Code No.: **30M07** | **MR13**

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, NOVEMBER-2018

Subject: **MATHEMATICS – II**

Branch: **CE**

Time: 3 hours **Max. Marks: 75**

PART – A

I. Answer ALL questions of the following **5x1Mark=5 Marks**

1. Prove that $\nabla \cdot \bar{r} = 3$
2. When f(x) = x on (-1, +1) is expanded in Fourier series then the series does not contain what terms?
3. Find the Δ^2 f(x) if $f(x) = x^2+2x+1$ and h=3
4. Distinguish between Simpson's 1/3,3/8 Integration rules with respect to computational advantage, error.
5. Given an initial value problem to be solved state whether Picard's successive iteration method and Taylor's series method are both equally computationally comfortable within some tolerance limit?

II. Answer ALL questions of the following **10x2Mark=20 Marks**

1. Find the angle between the normals to the surface $xy^3z^2 = 4$ at the points (-1, -1, 2) and (4, 1, -1)
2. In what direction from (3, 1,-2) is the directional derivative of $\phi = x^2 y^2 z^4$ maximum? Find also the magnitude of the maximum.
3. Prove that if F(s) is the complex Fourier transform of f(x),Then $F\{f(x-a)\}=e^{isa}F(s)$.
4. Find half-range sine series for the function f(x) = x in the range $0<x<\pi$.
5. Evaluate $\Delta(x^3+\cos x)$
6. Prove that $\mu=\frac{1}{2}(E^{\frac{1}{2}} + E^{\frac{-1}{2}})$
7. Write the normal equations of fitting a parabola.
8. Find a root of the equation $x^3-2x-5=0$, by the bisection method, correct to three decimal places.
9. Using Picard's method of success approximation, find the first approximation of the equation

   $\frac{dy}{dx} = y + x$, y(0) = 1.

10. Using Simpson's $\frac{3}{8}^{th}$ rule Evaluate $\int_0^6 \frac{1}{1+x^2}$ by taking n = 6.

PART-B

Answer ALL questions of the following **5x10 Marks= 50Marks**

1. Find total work done by force field $\bar{F} = (x + 2y + 4z)\bar{\imath} + (2x - 3y - z)\bar{\jmath} + (4x - y + 2z)\bar{k}$ in moving an object from origin 0 to P(1,1,1).

OR

2. Verify Gauss divergence theorem for $\bar{F} = (x^3 - yz)\bar{\imath} - 2x^2y\,\bar{\jmath} + z\bar{k}$ taken over the surface of the cube founded by the planes x = y = z =a and coordinate planes.
3. Let f(x) defined on [c, c+2π] and required to be expanded in Fourier series in terms of periodic functions $\{\phi_n\}$. What is the property on $\{\phi_n\}$ that helps us in getting Fourier coefficients?

   Determine for Fourier series of f (x) = $\begin{cases} \pi + x, & -\pi < x < 0 \\ 0, & 0 \le x < \pi \end{cases}$, $f(x + 2\pi) = f(x)$

OR

4. Find Fourier Sine transform of xe^{-ax} where a > 0.
5. Fit an exponential curve $y=ae^{bx}$ to the following data by the method of least squares

x	1	2	3	4	5	6	7	8
y	1.0	1.2	1.8	2.5	3.6	4.7	6.6	9.1

OR

6. Using Gauss's forward formulae, evaluate f (3.75) from the table

x	2.5	3.0	3.5	4.0	4.5	5.0
y	24	22	20	18	17	16

7. Distinguish between Gauss-Seidal and Jacobi methods when applied for solution of linear system

   A $\bar{x} = \bar{b}$ by bringing out salient features. Employing any one of these methods present in form of a table the details of computations of at least three iterations, for the solution of the system :

