CBCS SCHEME

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15MAT41

Fourth Semester B.E. Degree Examination, June/July 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. Employ Taylor's series method, find y(0.1) considering upto third degree term if y(x) satisfies the equation $\frac{dy}{dx} = x - y^2$, $y(0) = 1$. **(05 Marks)**

b. Using Runge-Kutta method of fourth order, find y(0.1) for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$ taking $h = 0.1$. **(05 Marks)**

c. Apply Milne's method to compute y(1.4) correct to four decimal places given $\frac{dy}{dx} = x^2 + \frac{y}{2}$ and following the data : y(1) = 2, y(1.1) = 2.2156, y(1.2) = 2.4649, y(1.3) = 2.7514. **(06 Marks)**

OR

2 a. Use Taylor's series method to find y(4.1) given that $(x^2 + y)y' = 1$ and y(4) = 4. **(05 Marks)**

b. Find y at x = 0.8, given $y' = x - y^2$ and y(0) = 0, y(0.2) = 0.02, y(0.4) = 0.0795, y(0.6) = 0.1762. Using Adams – Bashforth method. Apply the corrector formula. **(05 Marks)**

c. Using Modified Euler's method find y at x = 0.1 given $y' = 3x + \frac{y}{2}$ with y(0) = 1 taking h = 0.1. **(06 Marks)**

Module-2

3 a. Obtain the solution of the equation $2y'' = 4x + y'$ with initial conditions y(1) = 2, y(1.1) = 2.2156, y(1.2) = 2.4649, y(1.3) = 2.7514 and y'(1) = 2, y'(1.1) = 2.3178, y'(1.2) = 2.6725, y'(1.3) = 3.0657 by computing y(1.4) applying Milne's method. **(05 Marks)**

b. If α and β are two distinct roots of $J_n(x) = 0$ then prove that $\int_0^1 xJ_n(\alpha x)J_n(\beta x)dx = 0$ if $\alpha \neq \beta$. **(05 Marks)**

c. Show that $J_{-\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}}\cos x$ **(06 Marks)**

OR

4 a. Given $y'' - xy' - y = 0$ with the initial conditions y(0) = 1, y'(0) = 0. Compute y(0.2) and y'(0.2) by taking h = 0.2 using Runge - Kutta method of fourth order. **(05 Marks)**

b. If $x^3 + 2x^2 - x + 1 = aP_0(x) + bP_1(x) + cP_2(x) + dP_3(x)$ then, find the values of a, b, c, d. **(05 Marks)**

c. Derive Rodrigue's formula

$$P_n(x) = \frac{1}{2^n n!}\frac{d^n}{dx^n}\left[(x^2-1)^n\right]$$ **(06 Marks)**

Module-3

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

b. Discuss the transformation $w = z^2$. **(05 Marks)**

c. Find the bilinear transformation which maps the points $z = 1, i, -1$ into $w = 2, i, -2$. **(06 Marks)**

OR

6 a. Find the analytic function whose real part is

$$\frac{x^4 - y^4 - 2x}{x^2 + y^2}$$ **(05 Marks)**

b. State and prove Cauchy Integral formula. **(05 Marks)**

c. Evaluate $\int_c \frac{e^{2z}}{(z+1)(z-2)} dz$ where c is the circle : $|z| = 3$ using Cauchy's Residue theorem. **(06 Marks)**

Module-4

7 a. The probability function of a variate x is :

x	0	1	2	3	4	5	6	7
p(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

(i) Find k (ii) Evaluate $p(x < 6)$, $p(x \geq 6)$ and $p(3 < x \leq 6)$. **(05 Marks)**

b. Obtain mean and standard deviation of Binomial distribution. **(05 Marks)**

c. The joint distribution of two discrete variables x and y is $f(x, y) = (2x + y)$ where x and y are integers such that $0 \leq x \leq 2$; $0 \leq y \leq 3$.

Find : (i) Marginal distribution of x and y.

