

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlupochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad**II B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS, DECEMBER-2018**Subject: **Mathematics –II**Branch: **M E**Time: **3 hours**Max. Marks: **75****PART – A****I. Answer ALL questions of the following****5x1Mark=5 Marks**

1. What is ∇r where $r = |\vec{r}|$
2. If $f(x) = 1 + \sin x$ in $(-1, 1)$ is expressed as a Fourier series then find Fourier coefficient a_0 .
3. An interpolation formula derived for unequally spaced data, state if it is also valid for equally spaced data too, with reasons if there are.
4. Give one example of transcendental equation.
5. Evaluate $\int_0^2 (1 + x^2) dx$ by Simpson $\frac{1}{3}$ rd rule by dividing the interval into four parts.

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

1. Find the directional derivative of $\phi = xy^2 + yz^2$ at $(2, -1, 1)$ in the direction of $i + 2j + 2k$.
2. Prove that $\nabla r^n = n r^{n-2} \vec{r}$
3. Find the Fourier transform of $f(x) = \begin{cases} 1, & \text{if } |x| \leq 1 \\ 0, & \text{if } |x| > 1 \end{cases}$
4. Find the half range cosine series of x^2 in $(0, 1)$.
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. Fit a straight line to the following data

x	1	2	3	4	6
y	2.4	3.1	3.5	4.3	5

7. Obtain Newton Raphson formula for finding square root of a number N.
8. Find the iterative equation based on the Newton Raphson's method for $N^{\frac{1}{3}}$
9. Employ Euler's method for computing $y(0.4)$, with $h = 0.1$, from $y' = -y$, $y(0) = 1$.
10. Solve $\frac{dy}{dx} + xy = 0$, $y(0) = 1$ from $x=0$ to $x=0.3$ using Euler's method with $h=0.1$.

PART-B

Answer ALL questions of the following

5x10 Marks= 50Marks

1. Show that $\nabla^2 f(r) = f''(r) + \frac{2}{r}f'(r)$

OR

2. a) Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point $P = (1,2,3)$ in the direction of the line PQ where $Q = (5,0,4)$
 b) Using the line integral calculate the work done by the force $\vec{F} = (3x^2 + 6y)\vec{i} - 14yz\vec{j} + 20xz^2\vec{k}$ along the lines from $(0,0,0)$ to $(1,0,0)$, then to $(1,1,0)$ and then to $(1,1,1)$

3. Obtain the Half range sine series for $f(x) = x(\pi - x)$ in $0 < x < \pi$

OR

4. If $f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & \text{when } -\pi \leq x \leq 0 \\ 1 - \frac{2x}{\pi}, & \text{when } 0 \leq x \leq \pi \end{cases}$. Then show that the fourier series of $f(x) = \frac{8}{\pi^2} \left(\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \frac{\cos 5x}{5^2} + \dots \right)$ also deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$.

5. Fit a second degree curve to the following data points in least square sense :

x	0.0	1.0	2.0	3.0
y	1.0	6.0	17.0	34.0

OR

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

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

7. Solve by Jacobi iteration method the system $8x-3y+2z=20$, $6x+3y+12z=35$ and $4x+11y-z=33$.

OR

8. Solve the system of equations

$$2x+y+z=10;$$

$$3x+2y+3z=18$$

$$x+4y+9z=16 \text{ by L-U decomposition method}$$

9. Find the dominant Eigen value and the corresponding Eigen vector of $A = \begin{pmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{pmatrix}$ by power method.

OR

10. Find $y(0.1)$ and $y(0.2)$ using Runge - Kutta 4th order formula given that $y' = x^2 - y$ and $y(0) = 1$.

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Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad**II B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS, DECEMBER-2018**Subject: Mechanics of Fluids and Hydraulic Machines

Branch: ME

Time: 3 hours

Max. Marks: 75

PART – A

I. Answer ALL questions of the following

5x1Mark=5 Marks

1. Define specific weight
2. What do you mean by path line?
3. What is the significance of Reynold's number in pipe flow?
4. Write relation between C_d , C_v , C_c .
5. Write an expression for the minimum speed for starting a centrifugal pump.

II. Answer ALL questions of the following

10x2Mark=20 Marks

1. How do you classify fluids?
2. State the Newton's Law of Viscosity
3. Differentiate Rotational & Irrotational flows
4. Explain stream tube.
5. Write down the expression for Energy loss due to friction.
6. Write down the expression for power transmission through pipes and also condition for maximum transmission of power through pipes.
7. Explain hydraulic efficiency of a turbine.
8. Differentiate between radial flow and parallel flow turbines with examples.
9. What are the purposes of casing in centrifugal pump? Name the types of casing
10. Differentiate between the volute casing and vortex casing for the centrifugal pump.