   $-2x_1 + 10\,x_2 - x_3 - x_4 = 15$

   $-x_1 - x_2 + 10x_3 - 2x_4 = 27$

   $10x_1 - 2x_2 - x_3 - x_4 = 3$

   $-x_1 - x_2 - 2x_3 + 10\,x_4 = -9$

OR

8. Solve the following equations by Crout's method

   x + y + z = 9; 2x - 3y +4z =13; 3x +4y +5z = 40

9. Use Range Kutta method fourth order for finding y (0.1), y(0.2),given that $\frac{dy}{dx} = x^2 - y, y(0) = 1.$

OR

10. Find the numerically largest Eigen value of A= $\begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$ and the corresponding Eigen vector by power method

Code No.: **40103** **MR14**

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, EXAMINATIONS, DECEMBER-2018

Subject: **Fluid Mechanics**

Branch: **CE**

Time: 3 hours **Max. Marks: 75**

PART – A

I. Answer ALL questions of the following **5x1Mark=5 Marks**

1. What is the difference between Ideal and Real fluid?
2. Define the term velocity potential.
3. Write two assumptions of Bernoulli's equation.
4. Define boundary layer.
5. What is a compound pipe?

II. Answer ALL questions of the following **10x2Mark=20 Marks**

1. What is surface tension? Give two examples.
2. Explain how hydrostatic forces are estimated on canal lock gates.
3. Define and explain stream line, path line and streak line.
4. Define stream function. What is its significance in the analysis of fluid flow?
5. What are the surface and body forces associated with fluid flow?
6. What are the applications of continuity equation?
7. What are the characteristics of boundary layer?
8. Explain Reynold's experiment?
9. What is the condition for maximum transmission of power and corresponding efficiency of transmission?
10. What is Cipoletti weir? What is its discharge equation?

PART-B

Answer ALL questions of the following **5x10 Marks= 50Marks**

1. A sleeve 10 cm long encases a vertical metal rod 3 cm in diameter with a radial clearance of 0.02 mm. if when immersed in an oil of viscosity 6 poise, the effective weight of the sleeve is 7.5 N, will the sleeve slide down the rod and if so at what velocity?

(OR)

2) A trapezoidal plate of parallel sides `l' and `2l' and height `h' is immersed vertically in water with its side of length `l' horizontal and topmost. The top edge is at a depth `h' below the water surface. Determine:
   (a) Total force on one side of the plate.
   (b) Location of the centre of pressure.

3) The velocity components of a three-dimensional, incompressible fluid flow are prescribed as

$$u = x^2 + z^2 + 5; y = y^2 + z^2 - 3$$

Make calculations for the third component of velocity. Further check whether flow is irrotational?

(OR)

4) What is flow net? Describe briefly different methods of drawing flow nets. What are the applications of flow nets?

5) State and prove Bernoulli's theorem. What are the assumptions of your derivation?

(OR)

6) A pipe line 0. 6 cm diameter conveying oil (Specific gravity 0. 85) at the flow rate of 1800 lit/sec has a 90^0 bend in the horizontal plane. The pressure at the entrance to the bend is 147. 15 KN/m^2 and loss of head in the bend is 2m of oil. Find the magnitude and direction of the force exerted by the oil on the bend.

7) A thin flat plate measuring 75 cm x 25 cm is exposed parallel to a stream of water of uniform velocity 1. 2 m/s. the flow takes place parallel to 25 cm side of the plate. If the kinematic viscosity of water is 1. 1 centistokes, determine the maximum boundary layer thickness, shearing stress at the trailing edge and the drag on both sides of the plate.

(OR)

8) An oil of viscosity 9 poise and specific gravity 0.9 is flowing through a horizontal pipe of 60 cm dia. If the pressure the pressure drop in 100 m length of the pipe is 1800 kN/m^2, determine:
(i) the rate of flow of oil (ii) the centre line velocity (iii) the total frictional drag over 100 m length (iv) the power require to maintain the flow (v) the velocity gradient at the pipe wall.