(ii) Are x and y independent. **(06 Marks)**

OR

8 a. The marks of 1000 students in an examination follows a normal distribution with mean 70 and standard deviation 5. Find the number of students whose marks will be

(i) less than 65 (ii) more than 75 (iii) between 65 and 75 [Given $\phi(1) = 0.3413$] **(05 Marks)**

b. If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals, more than two will get a bad reaction. **(05 Marks)**

c. The joint distribution of the random variables X and Y are given. Find the corresponding marginal distribution. Also compute the covariance and the correlation of the random variables X and Y. **(06 Marks)**

X \ Y	1	3	9
2	1/8	1/24	1/12
4	1/4	1/4	0
6	1/8	1/24	1/12

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15CV42

Fourth Semester B.E. Degree Examination, June/July 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. With an example define statically determinate and statically indeterminate structure. **(04 marks)**

b. Determine the force in each member of the roof truss shown in Fig.Q1(b) by method of joints. **(12 Marks)**

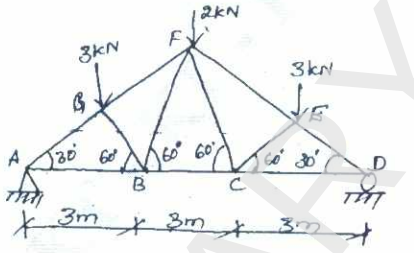

Fig.Q1(b)

OR

2 a. Define : i) Conditions of equilibrium ii) Degree of freedom iii) Assumptions in truss analysis. **(06 Marks)**

b. Determine the force in members CB and GC and state whether the members are in tension or compression Fig.Q2(b). Adopt method of section. **(10 Marks)**

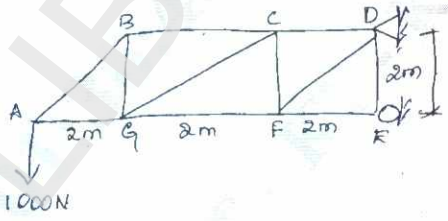

Fig.Q2(b)

Module-2

3 a. Determine the slope @ point 'C' of the beam in Fig.3(a) by moment area method. E = 200GPa, I = $6(10^6)mm^4$. **(08 Marks)**

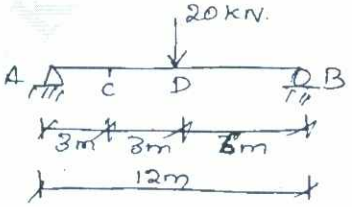

Fig.Q3(a)

b. By double integration method, determine slope and deflection at A for the beam shown in Fig.Q3(b). **(08 Marks)**

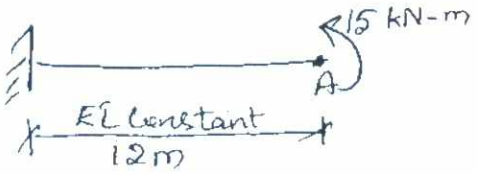

Fig.Q3(b)

OR

4 a. Using conjugate beam method, determine the slope and deflection @ point B of the beam shown in Fig. 4(a). EI is constant. **(08 Marks)**

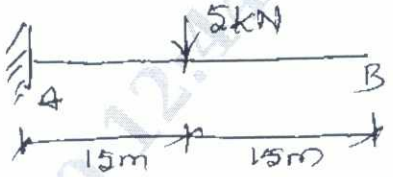

Fig.Q4(a)

b. Using Machaulay's method of deflection, calculate the deflection under two loads and maximum deflection for the beam shown in Fig.Q4(b). **(08 Marks)**

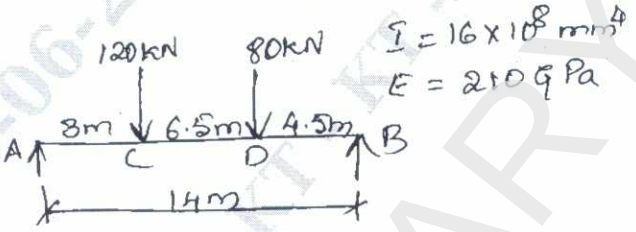

Fig.Q4(b)

Module-3

5 a. Explain the principles of virtual displacement and forces. **(06 marks)**

b. Using Castigliano's theorems, determine the vertical displacement of joint C of the truss shown in Fig.Q5(b). A = 400mm^2, E = 200GPa. **(10 Marks)**

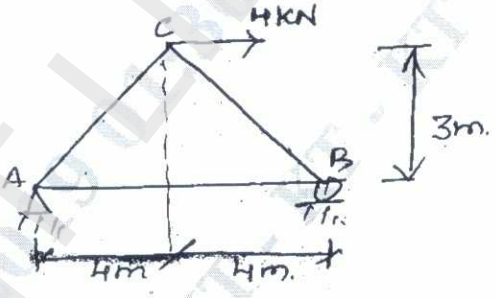

Fig.Q5(b)

