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10MAT41

Fourth Semester B.E. Degree Examination, June 2012

Engineering Mathematics - IV

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Using the Taylor's method, find the third order approximate solution at x = 0.4 of the problem $\frac{dy}{dx} = x^2y + 1$, with y(0) = 0. Consider terms upto fourth degree. **(06 Marks)**

b. Solve the differential equation $\frac{dy}{dx} = -xy^2$ under the initial condition y(0) = 2, by using the modified Euler's method, at the points x = 0.1 and x = 0.2. Take the step size h = 0.1 and carry out two modifications at each step. **(07 Marks)**

c. Given $\frac{dy}{dx} = xy + y^2$; y(0) = 1, y(0.1) = 1.1169, y(0.2) = 1.2773, y(0.3) = 1.5049, find y(0.4) correct to three decimal places, using the Milne's predictor-corrector method. Apply the corrector formula twice. **(07 Marks)**

2 a. Employing the Picard's method, obtain the second order approximate solution of the following problem at x = 0.2.

$$\frac{dy}{dx} = x + yz; \quad \frac{dz}{dx} = y + zx; \quad y(0) = 1, \quad z(0) = -1.$$ **(06 Marks)**

b. Using the Runge-Kutta method, solve the following differential equation at x = 0.1 under the given condition:

$$\frac{d^2y}{dx^2} = x^3\left(y + \frac{dy}{dx}\right), \quad y(0) = 1, \quad y'(0) = 0.5.$$

Take step length h = 0.1. **(07 Marks)**

c. Using the Milne's method, obtain an approximate solution at the point x = 0.4 of the problem $\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 6y = 0$, y(0) = 1, y'(0) = 0.1. Given y(0.1) = 1.03995, y'(0.1) = 0.6955, y(0.2) = 1.138036, y'(0.2) = 1.258, y(0.3) = 1.29865, y'(0.3) = 1.873. **(07 Marks)**

3 a. Derive Cauchy-Riemann equations in polar form. **(06 Marks)**

b. If f(z) is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$. **(07 Marks)**

c. If w = ϕ + iy represents the complex potential for an electric field and $y = x^2 - y^2 + \frac{x}{x^2 + y^2}$ determine the function ϕ. Also find the complex potential as a function of z. **(07 Marks)**

4 a. Discuss the transformation of $w = z + \frac{k^2}{z}$. **(06 Marks)**

b. Find the bilinear transformation that transforms the points $z_1 = i$, $z_2 = 1$, $z_3 = -1$ on to the points $w_1 = 1$, $w_2 = 0$, $w_3 = \infty$ respectively. **(07 Marks)**

c. Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$ where c is the circle $|z| = 3$, using Cauchy's integral formula. **(07 Marks)**

PART – B

5 a. Obtain the solution of $x^2y'' + xy' + (x^2 - n^2)y = 0$ in terms of $J_n(x)$ and $J_{-n}(x)$. **(06 Marks)**

b. Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials. **(07 Marks)**

c. Prove that $\int_{-1}^{+1} P_m(x) \cdot P_n(x) dx = \frac{2}{2n+1}$, $m = n$. **(07 Marks)**

6 a. From five positive and seven negative numbers, five numbers are chosen at random and multiplied. What is the probability that the product is a (i) negative number and (ii) positive number? **(06 Marks)**

b. If A and B are two events with $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$, $P(A \cap B) = \frac{1}{4}$, find $P(A/B)$, $P(B/A)$, $P(\overline{A}/\overline{B})$, $P(\overline{B}/\overline{A})$ and $P(A/\overline{B})$. **(07 Marks)**

c. In a certain college, 4% of boy students and 1% of girl students are taller than 1.8 m. Furthermore, 60% of the students are girls. If a student is selected at random and is found taller than 1.8 m, what is the probability that the student is a girl? **(07 Marks)**

7 a. A random variable x has the density function $P(x) = \begin{cases} Kx^2, & 0 \le x \le 3 \\ 0, & \text{elsewhere} \end{cases}$. Evaluate K, and find: i) $P(x \le 1)$, (ii) $P(1 \le x \le 2)$, (iii) $P(x \le 2)$, iv) $P(x > 1)$, (v) $P(x > 2)$. **(06 Marks)**

b. Obtain the mean and standard deviation of binomial distribution. **(07 Marks)**

c. In an examination 7% of students score less than 35% marks and 89% of students score less than 60% marks. Find the mean and standard deviation if the marks are normally distributed. It is given that $P(0 < z < 1.2263) = 0.39$ and $P(0 < z < 1.4757) = 0.43$. **(07 Marks)**