9) A 6 cm diameter pipe has a discharge of 450 l/min. At a section the pipe has a sudden expansion to a size of 9 cm diameter. If the pressure just u/s of the expansion is 20 kN/m^2, calculate the pressure just after the expansion. Assume the pipe to be horizontal at the expansion region.

(OR)

10) A discharge of 100 l/s is to be measured by triangular notch of vertex angle 60^0. What would be the head over the notch? If the accuracy of reading the head is 1 mm what error in discharge can be expected at this level? ($C_d = 0.58$)

Code No.: **40101** | **MR14**

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, NOVEMBER-2018

Subject: **STRENGTH OF MATERIALS-I**

Branch: **CE**

Time: 3 hours **Max. Marks: 75**

PART – A

I. Answer ALL questions of the following **5x1Mark=5 Marks**

1. State Hooke's law.
2. Define shear force?
3. Give the Flexure formula.
4. What do you mean by Section modulus?
5. What is Elastic curve?

II. Answer ALL questions of the following **10x2Mark=20 Marks**

1. Specify the equations of Equilibrium for a 2-D body acted upon by forces at rest.
2. Differentiate between stress and strength
3. Draw the Shear force and Bending moment diagrams for a simply supported beam of span 'l' subjected to point load 'W' at centre
4. For given material, Modulus of Elasticity is 110 GPa and Poisson's ratio is 0.30. calculate the Modulus of rigidity of the material.
5. What is the difference between zero bending moment point and the point of contraflexure.
6. State assumptions made in theory of pure bending.
7. Explain the significance of Mohr cirle?
8. Sketch the bending stress distribution for an I-section.
9. Derive the relationship between rate of loading, Shear force and Bending moment.
10. Sketch the variation of shear stress across the depth of a circular section

PART-B

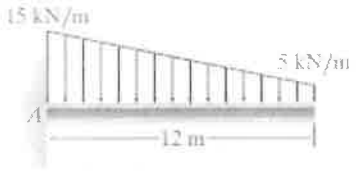
Answer ALL questions of the following **5x10 Marks= 50Marks**

1. a) Sketch the stress-strain diagram for HYSD steel and indicate salient points. (4M)
   b) A simple tension member 3 m long and has a cross-sectional area of 1290 mm^2 carries an axial load of 22 kN. Assume Modulus of elasticity as 204GPa. Determine the total elongation in the member due to applied load. (6M)

(OR)

2. a) Derive the relationship between the Modulus of Ealsticity and Modulus of Rigidity
   b) For a given material, Modulus of elasticity is 100GPa and shear modulus is 40GPa. Determine the bulk modulus and lateral contraction of a round bar of 36mm diameter and 2.4m long when stretched 2.5 mm. (4+6)M

3.Sketch the Shear force and Bending moment diagrams for the beam shown in fig.1.



(10M)

Fig.1 **(OR)**

4. A 10 m long simply supported beam carries two point loads of 10 kN and 6 kN at 2 m and 9 m respectively from the left end. It also has a uniformly distributed load of 4 kN/m for the length between 4 m and 7m from the left end. Draw the shear force and bending moment diagrams. (10M)
5. A Rectangular beam is to be cut out of a cylindrical log of wood with diameter 'd'. Determine the ratio of depth to width of the strongest beam which can be had from log of wood. (10M)

(OR)

6. The Tension flange of a cast iron I-section beam is 240mm wide and 50mm deep, the compression flange is 100mm wide and 20mm deep where as the web is 300mm x 30mm. The section is subjected to a vertical shear force of 350kN. Sketch the shear stress distribution and indicate the values at salient points. Assume that the beam is of simply supported. (10M)
7. a) State and explain moment area theorems. 4M
   b) A cantilever beam is 5m long and carries a u.d.l of 20kN/m. If the moment of inertia about neutral axis equals to 12600 cm^4 and E = 210GPa. Calculate the slope and deflection at a point 1.25 m from the free end by moment Area method. 6M

(OR)

8. State and Prove Conjugate beam theorems. **10M**

9. At a point in a strained material, there are normal stresses of 80Mpa(Compressive) and 50Mpa(Tensile) at right angles to each other with a shear stress 30MPa(negative). Determine the principal stresses, maximum shear stress and plane on which they act. Show them on the sketches of properly oriented elements. Use Mohr's circle method.