PART-B

Answer ALL questions of the following

5x10 Marks= 50Marks

1. A U-tube manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipeline. It's left end is connected to the pipe and the right limb is open to the atmosphere. The center of the pipe is 100 mm below the level of mercury in the right limb. Specific gravity of Mercury is 13.6. If the difference of Mercury level in the two limbs is 160 mm, determine the absolute pressure of the oil in the pipe.

OR

2. A shaft of diameter 100 mm is rotating inside a journal bearing of diameter 102 mm at a speed of 360 r.p.m. The space between the shaft and bearing is filled with a lubricating oil of viscosity 5 poise. The length of the bearing is 200 mm. Find the power absorbed in the lubricating oil.

3. a) Define i) Compressible & incompressible flow ii) 1D, 2D and 3D flows
b) What is Euler's equation of motion? How will you obtain Bernoulli's equation from it?

OR

4. a) Derive Euler's equation of motion. While listing out the assumptions made while deriving Bernoulli's equation, state and derive Bernoulli's equation.
b) A 60° reducing bend is connected in a pipe line, the diameter at inlet and outlet of the bend being 50cm and 25 cm respectively. Find the force exerted by the water on the bend if the intensity of pressure at inlet of the bend is 200kN/M². The rate of flow is 1m³/sec.
5. a) Define drag and lift.
b) Explain laminar sub layer and boundary layer thickness.
c) Find the ratio of displacement thickness to momentum thickness for the velocity distribution in the boundary layer is given by $\frac{v}{u} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$
where v = velocity in boundary layer at distance 'y'
 u = free stream velocity.
 δ = boundary layer thickness.

OR

6. A plate 2 m X 2 m moves at 40 km/hour in stationary air of density 1.25 kg/m³. If the coefficient of drag and lift are 0.2 and 0.8 respectively, find: (i) the lift force, (ii) the drag force, (iii) the resultant force, and (iv) The power required to keep the plate in motion.
7. A Francis turbine has to be designed to develop 367.5 kW under a head of H=70 m while running at N=750 rpm. Ratio of width of runner to diameter of runner, $n=0.1$, inner diameter is half the outer diameter. Flow ratio =0.15, hydraulic efficiency=95%, mechanical efficiency=84%. Four percent of the circumferential area of runner to be occupied by the thickness of vanes, velocity of flow is constant and the discharge is radial at exit. Calculate (i) The diameter of the wheel, (ii) The quantity of water supplied, and (iii) The guide vane angle at inlet and runner vane angle at inlet and exit.

OR

8. A Kaplan turbine produces 20600kw of power under a head of 22m with $\eta_o = 85\%$. If speed ratio =1.6 and flow ratio =0.5. Find the diameter of the runner, speed of the runner and specific speed of the turbine. Take the hub diameter= 0.35 times the runner diameter.
9. Explain the construction and working principle of a single acting reciprocating pump with the help of neat sketch.

OR

10. a) What are the different efficiencies of a centrifugal pump? Explain.
b) The centrifugal pump is to discharge 0.118m³/sec at a speed of 1450 rpm. against a head of 25m. The impeller dia is 250mm, its width at outlet is 50mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impellar.

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Branch: ME

Time: 3 hours

Max. Marks: 75

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

1. Define the terms: Sliding pair and Spherical pair?
2. What is the Condition for correct steering Davis steering gear?
3. What are the components of acceleration?
4. What do you understand by the pressure angle of cam?
5. In a simple gear train, if the number of idle gears is odd, then the motion of driven gear will be?

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

1. What do you mean by machine and how they are classified?
2. How is single slider crank chain mechanism different from the double slider one?
3. Differentiate Scott Russel and Grasshopper mechanisms?
4. Differentiate Paucellier and harts mechanisms.
5. Consider an example for slider crank and analyze the acceleration over it?
6. Define rubbing velocity. What will be the expression for rubbing velocity at a pin joint when the two links rotate in opposite direction?
7. How belt drives are classified? What are they?
8. What is a cam? What type of motion can be transmitted with a cam & follower
9. What is the advantage of a compound gear train over a simple gear train?
10. Define the following terms pitch circle and pitch diameter of gears

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

1. Describe the following inversion of four bar chain mechanisms with neat diagram.
 - a) Beam Engine b) Coupling rod locomotive c) Watts Indicator Mechanism

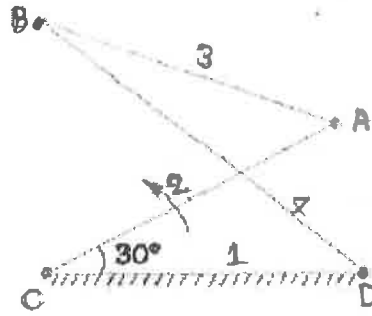
OR

2. a) Enumerate the inversions of a double slider-crank chain. Give examples. (4M)
- b) Describe elliptical trammel. Show that it can describe a true ellipse? (6M)
3. Draw a neat sketch of a Davis steering gear and explain its working.