8 a. A random sample of 400 items chosen from an infinite population is found to have a mean of 82 and a standard deviation of 18. Find the 95% confidence limits for the mean of the population from which the sample is drawn. **(06 Marks)**

b. In the past, a machine has produced washers having a thickness of 0.50 mm. To determine whether the machine is in proper working order, a sample of 10 washers is chosen for which the mean thickness is found as 0.53 mm with standard deviation 0.03 mm. Test the hypothesis that the machine is in proper working order, using a level of significance of (i) 0.05 and (ii) 0.01. **(07 Marks)**

c. Genetic theory states that children having one parent of blood type M and the other of blood type N will always be one of the three types M, MN, N and that the proportions of these types will on an average be 1 : 2 : 1. A report states that out of 300 children having one M parent and one N parent, 30% were found to be of type M, 45% of type MN and the remainder of type N. Test the theory by χ^2 (Chi square) test. **(07 Marks)**

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10CV42

Fourth Semester B.E. Degree Examination, June 2012
Concrete Technology

Time: 3 hrs. Max. Marks:100

Note: *1. Answer FIVE full questions, selecting at least TWO questions from each part.*
2. Assume any missing data suitably. Use IS10262 – 2009.

PART – A

1 a. Mention different types of cement. **(10 Marks)**

b. What are different laboratory tests conducted on cement in the laboratory? Explain any one of them in detail. **(10 Marks)**

2 a. Explain bulking of sand and its importance. **(06 Marks)**

b. What is meant by grading of aggregates? Explain the importance of size, shape and texture with respect to coarse aggregates. **(14 Marks)**

3 a. Define workability. What are the factors which affect the workability of concrete? **(08 Marks)**

b. Explain plasticizers, accelerators and retarders. **(12 Marks)**

4 a. Write a note on the following:
i) Batching; ii) Mixing; iii) Placing; iv) Curing. **(10 Marks)**

b. Explain the following:
i) Flyash; ii) Silica fume; iii) Rice husk ash; iv) GGBS. **(10 Marks)**

PART – B

5 a. Explain the following:
i) Maturity of concrete; ii) Modulus of rupture. **(06 Marks)**

b. What are the different methods of testing hardened property of concrete? Explain. **(14 Marks)**

6 a. Explain different types of shrinkage in concrete. **(10 Marks)**

b. Write short notes on: i) Creep; ii) Modulus of elasticity. **(10 Marks)**

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

b. Explain sulphate attack and chloride attack. **(10 Marks)**

8 Design the concrete mix for M_{20} grade concrete with the following data:
a. Characteristic compressive strength at 28 days-20 MPa.
b. Maximum size of aggregate – 20mm.
c. Degree of workability compaction factor – 0.8 (C.F).
d. Degree of quality control – Good, Mild.
e. Types of exposure: SP gravity of cement – 3.15
SP. gravity of coarse aggregate – 2.60
SP. gravity of fine aggregate – 2.60
Sand confirming to zone III
Assume any other data required suitably. **(20 Marks)**

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10CV43

Fourth Semester B.E. Degree Examination, June 2012
Structural Analysis – I

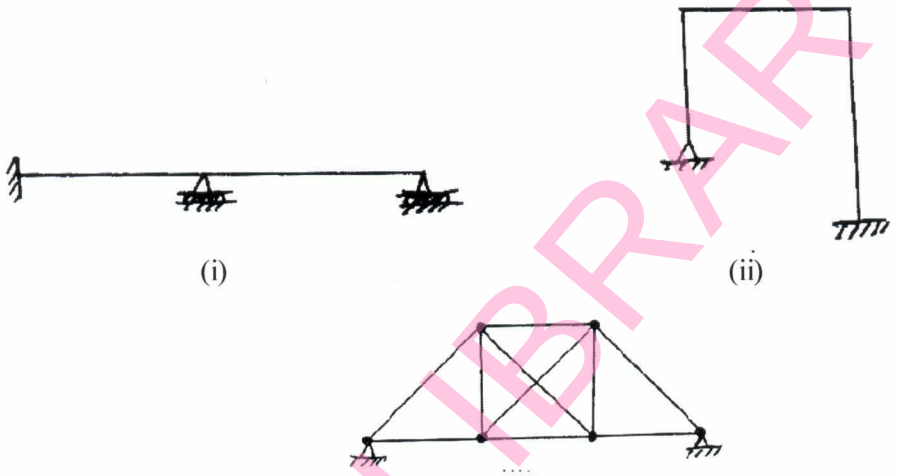
Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain static indeterminacy and kinematic indeterminacy with example. **(08 Marks)**

