 Marks)**

c. Find the most probable values of $\angle A$ and $\angle B$ from the following observation @ a station '0'.
$A = 9° 48' 36''$ ωt 2
$B = 54° 37' 48''$ ωt 3
$A + B = 104° 26' 28''$ ωt 4. **(08 Marks)**

Module-3

5 a. Define the following terms :
i) Zenith ii) Nadis ii) Azimuth iv) The altitude v) Celestial sphere. **(05 Marks)**

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

c. Find the shortest distance between two points A and B, given :
A latitude — 18° 24′ N longitude 36° 18′E
B latitude — 68° 32′ N longitude 126° 34′E. **(10 Marks)**

OR

6 a. Define the following :
i) Latitude ii) Longitude iii) The visible Harizon iv) Sensible Horizon. **(04 Marks)**

b. Explain Ecliptic and solstices. **(06 Marks)**

c. At a point 'A' in latitude 45°N, a straight line is ranged out which runs due east at A. This straight line is prolonged for 300 nautical miles to B. find the latitude of B, and if it be desired to travel due north from B. So as to meet the 45° parallel again at 'C', find the ABC at which we must set out and the distance BC. **(10 Marks)**

Module-4

7 a. Define the terms :
i) Picture plane ii) Camera axis iii) Focal length iv) Principal plane
v) Perspective projection vi) Film Base. **(06 Marks)**

b. With a neat sketch, derive the expression for the scale of a vertical photograph. **(06 Marks)**

c. A vertical photograph was taken at an altitude of 1200m above MSL. Determine the scale of the photograph for the terrain laying at elevation of 80m and 300m. If the focal length of the camera is 15cm. **(08 Marks)**

OR

8 a. Define the terms : i) Drift ii) crab iii) mosaics. **(06 Marks)**

b. Explain the procedure for aerial survey. **(06 Marks)**

c. The scale of an aerial photography is 1cm = 100m. The photograph size is 20cm × 20cm. determine the number of photography required to cover an area 10km × 10km, if the longitudinal lap is 60% and side lap is 30%. **(08 Marks)**

Module-5

9 a. Define EDM. **(04 Marks)**

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

c. Define remote sensing. Explain the applications in civil engineering. **(08 Marks)**

OR

10 a. What are the advantages of LIDAR technology? **(04 Marks)**

b. What is GIS? With a neat sketch, explain the components of GIS. **(08 Marks)**

c. What is GPS? Explain the basic principles of GPS and its application in surveying. **(08 Marks)**

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CBCS SCHEME

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17MATDIP41

Fourth Semester B.E. Degree Examination, June/July 2019
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Find the rank of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ -1 & 2 & 3 \\ 1 & 5 & 7 \end{bmatrix}$ by elementary row operations. **(08 Marks)**

b. Test for consistency and solve $x+y+z=6$, $x-y+2z=5$, $3x+y+z=8$. **(06 Marks)**

c. Solve the system of equations by Gauss elimination method :
$x+y+z=9$ $x-2y+3z=8$ $2x+y-z=3$ **(06 Marks)**

OR

2 a. Find all the eigen values and the corresponding eigen vectors of the matrix
$A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ **(08 Marks)**

b. Solve by Gauss elimination method $x_1-2x_2+3x_3=2$, $3x_1-x_2+4x_3=4$, $2x_1+x_2-2x_3=5$. **(06 Marks)**

c. If $A=\begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ find A^{-1} by Cayley Hamilton theorem. **(06 Marks)**

Module-2

3 a. Solve $\frac{d^3y}{dx^2}-2\frac{d^2y}{dx^2}+4\frac{dy}{dx}-8y=0$. **(08 Marks)**

b. Solve $6\frac{d^2y}{dx^2}+17\frac{dy}{dx}+12y=e^{-x}$. **(06 Marks)**

c. Solve $y''-4y'+13y=\cos 2x$. **(06 Marks)**

OR

4 a. Solve $\frac{d^3y}{dx^3}+6\frac{d^2y}{dx^2}+11\frac{dy}{dx}+6y=0$. **(08 Marks)**

b. Solve $y''+2y+y=\frac{e^{\frac{x}{2}}+e^{-\frac{x}{2}}}{2}$. **(06 Marks)**

c. Solve $y''+2y'+y=2x+x^2$. **(06 Marks)**

Module-3

5 a. Find $L[\cosh at]$. **(08 Marks)**

b. Find $L[e^{-2t}\sinh 4t]$ **(06 Marks)**

c. Find $R\{t\sin 2t\}$. **(06 Marks)**

OR

6 a. Show that $\int_0^\infty t^3 e^{-st} \sin t dt = 0$. **(08 Marks)**

b. If $f(t) = t^2$, $0 < t < 2$ and $f(t + 2) = f(t)$ for $t > 2$, find $L[f(t)]$. **(06 Marks)**

c. Express $f(t) = \begin{cases} t, & 0 < t < 4 \\ 5, & t > 4 \end{cases}$ in terms of unit step function and hence find their Laplace Transforms. **(06 Marks)**

Module-4

7 a. Find the inverse Laplace Transform of $\frac{3}{s^2} + \frac{2e^{-s}}{s^3} - \frac{3e^{-2s}}{s}$. **(08 Marks)**

b. Find $L^{-1}\left[\frac{s^3 + 6s^2 + 12s + 8}{s^6}\right]$. **(06 Marks)**

c. Find the inverse Laplace Transform of $\frac{s+5}{s^2 - 6s + 13}$. **(06 Marks)**

OR

8 a. Solve by using Laplace Transform $\frac{d^2y}{dt^2} + k^2 y = 0$, given that $y(0) = 2$, $y'(0) = 0$. **(08 Marks)**

b. Find inverse Laplace Transform of $\frac{1}{(s+1)(s+2)(s+3)}$. **(06 Marks)**

c. Find $L^{-1}\left[\frac{s+1}{s^2 + 6s + 9}\right]$. **(06 Marks)**

Module-5

9 a. Find the probability that a leap year selected at random will contain 53 Sundays. **(08 Marks)**

b. A six faced die on which the numbers 1 to 6 are marked is thrown. Find the probability of (i) 3 (ii) an odd number coming up. **(06 Marks)**

c. State and prove Bayee's theorem. **(06 Marks)**

OR

10 a. A problem is given to three students A, B, C whose chances of solving it are $\frac{1}{2}, \frac{1}{4}, \frac{1}{5}$ respectively. Find the probability that the problem is solved. **(08 Marks)**

b. For any three events A, B, C, prove that $P\{(A \cup B)/C\} = P(A/C) + P(B/C) - P\{(A \cap B)/C\}$. **(06 Marks)**

c. Three machines A, B and C produce respectively 60%, 30% and 10% of the total number of items of a factory. The percentages 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. **(06 Marks)**

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