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USN ☐☐☐☐☐☐☐☐☐☐ **10MAT41**

Fourth Semester B.E. Degree Examination, June/July 2015
Engineering Mathematics - IV

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART - A

1 a. Obtain y(0.2) using Picards method upto second iteration for the initial value problem
$$\frac{dy}{dx} = x^2 - 2y \quad y(0) = 1.$$ **(06 Marks)**

   b. Solve by Eulers modified method to obtain y(1.2) given $y' = \frac{y+x}{y-x}$ y(1) = 2. **(07 Marks)**

   c. Using Adam Bash forth method obtain y at x = 0.8 given **(07 Marks)**
$$\frac{dy}{dx} = x - y^2 \ , \quad y(0) = 0 \ , \quad y(0.2) = 0.02 \ , \quad y(0.4) = 0.0795 \text{ and } y(0.6) = 0.1762.$$

2 a. Solve by 4th order Runge Kutta method simultaneous equations given by
$$\frac{dx}{dt} = y - t \ , \quad \frac{dy}{dt} = x + t \text{ with } x = 1 = y \text{ at } t = 0 \text{ , obtain } y(0.1) \text{ and } x(0.1).$$ **(06 Marks)**

   b. Solve $\frac{d^2y}{dx^2} - x\left(\frac{dy}{dx}\right)^2 + y^2 = 0 \ , \ y(0) = 1 \ , \ y'(0) = 0.$ Evaluate y(0.2) correct to four decimal
   places, using Runge Kutta method of fourth order. **(07 Marks)**

   c. Solve for x = 0.4 using Milnes predictor corrector formula for the differential equation
   y" + xy' + y = 0 with y(0) = 1 , y(0.1) = 0.995 , y(0.2) = 0.9802 and y(0.3) = 0.956. Also
   z(0) = 0 , z(0.1) = -0.0995 , z(0.2) = -0.196 , z(0.3) = -0.2863. **(07 Marks)**

3 a. Verify whether f(z) = sin2z is analytic, hence obtain the derivative. **(06 Marks)**

   b. Determine the analytic function f(z) whose imaginary part is $\frac{y}{x^2 + y^2}$. **(07 Marks)**

   c. Define a harmonic function. Prove that real and imaginary parts of an analytic function are
   harmonic. **(07 Marks)**

4 a. Under the mapping w = e^z, find the image of i) $1 \leq x \leq 2$ ii) $\frac{\pi}{3} < y < \frac{\pi}{2}$. **(06 Marks)**

   b. Find the bilinear transformation which maps the points 1, i, -1 from z plane to 2, i, -2 into w
   plane. Also find the fixed points. **(07 Marks)**

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

PART - B

5 a. Prove $J_n(x) = \frac{x}{2n} [J_{n-1}(x) + J_{n+1}(x)].$ **(06 Marks)**

   b. Prove (n+1) $P_n(x) = (2n+1) x P_n(x) - n P_{n-1}(x).$ **(07 Marks)**

   c. Explain the following in terms of Legendres polynomials.
   $x^4 + 3x^3 - x^2 + 5x - 2$ **(07 Marks)**

1 of 2

Fourth Semester B.E. Degree Examination, June/July 2015
Concrete Technology

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer FIVE full questions, selecting*
at least TWO questions from each part.
2. Use of IS – 10262 – 2009 is permitted.

PART – A

1 a. What are the various laboratory tests conducted on cement? **(05 Marks)**
   b. Explain the importance of conducting the soundness test on cement and the procedure of conducting the soundness test. **(10 Marks)**
   c. Explain with the flow chart the manufacture of cement by wet process. **(05 Marks)**

2 a. Explain the importance of shape and texture of aggregate used in concrete. **(10 Marks)**
   b. Which are various tests conducted on coarse aggregates for determining its strength? **(05 Marks)**
   c. Explain bulking of aggregates. **(05 Marks)**

3 a. What is an admixture? What is the effect of air entrainment on the properties of concrete? **(12 Marks)**
   b. Write short notes on accelerators and retarders. **(08 Marks)**

4 a. Define workability and list the factors affecting workability. **(08 Marks)**
   b. List the various tests to measure workability and explain KEE BEE consistometer test. **(12 Marks)**

PART – B

5 a. What are factors affecting the strength of concrete? **(04 Marks)**
   b. Explain the accelerated curing test on concrete cubes. **(08 Marks)**
   c. Write short notes on Bond strength of concrete. **(08 Marks)**

6 a. Explain briefly the factors affecting modulus of elasticity of concrete. **(10 Marks)**
   b. Discuss the factors affecting creep. **(10 Marks)**