b. Obtain the degree of static indeterminacy and degree of kinematic indeterminacy for the structures shown in Fig.Q1 (b). **(06 Marks)**



(i) (ii) (iii)

Fig.Q1(b)

c. Derive the expression for strain energy in an elastic member due to bending. **(06 Marks)**

2 a. For the beam shown in Fig.Q2(a), determine slope at left support and deflection at 100 kN load, using moment area method. **(10 Marks)**

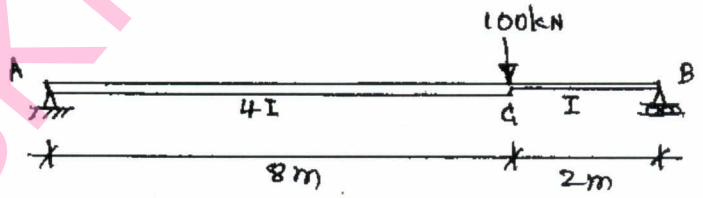


Fig.Q2(a)

b. For the beam shown in Fig.Q2(b), determine slope at left support and deflection at free end, using conjugate beam method. **(10 Marks)**

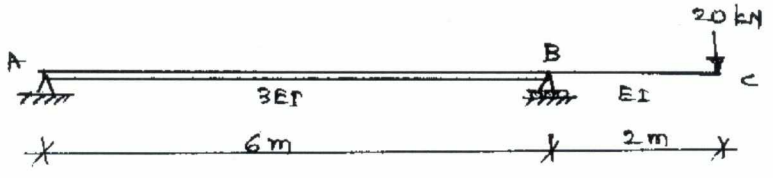


Fig.Q2(b)

3 a. Using Castigliano's theorm, obtain slope and deflection at the free end A, for the beam shown in Fig.Q3(a). **(10 Marks)**

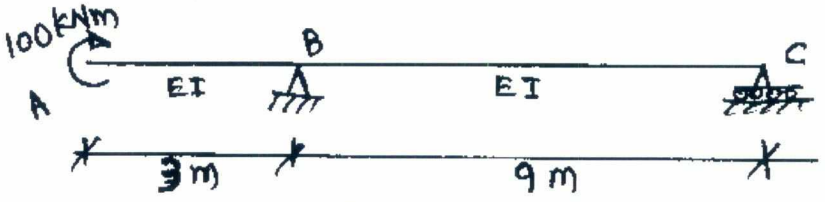


Fig.Q3(a)

b. Using Castigliano's theorm, determine the vertical and horizontal deflection at free end of bracket shown in Fig.Q3(b). **(10 Marks)**

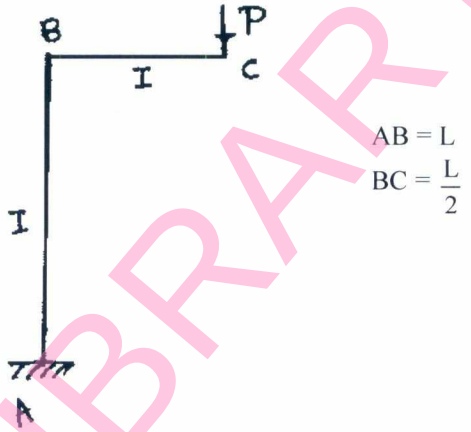


Fig.Q3(b)

4 a. Using strain energy method, determine the reaction at prop for a propped cantilever carrying UDL of w/m throughout. **(08 Marks)**

b. For the fixed beam shown in Fig.Q4(b), determine the reaction at support A and draw BMD, SFD, using strain energy method. **(12 Marks)**