OR

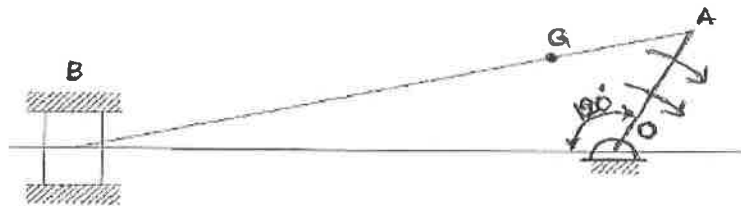
4. Prove that a point on one of the links of a Hart mechanism traces a straight line on the movement of its links

5. Locate all the instantaneous centres for the crossed four bar mechanism as shown in the fig. The dimensions of the various links are $CD=65\text{mm}$, $CA=60\text{mm}$, $DB=80\text{mm}$, and $AB=55\text{mm}$. Find angular velocities of the link AB and DB, if the crank CA rotates at 100rpm in the anti clockwise direction.



OR

6. In an I.C engine mechanism shown in fig., crank $OA=100\text{mm}$ and connecting rod $AB=100\text{mm}$ with center of gravity G, 100mm from A. In the position shown in the crank have an angular velocity of 75 rad/s and an angular acceleration of 1200 rad/s^2 . Find i). Velocity and acceleration of G, ii). Angular velocity and angular acceleration of the connecting rod AB. (use Relative velocity method)



7. A cam is to give the following motion to a knife-edged follower:
1. Outstroke during 60° of cam rotation;
 2. Dwell for the next 30° of cam rotation;
 3. Return stroke during next 60° of cam rotation, and
 4. Dwell for the remaining 210° of cam rotation.
- The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower is offset by 20 mm from the axis of the cam shaft.

OR

8. a) Discuss briefly the various types of belts used for the transmission of power.
 b) An open belt 100 mm wide connects two pulleys mounted on parallel shafts with their centres 2.4 m apart. The diameter of the larger pulley is 450 mm and that of the smaller pulley 300 mm. The coefficient of friction between the belt and the pulley is 0.3 and the maximum stress in the belt is limited to 14 N/mm width. If the larger pulley rotates at 120 rpm, find the maximum power that can be transmitted.
9. Determine: (i) Length of path of contact (ii) Arc of contact (iii) Contact ratio
 When a pinion is having 23 teeth drives a gear having teeth 57. The profile of the gears is involute with pressure angle 20° , module 8mm and addendum equal to one module.

OR

10. a) Explain 'law of gearing'.
 b) A pair of spur gears have 16 and 18 teeth, a module of 13mm, addendum of 13mm, and pressure angle of 14.5° . Show that the gears have interference. Determine the amount by which the addendum must be reduced to eliminate the interference.

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II B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS, DECEMBER-2018Subject: **Thermal Engineering-I**Branch: **ME**Time: **3 hours**Max. Marks: **75****PART – A****I. Answer ALL questions of the following****5x1Mark=5 Marks**

1. Define volumetric efficiency?
2. Which type of nozzles is used in C.I engines?
3. Define Brake Power.
4. Classify different types of compressors?
5. Define degree of reaction in axial flow compressor?

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

1. Explain the spark plug function in I C engines?
2. What is the necessity of cooling in I C Engines?
3. What is pre-ignition?
4. What is Fuel rating?
5. Explain the heat balance sheet?
6. What is a Morse test?
7. What is meant by indicated power of a Compressor?
8. Define Positive Displacement Compressor?
9. Define slip factor in a compressor?
10. Explain isometric efficiency of an axial compressor?

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

- 1 Briefly explain the terms: Time loss factor, Heat loss factor.

OR

- 2 Briefly explain the fuel injection system with neat sketch.
- 3 Briefly explain the terms: pre ignition, knocking in S.I Engines.

OR

- 4 Explain the delay period and its importance in C.I engines.
- 5 Find the bore of the single cylinder diesel engine working on the four stroke cycle & delivers 40 KW at 200 r.p.m from the following data.
Compression ration= 14:1
Fuel cut off=5% of the stroke
Index of compression curve is=1.4
Index of expansion curve is =1.3
Pressure at beginning of compressor=1 atm
Ratio of stroke to bore=1.5:1

OR

6. A four cylinder two stroke petrol engine, 75 mm bore by 90 mm stroke operates on the constant volume cycle and has a compression ratio 6:1, the efficiency ratio being 55%. Calculate the thermal efficiency. When it runs at 40 RPS, it develops a b.m.e.p of 360 KPa and uses 9.2 kg of fuel per hour of CV 44000 KJ/Kg. Calculate the break thermal efficiency and mechanical efficiency.

