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-2019

Subject: **MATHEMATICS-II**

Branch: CE

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

PART – A

I. Answer ALL questions of the following **5x1M=5 M**

1. If $\bar{r} = x\bar{\imath} + y\bar{\jmath} + z\bar{k}$, then find the value of div $\bar{r}$.
2. If f(x) = x in $(-\pi, \pi)$ is expressed as a Fourier series then find b_n.
3. Find the value of $(1+\Delta)(1-\nabla)$.
4. Define Transcendental Equations with example.
5. Write the second order Runge - Kutta formula.

II. Answer ALL questions of the following **10x2M=20 M**

1. Use Green's theorem to evaluate $\oint_c (x+y^2)dx + (x^2+y)\,dy$ where C is the circle of radius 2 with centre at the origin O of the x y plane.
2. Find curl $\bar{F}$, where $\bar{F}$ = grad $(x^3+y^3+z^3-3xyz)$.
3. Show that the fourier transform of $\exp(-x^2/2)$ is self reciprocal.
4. Define even and odd function give an example to each.
5. Find the missing entry in the table below of a quadratic, using suitable theorem, from the data :

x	5	10	15	20	25
y	20	90	210	.....	600

6. Evaluate $\Delta(x^3+\cos x)$.
7. Find a positive root between 0 and 1 of $xe^x = 1$ employing bisection method.
8. Find a positive root of the equation $x^3 - 4x - 9 = 0$ using bisection method.
9. Explain LU Decomposition Method.
10. Evaluate $\int_0^1 \frac{dx}{1+x}$ applying the Simpson's 1/3rd rule.

PART-B

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

1. Using Stokes theorem to evaluate $\iint_s (\nabla \times \bar{A}) \cdot \bar{n}\, dS$ where $\bar{A} = (x^2+y-4)\bar{\imath} + 3xy\,\bar{\jmath} + (2xz+z^2)\bar{k}$ and S is surface of the hemisphere $x^2+y^2+z^2 = 16$ above x y plane.

OR

2. Verify Stoke's theorem for f = (y-z+2) i+(yz+4)j - xzk where s is the surface of the cube x=0, y=0, z=0 x=2, y=2, z=2, above the xy - plane.

3. Find a Fourier series to represent $f(x)= x^2$ in $(0,2\pi)$.

OR

4. Find the Fourier cosine transform of e^{-x^2}.

5. Fit a second degree parabola to the data .

x	0	1	2	3	4
y	1.0	1.8	1.3	2.5	6.3

OR

6. Find f(3) using lagranges interpolation formula .

x	1	2	4	5	7
y=f(x)	2	5	7	8	9

7. Apply Gauss-Seidal iteration method to solve the equations $2x - 3y + 20z = 25$; $20x + y - 2z = 17$; $3x + 20y - z = -18$.

OR

8. Solve the following equations by Crout's method
$x + y + z = 9$; $2x - 3y + 4z = 13$; $3x + 4y + 5z = 40$.

9. Tabulate all the computations ,by the following methods , of value of integral, for comparison, $\int_0^1 \frac{1}{1+x}\, dx$; i) Gauss-legendre three-point ii) Simpson's 1/ 3 rule (iii) Trapezoidal method with h= 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.

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MR14

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, NOVEMBER-2019

Subject: **MATHEMATICS-III**

Branch: Common to **CE**

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

PART – A

I. Answer ALL questions of the following **5x1M=5 M**

1. Define Odd function
2. State linear property of Z-Transformation
3. Write down simpson's 1/3 rd rule.
4. Write down n^{th} approximation value for y for the differential equation $\frac{dy}{dx} = f(x, y), y(x_0) = y_0$ using Picard's method.
5. Give examples of partial differential equation

II. Answer ALL questions of the following **10x2M=20 M**

1. Express $f(x) = x^3$ as Fourier series in $(-\pi,\pi)$
2. Express $f(x) = x$ as a half range sine series in $0 < x < 2$.
3. Find Z transform of na^n
4. State convolution theorem of Z-transforms.
5. Evaluate $\int_1^2 \frac{1}{x}dx$ by Trapezoidal rule.
6. Write the first and second order derivative formulae at $x = x_0$ using Newton's forward difference formula.
7. Find the value of y for x=0.1 by Picard's method up to two approximations, given that $\frac{dy}{dx} = y-x^2$, $y(0) = 1$.
8. Given $y' = 3x + \frac{y}{2}$ and $y(0)=1$, find $y(0.1)$ using Taylor's series method.
9. Solve $p^2 - q^2 = npq$.
10. Form partial differential equation from the equation $z = ax + by + ab$ by eliminating a and b.

PART-B

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

1. Using Fourier integral show that $e^{-a} - e^{-bx} = \frac{2(b^2-a^2)}{\pi}\int_0^\infty \frac{\lambda sin\lambda x d\lambda}{(\lambda^2+a^2)(\lambda^2+b^2)}, a, b > 0$

OR

2. Find the Fourier sine transform of $f(x) = \frac{1}{x(a^2+x^2)}$ and derive Fourier Cosine transform of $\phi(x) = \frac{1}{(a^2+x^2)}$

3. Using Z- transform solve $4u_n - u_{n+2} = 0$ given that $u_0 = 0$ and $u_1 = 2$

OR

4. Use the Z-transform to solve $u_{n+2} + 4u_{n+1} + 3u_n = 3^n$ with $u_0 = 0$, $u_1 = 1$.

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. If p is the pull required to lift a load w by means of a pully block, find a linear law of the form p = mw + c connecting p and w using the following data

p=	12	15	21	25
w=	50	70	100	120

7. Using Adam's -Bash forth method, obtain the solution of $\frac{dy}{dx} = x - y^2$ at x = 0.8 given the values

x	0	0.2	0.4	0.6
y	0	0.0200	0.0795	0.1762

OR

8. Solve $\frac{dy}{dx} = x + z$, $\frac{dz}{dx} = x - y^2$ with y(0) = 2, z(0) =1 to get y(0.1), y(0.2), z(0.1) and z(0.2) approximating by Taylor's algorithm.