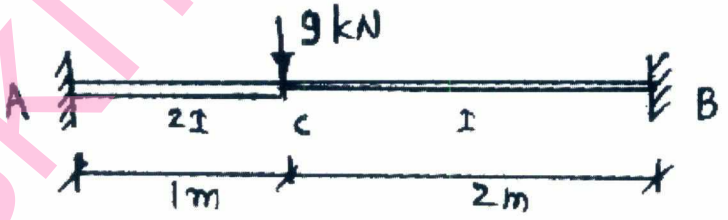


Fig.Q4(b)

PART – B

5 a. A three linged parabolic arch of 20 m symmetrical span and 5 m rise, carries a UDL of 40 kN/m on the entire span and a point load of 200 kN at 5 m from right end. Determine the reactions. Also determine BM, normal thrust and radial shear at 5 m from left end. **(10 Marks)**

b. A foot bridge 3 m wide is supported by two suspension cables with a central dip of 3 m and horizontal span of 30 m. Determine the maximum and minimum tension in cable. Also determine the length of cable and cross-sectional area of cable. The foot bridge has to carry a load of 10 kN/sq.m. Permissible stress in cable is 120 MPa. **(10 Marks)**

6 a. Analyse the propped cantilever shown in Fig.Q6(a), using consistant deformation methods. Draw BMD. EI-Constant throughout. **(10 Marks)**

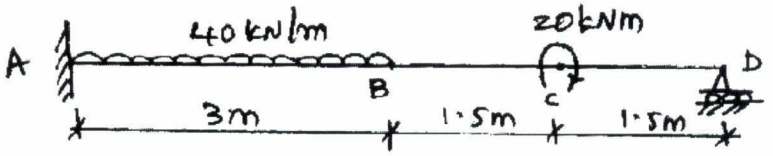


Fig.Q6(a)

b. Analyse the fixed beam shown in Fig.Q6 (b). Draw BMD. **(10 Marks)**

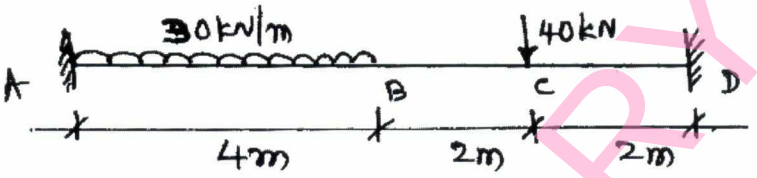


Fig.Q6(b)

7 Using three moment equations analyse the continuous beam shown in Fig.Q7. Draw SFD and BMD. **(20 Marks)**

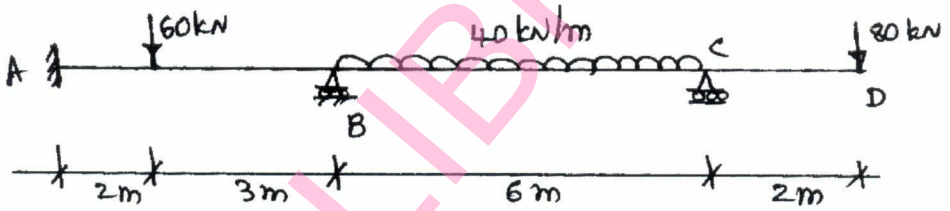


Fig.Q7 EI = constant through out

8 A two hinged parabolic arch, with I proportional to the secant of slope of arch axis, is having a span of 20 m and central rise of 4 m. It is subjected to a single point load of 50 kN at 6 m from left end. Determine the reactions. Also obtain normal thrust and radial shear at 5 m from left support. **(20 Marks)**

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10CV44

Fourth Semester B.E. Degree Examination, June 2012
Surveying – II

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Distinguish between :
   i) Horizontal axis and Vertical axis
   ii) Face left and Face right observation.
   iii) Clamp screw and Tangent screw
   iv) Transiting and line of collimation. **(08 Marks)**

   b. Explain the measurement of a horizontal angle by repetition method. Draw a typical tabular column. Mention the errors eliminated by this method. **(12 Marks)**

2 a. Explain the adjustment of horizontal axis of a transit theodolite by the 'spire test'. **(10 Marks)**

   b. A dumpy level was setup at 'C', midway between two points A and B, 80 m apart. Staff readings on A and B were 3.200 and 3.015 m respectively. The instrument was then shifted to 'D', 20 m away from B in line with AB. The respective staff readings were 2.825 m and 2.690 m. Calculate the staff readings at A and B to provide horizontal line of sight. **(10 Marks)**