7 a. Explain the different methods of controlling sulphate attack on concrete. **(10 Marks)**
   b. Discuss the durability of concrete in sea water. **(10 Marks)**

8 Design a concrete mix by IS method for M30 grade concrete as per IS 10262 – 2009.
   a) Grade : M30
   b) Cement : OPC – 43 Grade
   c) Maximum Nominal size of aggregate : 20mm
   d) Minimum cement content : 320 Kg/m^3
   e) Max. w/c Ratio : 0.45
   f) Workability : 100mm slump
   g) Exposure condition : severe (Reinforced concrete)
   h) Method of concrete placing : pumping
   i) Degree of super vision : Good
   j) Type of aggregate : Crushed Angular
   k) Max. Cement content : 450 Kg/m^3
   l) Chemical admixture : Super plasticizer.

10CV43

Fourth Semester B.E. Degree Examination, June/July 2015
Structural Analysis – I

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting
atleast TWO questions from each part.
2. Missing data, if any, may be suitably assumed.

PART – A

1   a. Distinguish between statically determinate and indeterminate structures with examples.
    (08 Marks)

   b. Find degree of indeterminacy of following structure shown in Fig. Q1(b).   **(06 Marks)**

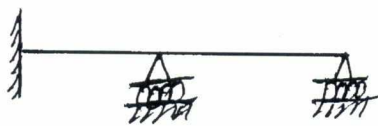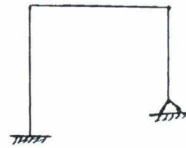
Fig.Q1(b)(i)   Fig.Q1(b)(ii)   Fig.Q1(b)(iii)

   c. Derive an expression for strain energy stored due to bending.   **(06 Marks)**

2   a. A cantilever beam of length 4 m is loaded as shown in Fig .Q2(a). Calculate the deflection
and slope at free end by moment area method. Taking EI is constant.   **(10 Marks)**
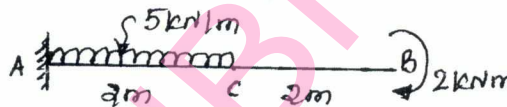
Fig.Q2(a)

   b. For the beam shown in Fig. Q2(b). Determine slope at left support and deflection at 100 kN
load, using conjugate beam method.   **(10 Marks)**

Fig.Q2(b)

3   a. Find the vertical deflection at C for the bent shown in Fig. Q3(a), by real work method
[strain energy]. Take EI is constant.   **(10 Marks)**

Fig.Q3(a)

   b. Determine the deflection under 60 kN loads in the beam shown in Fig.Q3(b), by strain
energy method.   **(10 Marks)**

Fig.Q3(b)

1 of 2

Fourth Semester B.E. Degree Examination, June/July 2015
Surveying – II

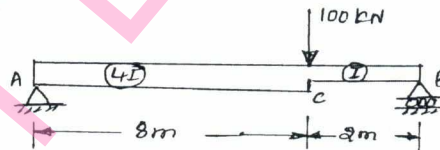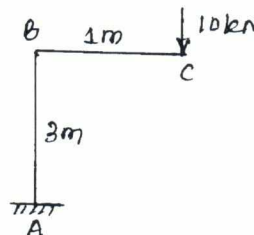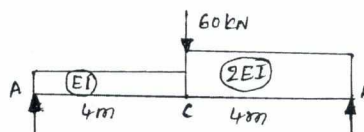Time: 3 hrs.   Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting*
atleast TWO questions from each part.
2. Draw neat sketches.
3. Missing data, if any, may be suitably assumed.

PART – A

1 a. Explain the following terms with reference to theodolite :
   i) transiting   ii) swinging   iii) line of collimation
   iv) horizontal axis   v) faceleft observation.   **(10 Marks)**
   b. With a neat sketch and tabular column, explain the measurement of horizontal
   angles by repetition method. List the errors that are eliminated by this method.
                                                                      (10 Marks)

2 a. What are the permanent adjustments of a theodolite? Explain the spire test.   **(10 Marks)**
   b. The following observations were made during the testing of a dumpy level

Instrument @	Staff Reading on	
	A	B
A	1.702	2.244
B	2.146	3.044

   Distance AB = 1500 meters.
   Is the instrument in adjustment? To what reading should the line of collimation be adjusted
   when the instrument were at B? If RL of A = 432.052 m, what should be the RL of B?
                                                                      (10 Marks)