(OR)

10. Write a short note on the following.
    a) Maximum Principal stress theory b) Von Mises Theory (5+5)M

Code No.: **40M03**

MR14

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, NOVEMBER-2018

Subject: **MATHEMATICS – III**

Branch: **CE**

Time: 3 hours **Max. Marks: 75**

PART – A

I. Answer ALL questions of the following **5x1Mark=5 Marks**

1. Find the values of a_0 in the expansion of $f(x) = x + x^3$ in $(-\pi, \pi)$
2. Find Z-transform of sin(3n +5).
3. Write the Newton's forward difference formulae for the first and second order derivatives.
4. Write Euler's Formula to solve initial value problem.
5. Find the complete integral of $z = px + qy + pq$

II. Answer ALL questions of the following **10x2Mark=20 Marks**

1. Find Fourier cosine transform of $f(x) = x$, $0 < x < 4$
2. Show that $F_S\{xf(x)\} = -\frac{d}{dp}[F_C(p)]$.
3. If $u_n = \{8, 6, 5, -1, 9, 7, 4, 3\}$, then find Z transform of $\{u_n\}$
4. Find the Z-transform of $n \sin n\theta$.
5. Write the first and second order derivative formulae at $x = x_0$ using Newton's forward difference formula.
6. Derive Simpson's $1/3^{rd}$ rule.
7. Given $\frac{dy}{dx} = -y$, $y(0) = 1$, find $y(0.1)$ using Runge - kutta method of 2^{nd} order
8. Using Taylor's series method solve $\frac{dy}{dx} = x^2 - y$, $y(0) = 1$ at $x = 0.1$.
9. Form partial differential equation from the equation $z = (x^2 + a)(y^2 + b)$ by eliminating a and b.
10. Solve $y^2p - xyq = x(z - 2y)$.

PART-B

Answer ALL questions of the following **5x10 Marks= 50Marks**

1. Obtain Fourier series for $f(x) = \begin{cases} x \text{ for } -\pi < x < 0 \\ 0 \text{ for } 0 < x < \frac{\pi}{2} \\ x - \frac{\pi}{2} \text{ for } \frac{\pi}{2} x < \pi \end{cases}$

OR

2. Find the Fourier i) Sine transform of x^{n-1}, $n > 0$ ii) Cosine transform of x^{n-1}, $n>0$

3. Using Convolution theorem , Evaluate $Z^{-1}\{\frac{z^3-20z}{(z-2)^3(z-4)}\}$

OR

4. Use the convolution theorem to evaluate $Z^{-1}\left\{\frac{z^2}{(z-a)(z-b)}\right\}$

5. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at (a) x = 1.1 (b) x = 1.6 for the data

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6
y	7.989	8.403	8.781	9.129	9.451	9.750	10.031

OR

6. Pressure and volume of a gas are related by $PV^{\gamma} = C$. Fit it to the data

Pressure (P) (kg /cm^2)	0.5	1.0	1.5	2.0	2.5	3.0
Volume (V) (liters)	1.62	1.00	0.75	0.62	0.52	0.46

7. Using Runge -Kutta method of order 4, find y at x = 0.1, 0.2, 0.3, given that $\frac{dy}{dx} = \frac{y-x}{y+x}, y(0) = 1$

OR

8. Evaluate y (0.2) and y(0.4) correct to four decimals by Taylor series method if y(x) satisfies $\frac{dy}{dx} = 1 - 2xy \; given \; y(0) = 0.$

9. Solve $x^2(y-z)p+y^2(z-x)q = z^2(x-y)$

OR

10. Solve $\frac{x^2}{p} + \frac{y^2}{q} = z$