3 a. Explain the method of finding the reduced level of the top of the given object whose base is inaccessible by double plane method. **(10 Marks)**

   b. Find the elevation of top of the chimney from the following data :

Instrument station	Reading on BM	Angle of elevation	Remarks
A	0.862	18° 36′	RL of BM = 421.380 m
B	1.222	10° 12′	Distance AB = 50 m

   Stations A and B and top of chimney are in the same vertical plane. **(10 Marks)**

4 a. What is tacheometry? What are the different systems of tacheometric measurements? **(06 Marks)**

   b. Sighted horizontally, a tcheometric reads 1.645 and 2.840 corresponding to stadia wires, are vertical staff 120 m away. The focal length of the object glass is 200 mm and the distance from the object glass to the trunion axis is 150 mm. Calculate the stadia interval. **(08 Marks)**

   c. A subtense theodolite was used to determine the horizontal distance of a point from the instrument station. The micrometer readings of the drum of the diaphragm were respectively 3.425 and 3.930, when the staff intercept was 3 m, The micrometer screw has 100 threads for from the centre of the object glass was measured as 200 mm. **(06 Marks)**

PART – B

5 a. Derive the expression for tangential angle by Rankiness principle of deflection angle method. **(06 Marks)**

   b. Derive the relation ship between various elements of a reverse curve for parallel straights when the conditions are i) unequal radius ii) $\Delta_1 = \Delta_2$. **(08 Marks)**

   c. Two straight lines with a total deflection angle of 72° 30′ are to be connected by a compound curve of two branches of equal length. The radius of the first are is 350 mts and that of second arc is 500 mts and the change of vertex is 1525 mts. Find the chainages of two tangent points and that of point of compound curvature. **(06 Marks)**

6 a. Explain the principle of least square. **(02 Marks)**

b. What is meant by a satellite station and reduction to centre? Derive the expression for reducing the angles measured at the satellite stations to centre. **(10 Marks)**

c. In measuring angles from a triangulation B, it was found necessary to set the instrument at a satellite station 'S' due south of the main station 'B' and at a distance of 12.2 mts from it. The line BS approximately bisects the exterior angle ABC. The angles ASB and BSC are observed to be 30° 20′ 30″ and 29° 45′ 6″ respectively. When the station B was observed, the ∠CAB = 59° 18′ 26″ and ∠ACB = 60° 26′ 12″ AC = 4248.5 mm from the adjacent triangle. Determine the correct value of the angle ABC. **(08 Marks)**

7 a. What is transition curve? Why and where these curves are provided? List the conditions to be fulfilled by a transition curve. **(06 Marks)**

b. What are vertical curves and where they are used? **(04 Marks)**

c. A transition curve is required for a circular curve of 200 mts radius, the gauge being 1.5 mts and maximum super elevation restricted to 15 mts. The transition is to be designed for a velocity such that no lateral pressure is imposed on the rails and the rate of gain of radial acceleration is 30 cm/ sec^3. Calculate the required length of the transition curve and the design speed. **(10 Marks)**

8 a. What is Simpson's rule? Derive the expression for it. **(06 Marks)**

b. What is "zero circle" of a planimeter? Explain any one method of finding its area. **(06 Marks)**

c. The following readings were obtained when an area was measured by a planimeter, the tracing arm being set to a natural scale. The initial reading and final readings were 2.268 and 4.582. The zero of the disc passed the index mark once in the clockwise direction. The anchor point was inside the figure with the value of the constant c = 26.430.

i) Calculate the area of the figure

ii) If the area of the figure drawn to a scale of 1 inch = 64 feet, find the area of the figure. **(08 Marks)**

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10CV45

Fourth Semester B.E. Degree Examination, June 2012
Hydraulics and Hydraulic Machines

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Describe the geometric similarity, kinematic similarity and dynamic similarity. **(06 Marks)**

b. Explain the Rayleigh's method of dimensional analysis, with an example. **(06 Marks)**

c. Water is flowing through a pipe of diameter 40 cm at a velocity of 4 m/s. Find the velocity of oil flowing in another pipe of diameter 10 cm, if the condition of dynamic similarity is satisfied between the two pipes. The viscosity of water and oil are given as 0.01 Poise and 0.025 Poise. The specific gravity of oil = 0.8. **(08 Marks)**