3 a. What is a total station? List out the advantages of total station.   **(04 Marks)**
   b. Derive the expressions for the horizontal distance, vertical distance and the elevation of an
   object by double plane method, when the base is inaccessible   **(08 Marks)**
   c. In order to ascertain the elevation of the top(Q) of the signal on a hill, observations were
   made from two instrument stations P and R at a horizontal distance 100 meters apart, the
   stations P and R being in line with Q. The angles of elevation of Q at P and R were 28° 42′
   and 18°6′ respectively. The staff readings upon the benchmark of elevation 287.280 meters
   were respectively 2.870 and 3.750 m when the instrument was at P and R, the telescope
   being horizontal. Determine the elevation of the foot of the signal if the height of the signal
   above its base is 3 meters.   **(08 Marks)**

4 a. Derive the expressions for distance and elevation when the staff is held vertical and the line
   of sight is inclined.   **(10 Marks)**
   b. Determine the gradient from a point A to a point B from the following observations made
   with a tacheometer fitted with an anallactic lens. The constant at the instrument was 100 and
   the staff was held vertically.

Instrument station	Staff point	Bearing	Vertical angle	Staff readings
P	A	134°	+10° 32′	1.360, 1.915, 2.490
	B	224°	+5° 6′	1.065, 1.885, 2.705

                                                                      (10 Marks)

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Fourth Semester B.E. Degree Examination, June/July 2015
Hydraulics and Hydraulic Machines

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting*
atleast TWO questions from each part.
2. Assume missing data suitably.

PART – A

1 a. Explain the terms: distorted models and undistorted models.   **(04 Marks)**
 b. Explain Froude's model law. List its application in fluid flow problems.   **(06 Marks)**
 c. The resisting torque T against the motion of a shaft in a lubricated bearing depends on the viscosity μ, the rotational speed N, the diameter D and bearing pressure intensity P, show that $T = \mu ND^3 \phi \left[\dfrac{P}{\mu N} \right]$.   **(10 Marks)**

2 a. What do you understand best hydraulic channel section? Derive the conditions for best hydraulic triangular channel section.   **(10 Marks)**
 b. A trapezoidal channel with side sloper of 3 horizontal to 2 vertical has to be designed to convey 10 m³/s at a velocity of 1.5 m/s, so that the amount of concrete lining for the bed and sides is minimum. Find: i) The wetted perimeter; ii) Slope of the bed if Manning's n = 0.014.   **(10 Marks)**

3 a. Derive the differential equation for gradually varied flow and list all the assumptions.
                                                                           (10 Marks)
 b. A discharge of 18 m³/s flows through a rectangular channel 6m wide at a depth of 1.6m. Find:
  i)   Specific energy head
  ii)   Critical depth
  iii) State weather the flow is subcritical or supercritical
  iv)   What is the depth alternate to the given above?   **(10 Marks)**

4 a. Derive the expressions for force exerted by a jet on an inclined plate in the direction of the jet. i) When the plate is stationary? and   ii) When the plate is moving in the direction of jet?   **(10 Marks)**
 b. A jet of water of diameter 25mm strikes a 200mm × 200mm square plate of uniform thickness with a velocity of 10m/s at the centre of the plate which is suspended vertically by a hinge on its top horizontal edge. The weight of the plate is 98.1N. The jet strikes normal to the plate. What force must be applied at the lower edge of the plate so that plate is kept vertical? If the plate is allowed to deflect freely, what will be the inclination of the plate with vertical due to the force exerted by the jet of water?   **(10 Marks)**

1 of 2

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Fourth Semester B.E. Degree Examination, June/July 2015
Building Planning and Drawing

Time: 4 hrs.   Max. Marks:100

Note: 1. *Part A is compulsory and answer any Two full Questions from Part B*
         2. *Suitable data may be assumed whenever necessary.*

PART – A

1   The line diagram of residential building is given in Fig.Q1. Draw the following to a scale of 1:100.
  a. Plan at sill level
  b. Front Elevation   (20 Marks)
  c. Sectional Elevation Through Section "PQRS".   (10 Marks)
  d. Shedule of opening.   (25 Marks)
                                                                         (05 Marks)

PART – B

2 a. Draw the front Elevation and sectional plan view of Half paneled and half Glazed window of size 1.2m × 1.5m.
                                                                         (10 Marks)
   b. Draw plan and sectional Elevation of R.C.C Dog legged staircase for an office building which measures 3.0m × 5.5m. The Ver distance between floor is 3.3m (including landing). Thickness of the floor slab and landing slab = 150mm. Width of stair = 1.5m.
                                                                         (10 Marks)

3   Prepare working drawing of a Isolated footing of column size 350 × 500mm reinforced with 8 number of 12mm HYSD bars together with 8mm diameter tie (stirrups) at 150mm centre to centre. Tooting size is 2.0 × 2.5m. Effective depth 500mm at the face of column to 150mm at tip. The footing Reinforced compriser of 12mmφ HYSD bars at 150mm centre to centre both ways.
   a. Sectional elevation of column with footing.
   b. Sectional plan of column and footing.   (10 Marks)
                                                                         (10 Marks)

4   Prepare a Bubble diagram (connectivity diagram) of college canteen and develop a single line diagram based on the bubble diagram (to a suitable scale)
        1) Dining area for Boys and Girls separately
        2) Kitchen
        3) Juice Corner
        4) Snacks Corner
        5) Dining arc for staff
        6) Store for kitchen
        7) Utilities attached to kitchen
        8) Eland Washing
        9) Cash Counter
   The student strength of college is 2500.