OR

6 a. Derive strain energy in an axially loaded member. **(06 marks)**

b. A beam AB is simply supported over a span 5m in length. A concentrated load of 30kN is acting at a section 1.25m from left support A. Calculate the deflection under the load point using dummy unit load method. E = 200×10^6kN/m^2 I = 13×10^{-6}m^4. **(10 Marks)**

Module-4

7 a. A footbridge of width 3m and span 50m is carried by 2 cables of uniform section having a central dip of 5m. If the platform load is 5kN/m^2. Calculate the maximum pull in the cables. Find the necessary section area required if the allowable stress is 120N/mm^2. **(10 Marks)**

b. Derive the expression for the length of cable for supports at same levels. **(06 Marks)**

OR

8 A 3–hinged parabolic arch has span 16m and central rise 4m. It carries a point load of 100kN @ 4m from left support. Evaluate reaction components, moment, thrust and radial shear at a section 6m from left support. Take the equation of arch $y = 4h\ x(\ell - x)$ with left hand support as origin. Draw BMD. **(16 Marks)**

Module-5

9 a. a udl of 15kN/m covering a length of 3m crosses a girder of span 10m – find the max, shear force and bending moment at a section 4m from left support. **(08 Marks)**

b. Define influence line and its significance. **(08 Marks)**

OR

10 Determine maximum moment and shear force at point C shown in Fig.Q10. The loading is due to axle loads of IRC class A driving vehicle on top of the beam. Assume that the vehicle can move in either direction. **(16 Marks)**

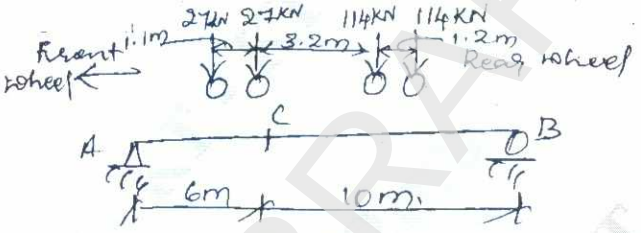

Fig.Q10

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15CV43

Fourth Semester B.E. Degree Examination, June/July 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 π-Theorem. Also explain its advantages over Rayleigh's method of dimensional analysis. **(05 Marks)**

b. A ship 300m long moves in sea-water, whose density is 1030 kg/m^3. A 1:100 model of this ship is to be tested in a wind tunnel. The velocity of air in the wind tunnel around the model is 30 m/s and the resistance of the model is 60N. Determine the velocity of ship in sea-water and also the resistance of the ship in sea-water. The density of air is given as 1.24 kg/m^3. Take the kinematic viscosity of sea-water and air as 0.012 strokes and 0.018 strokes respectively. **(08 Marks)**

c. Define: Buoyancy, Metacentre Metacentric height. **(03 Marks)**

OR

2 a. Explain the Froude model law. Derive the different scale ratio for Froude model law. **(08 Marks)**

b. Derive on the basis of dimensional analysis suitable parameters to present the thrust developed by a propeller. Assume that the thrust P depends upon the angular velocity W speed of advance V, diameter D, dynamic viscosity μ, mass density ρ, elasticity of the fluid medium which can be denoted by the speed of sound in the medium C. **(08 Marks)**

Module-2

3 a. Prove that for a channel of circular section the depth of flow d = 0.81D for maximum velocity. Where D = Diameter of circular channel, d = depth of flow. **(08 Marks)**

b. The discharge of water through a rectangular channel of which width 8m is 15m^3/s when 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 maximum specific energy. **(08 Marks)**

OR

4 a. Explain specific energy curve, and thus derive expression for critical depth and critical velocity. **(08 Marks)**

b. An open channel of most economical section, having the form of a half hexagon with horizontal bottom is required to give a maximum discharge of 20.2 m^3/s of water. The slope of the channel bottom is 1 in 2500. Taking Chezy's constant C = 60 in Chezy's equation, determine the dimensions of the cross-section. **(08 Marks)**