9. Solve the equation $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, where $u(x,0) = 6e^{-3x}$ by method of separation of variables.

OR

10. Solve $z^2(p^2x^2 + q^2) = 1$.

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MR14

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II B.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, NOVEMBER-2019

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. Write the relation between Young's modulus, Bulk modulus and Poisson's ratio.
2. Define point of contraflexure.
3. Write the Flexure formula.
4. Write the differential equation for the beam to find deflections.
5. State the Maximum Shear Stress Theory of Failure.

II. Answer ALL questions of the following **10x2Marks=20 Marks**

1. What do you mean by principle of superposition?
2. A Copper bar 250 mm long & 50 mm X 50 m in cross section is subjected to an axial load. If the increase in volume of the bar is 37.5 mm^3, find the magnitude of the load. Take Poisson's ratio=0.25, E=100 GPa.
3. Draw the Shear force and bending moment diagram for a simply supported beam of length '1' subjected to a clockwise moment 'M' at the centre.
4. A cantilever beam of 2.5 m span subjected to audl 3kN/m over its entire length and a point load of 4kN at the free end. Draw shear force and bending moment diagram.
5. Draw the Shear stress distribution over an I-section.
6. Distinguish between direct stress & bending stress.
7. Derive the slope and deflection at the free end of a cantilever beam of length L and constant flexural rigidity EI, carrying a point load W at its free end.
8. A simply supported beam of 3 m span subjected to a point load of 5 kN at the centre. Find the maximum deflection.
9. What is maximum Principal Strain Theory?
10. What are the main theories of failure for a material?

PART-B

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

1. A steel bar of 25 mm diameter was tested in tension and following were observed: Limit of Proportionality = 196.32 kN; Load at yield = 218.13 kN, Ultimate load = 278.20 kN. At the proportional limit, the elongation measured over a gauge length of 100 mm was 0.189 mm. After fracture, the length between the gauge points was 112.62 mm and the minimum diameter was 23.64. Determine the Young's modulus and measures of ductility (percentage elongation and percentage contraction)

OR

2. a) An axial pull of 10 kN is suddenly applied on a steel rod of 500 mm length and 8 mm diameter. Calculate the elongation of the rod and absorbed strain energy. Also find the modulus of resilience. Take E= 2x 10^5 N/mm^2

   b)A bar of steel 30 mm diameter subjected to a tensile load of 60 kN and the measured extension on a 20cm gauge length was 0.01 cm and the change in diameter was 0.0004 cm. Calculate the Poisson's ratio, Young's modulus, bulk modulus and modulus of rigidity.

3. Draw the shear force and bending moment diagrams for a cantilever beam of length 4 in if two anti-clockwise moments of 15 kNm and 10 kNm are applied at the mid-span and the free end, respectively.

OR

4. A beam of span 8 m rests on supports 6m apart, the right hand end is overhanging by 2 m. The beam carries a uniformly distributed load of 10 kN/m over the entire length and a point load 3kN at the free end. Draw Shear force and bending moment diagrams and find the point of contra-flexure, if any.

5. A timber beam of rectangular section is simply supported at the ends and carries a point load at the centre of the beam. The maximum bending stress is 12 N/mm^2 and maximum shearing stress is 1 N/mm^2, find the ratio of span to depth.

OR

6. An I section having Top flange 150 mm x 20mm, bottom flange 175 mm x 20 mm and web 320 mm x 20 mm is used as a beam (simply supported and symmetrical about 'y' axis). If at a section, it is subjected to a sheaf force of 250 kN. Find the greatest intensity of shear stress in the beam and show also the variation of shear stress across the section.

7. Calculate the slope at the ends and deflection at the centre of a beam loaded with a couple 'M' at the centre using conjugate beam method.

OR

8. A beam ABC is simply supported at 'A' and 'B' and free at 'C'. AB=4m and BC=lm. A point load of 10 kN is applied at the mid span of AB, and another point load of 2 kN is applied at C. Find the deflection at the centre of AB. The moment of inertia of AB is 'I' and BC is '$2I$'.Use the conjugate beam method.

9. The stresses at a point in a bar are 250 N/mm^2 (tensile) and 150 N/mm^2(compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 30° to the axis of major stress. Also determine the maximum intensity of shear stress in the material at that point.

OR

10. a) Give the reasons, which theory of failure in best suited for i) ductile materials ii) Brittle materials

    b) The principal stresses at a point in an elastic material are 100 N/mm^2 (Tensile), 80 N/mm^2 (Tensile) & 50 N/mm^2(compressive). If the stress at the elastic limit in simple tension is 200 N/mm^2, determine whether the failure of material will occur according to maximum principal stress theory. If not, then find the factor of safety.