                                                                         (20 Marks)

5   The line diagram of a Residential building is shown in Fig (Q.5) prepare water supply connection and sanitary connection with usual notations. (Assume Road direction) and road to the site as shown in Fig.Q5.
                                                                         (20 Marks)

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Fourth Semester B.E. Degree Examination, June/July 2015
Advanced Mathematics - II

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. Find the angle between 2 diagonals of a cube. **(06 Marks)**

b. If A(0 9 6), B(1 2 3) , C(7 - 25) are vertices of a triangle. Find the coordinates of the foot of the perpendicular drawn from A to BC. **(07 Marks)**

c. Find the equation of the plane in the Intercept form $\dfrac{x}{a}+\dfrac{y}{b}+\dfrac{z}{c}=1$. **(07 Marks)**

2 a. Find the equation of the plane passing through the three points $(2, 3, 4)$, $(-3, 5, 1)$ $(4, -1, 2)$. **(06 Marks)**

b. Find the equation of the plane through the points $(1, 2, -1)$ and perpendicular to the planes $x + y - 2z = 5$ and $3x - y + 4z = 12$. **(07 Marks)**

c. Find the equation of the plane through the points $(-1, 2, 0)$ and containing the plane $2x + 3y + 5z - 1 = 0$ and $3x + y - z + 2 = 0$. **(07 Marks)**

3 a. Find the unit vector parallel to the sum of the vector $\vec{A} = 2i + 4j - 5k$ and $\vec{B} = i + 2j + 3k$. **(06 Marks)**

b. Determine λ such that $\vec{A} = i + j + k$, $\vec{B} = 2i - 4k$. $\vec{C} = i + \lambda j + 3k$ are coplanar. **(07 Marks)**

c. Prove that $(\vec{a} \times \vec{b}) \times \vec{c} = (\vec{a}.\vec{c})\,\vec{b} - (\vec{b}.\vec{c})\,\vec{a}$. **(07 Marks)**

4 a. Prove that $\dfrac{d}{dt}[\vec{F}.\vec{G}] = \vec{F}.\dfrac{d\vec{G}}{dt} + \dfrac{d\vec{F}}{dt}.\vec{G}$. **(06 Marks)**

b. Find the velocity and acceleration for the curve $\vec{r} = (1-t^3)\,i + (1+t^2)j + (2t - 5)k$ at $t = 1$ and also find their magnitude. **(07 Marks)**

c. If $\dfrac{d\vec{a}}{dt} = \vec{w} \times \vec{a}$ and $\dfrac{d\vec{b}}{dt} = \vec{w} \times \vec{b}$ then show that $\dfrac{d}{dt}[\vec{a} \times \vec{b}] = \vec{w} \times (\vec{a} \times \vec{b})$. **(07 Marks)**

5 a. Find the directional derivative of $\phi = x^2 yz + 4xz^2$ at $(1, -2, -1)$ along $2i - j - 2k$. **(06 Marks)**

b. If $\vec{F} = (x + y + 1)\,i + j - (x + y)k$. Find $\vec{F}.\text{curl}\,\vec{F}$. **(07 Marks)**

c. Show that $\nabla.(\nabla \times \vec{A}) = 0$. **(07 Marks)**

6 a. Find L f(t) given that $f(t) = \begin{cases} t ; & 0 < t < 4 \\ 5 ; & t > 4 \end{cases}$ **(05 Marks)**

b. Find i) $L[e^{3t} \sin 5t \sin 3t]$ ii) $L[t^5 \cosh 3t]$ iii) $L[t^3 e^{-3t}]$. **(15 Marks)**

7 a. Find $L\left[\dfrac{1-e^t}{t}\right]$. **(05 Marks)**

b. Find i) $L^{-1}\left[\dfrac{4s + 5}{(s-1)^2 (s+2)}\right]$ ii) $L^{-1}\left[\dfrac{4s+15}{16s^2 - 25}\right]$ iii) $L^{-1}\left[\dfrac{s}{s^2 - 6s + 9}\right]$. **(15 Marks)**

1 of 2