Module-3

5 a. Define the term hydraulic jump. Derive an expression for depth of hydraulic jump in terms of u/s Froude's 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. Derive an expression for the length of Back water curve **(08 Marks)**

b. A sluice gate discharge water in to a horizontal rectangular channel with a velocity of 6m/s and 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. **(08 Marks)**

Module-4

7 a. Derive an equation for the force existed by a jet of water on a fixed curved plate in the direction of the jet when the jet strikes at the centre of the plate. Hence show that the force exerted on semi circular plate is two times the force exerted by the jet on an fixed vertical plane plate. **(08 Marks)**

b. A pelton wheel is having a mean bucket diameter of 1m and is running at 999.9 rpm. The net head on the pelton wheel is 699m. If the side clearance angle is 15° and discharges through nozzle is $0.1m^3/s$ find:

i) Power available at the nozzle

ii) Hydraulic efficiency of the turbine. **(08 Marks)**

OR

8 a. A jet of water of diameter 50mm, having a velocity of 20 m/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 outlet.

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)**

b. What do you mean by gross had, net Head and efficiency of turbine? Explain the different types of the efficiency of a turbine. **(08 Marks)**

Module-5

9 a. Define draft tube. What are the different types of draft tube? Explain draft tube theory and its efficiency. **(08 Marks)**

b. A centrifugal pump is to discharge 0.118 m^3/sec a speed of 1450 rpm against a 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. **(08 Marks)**

OR

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

b. A Kaplan turbine develops 24647.6 kW power at an average head of 39m. Assuming a speed ratio of 2. Flow ratio of 0.6, diameter of the boss 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)**

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15CV/CT44

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

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS10262, IS 383 are permitted.

Module-1

1 a. Explain with the flow chart the manufacture of cement by dry process. **(06 Marks)**

b. What are the various tests conducted on coarse aggregate for determining its strength? Explain any two. **(06 Marks)**

c. List the different types of admixtures. **(04 Marks)**

OR

2 a. Explain hydration of cement and importance of Bogue's compounds. **(08 Marks)**

b. Explain the effect of fly ash and silica fume in the hardened state of concrete. **(08 Marks)**

Module-2

3 a. Define workability. Explain the factors affecting workability. **(08 Marks)**

b. Explain the different methods of curing. **(08 Marks)**

OR

4 a. Explain the process of manufacturing of concrete. **(08 Marks)**

b. Explain the good and bad practice of making and using fresh concrete. **(08 Marks)**

Module-3

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

b. List the insitu tests conducted on concrete. Explain the principle of rebound hammer test. **(08 Marks)**

OR

6 a. Discuss the various factors affecting the creep. **(06 Marks)**

b. Explain the different methods of controlling chloride attack on concrete. **(06 Marks)**

c. List the applications of ultrasonic pulse velocity test. **(04 Marks)**

Module-4

7 Design a concrete mix by I.S. method for M30 grade concrete as per IS 10262.

a. Grade : M30
b. Cement : OPC – 43 Grade
c. Maximum nominal size of aggregate : 20mm
d. Minimum cement content : 320 kg/m^3
e. Maximum W/C ratio : 0.45
f. Workability : 75mm slump
g. Exposure condition : severe
h. Maximum cement content : 450 kg/m^3
i. Method of concrete placing : pumping
j. Chemical admixture : Super plasticizer.

Test data for materials

i) Specific gravity of cement : 3.15
ii) Specific gravity of F.A : 2.75
iii) Specific gravity of C.A : 2.75
iv) Fine aggregate conforming to zone – II of table 3 of IS 383. **(16 Marks)**

OR

8 Design a concrete mix by IS method for M40 grade concrete as per IS:10262.

a. Grade : M40
b. Cement : OPC – 43 Grade
c. Maximum nominal size of aggregate : 20mm
d. Minimum cement content : 320 kg/m^3
e. Maximum W/C ratio : 0.45
f. Workability : 100mm slump
g. Exposure condition : severe (for reinforced concrete)
h. Maximum cement content : 450 kg/m^3
i. Method of concrete placing : pumping
j. Type of aggregate : crushed angular
k. Degree of supervision : Good
l. Chemical admixture : super plasticizer.