2 a. Show that the sloping side of a most economical trapezoidal section makes an angle 60° with horizontal. **(06 Marks)**

b. Determine the maximum discharge of water through a circular channel of diameter 2 m when the bed slope of the channel is 1 in 1500. Take C = 60. **(06 Marks)**

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

3 a. Derive an expression for critical depth and critical velocity in case of non-uniform flow through rectangular channel. **(06 Marks)**

b. The discharge of water through a rectangular channel of width 10 m, is 20 m^3/s when depth of flow of water is 2 m. Calculate

i) Specific energy of flowing water.
ii) Critical depth and critical velocity.
iii) Minimum specific energy. **(06 Marks)**

c. A sluice gate discharges water into a horizontal rectangular channel with a velocity of 6 m/s and depth of flow is 0.4 m. The width of the channel is 8 m. Determine whether a hydraulic jump will occur, and if so, find tits height and loss of energy per kg of water. Also determine the power lost in the hydraulic jump. **(08 Marks)**

4 a. The diameter of nozzle fitted to a pipe is 100 mm. The head of water at the centre of nozzle is 100 m. Find the force exerted by the jet of water on a fixed vertical plate. The coefficient of velocity is given as 0.95. **(06 Marks)**

b. A jet of water of 40 mm diameter strikes a hinged square plate at its centre, with a velocity of 20 m/s. The plate is deflected through an angle of 30°. Find the weight of the plate. If the plate is not allowed to swing, what will be the force required at the lower edge of the plate to keep the plate in vertical position. **(06 Marks)**

c. A 80 mm diameter jet having a velocity of 40 m/s strikes a flat plate, the normal of which is inclined at 45° to the axis of the jet. Find the normal pressure on the plate: i) when the plate is stationary, and ii) when the plate is moving with a velocity of 20 m/s and away from the jet. Also determine the power and efficiency of the jet when the plate is moving. **(08 Marks)**

PART – B

5 a. A jet of water strikes an unsymmetrical moving curves plate tangentially at one of the tips. Derive an expression for the force exerted by the jet in the horizontal direction of motion. Also describe the velocity triangles and obtain an expression for work done and efficiency. **(10 Marks)**

b. A jet of water moving at 15 m/s impinges on symmetrical curved vane tangentially to deflect the jet through 120°, find the angle of the jet so that there is no shock at inlet. What is the absolute velocity of the jet at exit in magnitude and direction and the work done per second per unit weight of water striking per second? Assume that the vane is smooth. **(10 Marks)**

6 a. For a Pelton wheel, derive an expression for work done and hydraulic efficiency. Also determine the condition for maximum hydraulic efficiency. **(10 Marks)**

b. The water available for a Pelton wheel is 4 cumecs and the total head from the reservoir to the nozzle is 250 m. The turbine has two runners with two jets per runner. All the four jets have the same diameters. The pipeline is 3000 m long. The efficiency of power transmission through the pipeline and the nozzle is 91% and efficiency of each runner is 90%. The velocity coefficient of each nozzle is 0.975 and coefficient of friction '4f' for the pipe is 0.0045. Determine i) the power developed by the turbine ii) the diameter of the jet and iii) the diameter of the pipeline. **(10 Marks)**

7 a. Define draft tube theory and obtain an expression for efficiency of a draft tube. **(06 Marks)**

b. What is cavitation? Mention the precautions to be taken against cavitation. What are the effects of cavitation? **(06 Marks)**

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

8 a. Describe the different heads of a centrifugal pump with necessary equations. **(06 Marks)**

b. The diameter of an impeller of a centrifugal pump at inlet and outlet at 30 cm and 60 cm respectively. The velocity of flow at outlet is 2.0 m/s and the vanes are set back at an angle of 45° at the outlet. Determine the minimum starting speed of the pump if the manometric efficiency is 70%. **(06 Marks)**

c. A three stage centrifugal pump has impellers 40 cm in diameter and 2 cm wide at outlet. The vanes are curved back at the outlet at 45° and reduce the circumferential area by 10%. The manometric efficiency is 90% and the overall efficiency is 80%. Determine the head generated by the pump when running at 1000 rpm delivering 50 litres per second. What should be the shaft horse power? **(08 Marks)**