Test data for materials

i) Specific gravity of cement : 3.15
ii) Specific gravity of C.A. : 2.74
iii) Specific gravity of F.A : 2.74
iv) Water absorption for
C.A : 0.5%
F.A. : 1.0%
v) Fine aggregate conforming to grading zone-I of table 4 of IS 383. **(16 Marks)**

Module-5

9 a. Explain the advantages and disadvantages of RMC. **(06 Marks)**
b. Explain the properties of FRC. **(06 Marks)**
c. List the applications of light weight concrete. **(04 Marks)**

OR

10 a. Discuss the properties of self compacting concrete. **(08 Marks)**
b. Explain the applications of fiber reinforced concrete. **(08 Marks)**

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15CV45

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

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Missing data if any may be suitably assumed and clearly stated.***
3. ***Use of Plasticity chart allowed 1498-1970.***

Module-1

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

b. The following data were obtained in a shrinkage limit test :
Initial weight of saturated soil = 0.956N ; Initial volume of saturated soil = 6.85×10^{-5} m^3
Final dry volume = $2.41 \times 10^{-5} m^3$; Final dry weight = 0.435N.
Determine the shrinkage limit , initial bulk , unit weight , dry unit weight , specific gravity of soil solids, initial and final void ratios. **(08 Marks)**

OR

2 a. Explain IS classification system for coarse and fine grained soils as per 1498 – 1970. Use plasticity chart at the appropriate level. **(08 Marks)**

b. In an earthen embankment under construction the bulk unit weight is 16.50kN/m^3 at water content 11%. If the water content has to be increased to 15% , compute the quantity of water to be added per cubic meter of soil. Assuming no change in void ratio, determine the degree of saturation at this water content by taking G = 2.70. **(08 Marks)**

Module-2

3 a. With relevant sketches, explain the following : i) Single grained structure ii) Honey combed structure iii) Flocculant structure iv) Dispersed structure. **(08 Marks)**

b. Following are the observations of a compaction test :

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

If the compaction mould is 950CC and by assuming G = 2.65.
i) Draw the compaction curve.
ii) Report the optimum moisture content and maximum dry unit weight.
iii) Draw 100% saturation line. **(08 Marks)**

OR

4 a. With the help of neat sketch, explain any two principle clay minerals. **(08 Marks)**

b. Laboratory compaction test on soil having specific gravity of 2.7 gave a maximum dry unit weight of 18kN/m^3 and a water content of 15%. Determine the degree of saturation , air content and percentage air void at the maximum dry unit weight. What would be the theoretical maximum dry unit weight corresponding to zero air void at the optimum water content? **(08 Marks)**

Module-3

5 a. Explain the following : i) Effective stress concept ii) Seepage and superficial velocity iii) Quick sand condition iv) Capillary rise of water in soil. **(08 Marks)**

b. A soil stratum with permeability K = 5×10^{-7} cm/s overlies an impervious stratum. The impervious stratum lies at a depth of 18m below the ground surface. A sheet pile wall penetrates 8m into the permeable soil stratum. Water stands to a height of 9m on upstream side and 1.5m on downstream side above the surface of soil stratum. Sketch the flow net and determine the quantity of seepage. **(08 Marks)**

OR

6 a. Describe the Casagrande's method to locate the phreatic line in a homogeneous earth dam with a horizontal filter at its toe. **(08 Marks)**

b. In a falling head permeability test, the soil sample used is 20cm long with a cross – sectional area 24cm^2. Calculate the time required for the head causing flow to drop from 250mm to 120mm. The area of cross – section of the stand pipe is 2cm^2. The soil sample is made up of 3 layers. The thickness of first layer from the top is 8cm and has a value of K as 2×10^{-4} cm/s. The second layer has thickness of 7cm and it has K = 5×10^{-4}cm/s. The bottom most layer has a K value of 7×10^{-4} cm/s. Flow is in a direction perpendicular to the layers. **(08 Marks)**

Module-4

7 a. Explain Mass – spring anology theory of consolidation of soil. **(08 Marks)**

b. A clay soil, tested in a consolidometer , showed a decrease in void ratio from 1.20 to 1.10 when the pressure was increased from 0.25 to 0.50 Kgf/cm^2. Calculate the coefficient of compressibility (a_v) and the coefficient of volume compressibility (m_v). If the coefficient of consolidation (C_v) determined in the test for the given stress increment was 10m^2/year, calculate the coefficient of permeability in cm/s. **(08 Marks)**