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MATDIP401

Fourth Semester B.E. Degree Examination, June 2012
Advanced Mathematics - II

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Find the angles between any two diagonals of a cube. **(06 Marks)**

b. Find the equations of two planes, which bisect the angles between the planes $3x - 4y + 5z = 3$, $5x + 3y - 4z = 9$. **(07 Marks)**

c. Find the image of the point (1, 2, 3) in the line $\frac{x+1}{2} = \frac{y-3}{3} = -z$ **(07 Marks)**

2 a. Find the equation of the plane through the point (1, -1, 0) and perpendicular to the line $2x + 3y + 5z - 1 = 0 = 3x + y - z + 2$. **(06 Marks)**

b. Find the value of k such that the line $\frac{x}{k} = \frac{y-2}{2} = \frac{z+3}{3}$ and $\frac{x-2}{2} = \frac{y-6}{3} = \frac{z-3}{4}$ are coplanar. For this k find their point of intersection. **(07 Marks)**

c. Find the distance of the point (1, -2, 3) from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$. **(07 Marks)**

3 a. Show that the position vectors of the vertices of a triangle $\vec{a} = 3(\sqrt{3}\hat{i} - \hat{j})$, $\vec{b} = 6\hat{j}$, $\vec{c} = 3(\sqrt{3}\hat{i} + \hat{j})$ form an isosceles triangle. **(06 Marks)**

b. Find the unit normal to both the vectors $4\hat{i} - \hat{j} + 3\hat{k}$ and $-2\hat{i} + \hat{j} - 2\hat{k}$. Find also the sine of the angle between them. **(07 Marks)**

c. Prove that the position vectors of the points A, B, C and D represented by the vectors $-\hat{j} - \hat{k}$, $4\hat{i} + 5\hat{j} + \hat{k}$, $3\hat{i} + 9\hat{j} + 4\hat{k}$ and $-4\hat{i} + 4\hat{j} + 4\hat{k}$, respectively are coplanar. **(07 Marks)**

4 a. Find the value of λ so that the points A(-1, 4, -3), B(3, 2, -5), C(-3, 8, -5) and D(-3, λ, 1) may lie on one plane. **(06 Marks)**

b. If $\vec{a}, \vec{b}, \vec{c}$ are the position vectors of points A, B, C, prove that $(\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a})$ is a vector perpendicular to the plane of triangle ABC. **(07 Marks)**

c. Find a set of vectors reciprocal to the set $2\hat{i} + 3\hat{j} - \hat{k}$, $\hat{i} - \hat{j} - 2\hat{k}$, $\hat{i} + 2\hat{j} + 2\hat{k}$. **(07 Marks)**

5 a. Find the maximum directional derivative of $\log(x^2 + y^2 + z^2)$ at (1, 1, 1). **(06 Marks)**

b. Find the unit normal vector to the curve $\vec{r} = 4\sin t\hat{i} + 4\cos t\hat{j} + 3t\hat{k}$. **(07 Marks)**

c. Show that $\vec{F} = \frac{x\hat{i} + y\hat{j}}{x^2 + y^2}$ is both solenoidal and irrotational. **(07 Marks)**

6 a. Find the Laplace transforms of $\sin^2 3t$ and $\sqrt{t}$. **(06 Marks)**

b. Find L[f(t)], given that $f(t) = \begin{cases} t-1 & 0 < t < 2 \\ 3-t & t > 2 \end{cases}$. **(07 Marks)**

c. Find the Laplace transform of $e^{2t}\cos t + t\,e^{-t}\sin 2t$. **(07 Marks)**

7 a. Find the Laplace transform of $\int_0^t \cos 2(t-u)\cos 3u\,du$. **(06 Marks)**

b. Find the inverse Laplace transform of

i) $\frac{s+1}{s^2-s+1}$ ii) $\frac{1}{s(s^2+a^2)}$. **(14 Marks)**

8 a. Find the inverse Laplace transform by using convolution theorem of $\frac{1}{(s^2+a^2)^2}$. **(10 Marks)**

b. By applying Laplace transform, solve the differential equation $\frac{d^2y}{dt^2}+5\frac{dy}{dt}+6y=5e^{2t}$. Subject to the conditions $y(0)=2$, $y'(0)=1$. **(10 Marks)**

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