OR

8 a. With the help of neat sketch , explain determination of preconsolidation pressure by Casagrande's method. **(04 Marks)**

b. Briefly explain normally consolidated, under consolidation and over consolidated soils. **(06 Marks)**

c. Following data were obtained from a consolidation test on a clay sample with double drainage conditions : Void ratio at 100 KPa = 1.37 ; Void ratio at 200 KPa = 1.25. Thickness of the soil sample at 100KPa = 20mm ; Coefficient of permeability = 5×10^{-7} mm/s. Calculate i) Compression index ii) Coefficient of volume change iii) Coefficient of consolidation in mm^2/year. **(06 Marks)**

Module-5

9 a. List the various test to determine shear strength parameters of soil and explain briefly any one method. **(06 Marks)**

b. In a direct shear test conducted on a dense sand, the sample fails at a shear stress of 75 kN/m^2, when the normal stress was held constant at 100kN/m^2. Draw the Mohr circle for the failure condition and determine i) the angle of shearing resistance ii) the orientation of the major and minor principal planes and the stress acting on them iii) the orientation of the plane of maximum shear stress. If a specimen of this soil were to be tested in a triaxial shear test under CD condition at a cell pressure of 125kN/m^2, at what axial stress would the sample fail? **(10 Marks)**

OR

10 a. Explain the types of shear test based on different drainage condition. **(06 Marks)**

b. An unconfined compression test was conducted on an undisturbed sample of clay. The sample had a diameter of 37.5mm and was 80mm long. The load at failure measured by the proving ring was 28N and the axial deformation of the sample at failure was 13mm. Determine the unconfined compressive strength and the undrained shear strength of the clay. **(10 Marks)**

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15CV46

Fourth Semester B.E. Degree Examination, June/July 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. Derive relationship between Radius and Degree of the curve. Draw Reverse curve for parallel straights and label the parts. **(08 Marks)**

b. Two tangents intersect at chainage of 59 + 60, the deflection angle being 50°30′. Calculate the necessary data for setting out a curve of 300 m radius to connect the two tangents by the offset from chords produced method with peg interval of 20 m. The chain is of 20 m length. **(08 Marks)**

OR

2 a. Give the requirement of transition curves on highways and why are vertical curves provided on highways? **(08 Marks)**

b. A Road bend deflects 80° and is to be designed for a maximum speed 100 kmph and centrifugal ration = 1/4. The maximum rate of change of acceleration = 30 cm/cubic.sec. The curve consists of a circular are combined with two spirals. Calculate the radius of the circular curve, length of the transition curve, total length of the combined curve, chainages of beginning and end of transition curve and junction of transition curves with circular curve? Chainage of point of intersection = 42862 m. **(08 Marks)**

Module-2

3 a. Briefly discuss on the classification of triangulation system with figures. **(08 Marks)**

b. Directions are observed from eccentric station S at 62.18m from station C. The following were the results $\hat{A} = 0°0'0''$, $\hat{B} = 21°54'32''$, $\hat{C} = 296°12'2''$, AC = 8240.6 m, BC = 10863.6m, obtain the angle $A\hat{C}B$? **(08 Marks)**

OR

4 a. What are probable errors, most probable value and normal equations? What is spherical excess? **(08 Marks)**

b. The following are the observation data:

$\hat{A} = 45°30'10''$ of weight 2

$\hat{B} = 40°20'20''$ of weight 3

$\hat{A} + \hat{B} = 85°50'10''$ of weight 1

Find most probable values of $\hat{A}$ and $\hat{B}$? **(08 Marks)**

Module-3

5 a. With sketches define the following:

i) Declination of star and hour angle

ii) Altitude of star and Azimuth **(08 Marks)**

b. Determine the azimuth and altitude of a star from the following data. Latitude of the observer = 48°, Hour angle of the star = 43 degrees, Declination of star = 18°20′ N. **(08 Marks)**

OR

6 a. What is Astronomical triangle? State the Napier's rule for solving the astronomical triangle? **(08 Marks)**

b. A star has a declination of 50°15′, its upper culmination is in the Zenith of the place. Find the altitude of the star at lower culmination. **(08 Marks)**

Module-4

7 a. State the different applications of photogrammetry. Derive equation for relief displacement in vertical aerial photograph. **(08 Marks)**

b. Two points A and B having elevations of 500 m and 300 m respectively above the datum appear in vertical photograph of focal length = 20 cms and flying height of the aircraft = 2500 m above the datum, their corrected coordinates are as follows:

Point	Photographic Coordinates	
	x (cms)	y (cms)
a	+2.65	+1.36
b	−1.92	+3.65

Determine the length of AB? **(08 Marks)**

OR

8 a. Briefly discuss on the procedure for carrying out the aerial survey to acquire the pictures of the specified area. **(08 Marks)**

b. The scale of the aerial photo is 1 cm = 100 m, the size of photo = 20cms × 20 cms. Determine number of photographs required to cover an area of 100 km^2 for the specified overlaps. **(08 Marks)**

Module-5

9 a. How is distance measurement carried out using EDM? **(05 Marks)**

b. Write a note on image interpretation technique. **(05 Marks)**

c. Briefly bring out the process on differential positioning in GPS. **(06 Marks)**

OR

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

b. What are the applications of total station? **(04 Marks)**

c. Briefly discuss on the different applications of GIS in civil engineering. **(04 Marks)**

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CBCS SCHEME

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15MATDIP41

Fourth Semester B.E. Degree Examination, June/July 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 the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$ by elementary row operation. **(06 Marks)**

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

c. Find all eigen values of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ **(05 Marks)**

OR

2 a. Solve the system of equation by Gauss - Elimination method.

$x + y + z = 9$
$x - 2y + 3z = 8$
$2x + y - z = 3$ **(06 Marks)**

b. Using Cayley – Hamilton theorem find A^{-1}, given $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ **(05 Marks)**

c. Reduce the matrix $A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ into row echelon form and hence find its rank. **(05 Marks)**

Module-2

3 a. Solve by the method of undetermined co-efficient $y'' - 4y' + 4y = e^x$. **(06 Marks)**

b. Solve $(D^3 + 6D^2 + 11D + 6)y = 0$. **(05 Marks)**

c. Solve $y'' + 2y' + y = 2x$. **(05 Marks)**

OR

4 a. Solve by the method of variation of parameter $y'' + a^2y = \sec ax$. **(06 Marks)**

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

c. Solve $(D^2 - 1)y = e^{2x}$. **(05 Marks)**

Module-3

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

b. Find $L[\cos t \cdot \cos 2t \cdot \cos 3t]$ **(05 Marks)**

c. Find $L[e^{-2t}(2\cos 5t - \sin 5t)]$ **(05 Marks)**

OR

6 a. Find $L[e^{-t} \cdot \cos^2 3t]$ **(06 Marks)**

b. Express the following function into unit step function and hence find $L[f(t)]$ given

$$f(t) = \begin{cases} t, & 0 < t < 4 \\ 5, & t > 4 \end{cases}$$ **(05 Marks)**

c. Find $L[t \cdot \cos at]$ **(05 Marks)**

Module-4

7 a. Using Laplace transforms solve the differential equation $y'' + 4y' + 4y = e^{-t}$ given $y(0) = 0$, $y'(0) = 0$. **(06 Marks)**

b. Find $L^{-1}\left[\frac{2s-5}{4s^2+25}\right] + L^{-1}\left[\frac{8-6s}{16s^2+9}\right]$ **(05 Marks)**

c. Find $L^{-1}\left[\frac{1}{s(s+1)(s+2)(s+3)}\right]$ **(05 Marks)**

OR

8 a. Employ Laplace transform to solve the equation

$y'' + 5y' + 6y = 5e^{2x}$, $y(0) = 2$, $y'(0) = 1$. **(06 Marks)**

b. Find $L^{-1}\left[\frac{s+5}{s^2-6s+13}\right]$ **(05 Marks)**

c. Find $L^{-1}\left[\log\left(\frac{s+a}{s+b}\right)\right]$ **(05 Marks)**

Module-5

9 a. If A and B are any two mutually exclusive events of S, then show that

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ **(06 Marks)**

b. Prove the following :

(i) $P(\phi) = 0$ (ii) $P(\overline{A}) = 1 - P(A)$ **(05 Marks)**

c. Three machines A, B and C produce respectively 60%, 30%, 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. **(05 Marks)**

OR

10 a. State and prove Bay's theorem. **(06 Marks)**

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

c. A shooter can hit a target in 3 out of 4 shots and another shooter can hit the target in 2 out of 3 shots. Find the probability that the target is being hit.

(i) when both of them try (ii) by only one shooter. **(05 Marks)**

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