7. Derive an expression for isothermal efficiencies of compressor in terms of the Pressure ratio.

OR

8. Compute the work required to compress 1kg of air at 25°C and 100 KPa to 10 MPa pressure if the compression process is,

i) Isothermal process

ii) Adiabatic Process.

9. A centrifugal compressor operating at a pressure ratio of 4:1 has inlet temperature of 15°C. Calculate the overall diameter of impeller given that speed of operation 15000 rpm.

Slip factor=0.9

Power input factor=1.03

Isentropic efficiency =0.85

OR

10. An axial flow compressor, with compression ratio as 4, draws air at 20°C and delivers it at 197°C. The mean blade speed and flow velocity are constant throughout the compressor.

Assuming 50% reaction blading and taking blade velocity as 180 m/s, find the flow velocity

and the number of stages if work factor =0.85, $\alpha=12^\circ$, $\beta=42^\circ$, $C_p=1.005\text{KJ/KgK}$

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Branch: ME

Time: 3 hours

Max. Marks: 75

PART – A**I. Answer ALL questions of the following**

5x1Mark=5 Marks

1. What is the principle of centrifugal casting?
2. What is Arc welding?
3. What is a two - high rolling mill?
4. What is forging?
5. Which process used for moulding of plastic bottles?

II. Answer ALL questions of the following

10x2Mark=20 Marks

1. What are the defects in casting?
2. Define Runner & sprue?
3. Write the applications of resistance welding
4. Types of flames in Oxy-acetylene welding?
5. Define cold and hot working in short.
6. Describe the advantages, disadvantages and write the applications of ring rolling.
7. What are the advantages of forging operation?
8. What are the applications of Hydrostatic extrusion?
9. How do you make (a) Plastic Chairs (b) Plastic Bottles?
10. Write the disadvantages of injection moulding?

PART-B**Answer ALL questions of the following**

5x10 Marks= 50Marks

1. Describe Hot chamber diecasting machine with a neat sketch. Discuss the advantages and applications of their casting process.

OR

2. Explain the importance of using metal as pattern material.
3. Explain the process of TIG welding with neat sketch and enumerate its advantages, disadvantages and applications

OR

4. Explain the friction welding process with neat sketches.
5. Explain the process of wire drawing with neat sketch? What are different types of lubricating methods for wire drawing? List out the materials that used in manufacturing of wire drawing dies

OR

6. a) With relevant sketches explain the basic sheet metal operations.
b) What is bending process? Explain types of bending methods with neat sketches.
7. a) Explain the advantage of Backward extrusion process over forward extrusion process.
b) Explain the principle and applications of Hydrostatic extrusion.

OR

8. a) What are the different types of forging hammers? Discuss their applications.
b) Describe the principle and working of rotary forging.
9. List out the different types of thermoplastics and thermosetting write the applications of thermoplastics and thermosetting.

OR

10. Explain the molecular structure of the plastics with all the chain molecules.

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1. Write the fourier sine transform.
2. State Damping Rule.
3. Write the Newton's Backward difference formulae for the first and second order derivatives.
4. Write down Milne's Corrector formula.
5. Write down general linear partial differential equation of the second order in two independent variables.

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

1. Find half range cosine series of $f(x) = x$ in $0 \leq x \leq \pi$.
2. Express $f(x) = x$ as Fourier series in $(-\pi, \pi)$
3. Find Z-Transform of unit step sequence (H_n) where $H_n = \begin{cases} 1 & \text{for } n \geq 0 \\ 0 & \text{for } n < 0 \end{cases}$
4. Show that $Z\left(\frac{1}{n!}\right) = e^{\frac{1}{x}}$
5. If $\sum x = 72$, $\sum y = 36$, $\sum xy = 282$, $\sum x^2 = 588$, $n=9$ and $y=a+bx$ then find a and b
6. Find a least squares straight line for the following data.

x	1	2	3
y	5	3	6

7. Given $\frac{dy}{dx} = x+y$, $y(0) = 1$, find the value of $y(0.1), y(0.2)$ by Euler's method.
8. Obtain Picard's second approximate solution of the initial value problem $\frac{dy}{dx} = \frac{x^2}{y^2+1}$, $y(0) = 0$.
9. Form the partial differential equation by eliminating the arbitrary constants a,b from $Z = ax^3 + by^3$
10. Solve $\sqrt{p} + \sqrt{q} = 1$.

PART-B

Answer ALL questions of the following

5x10 Marks= 50Marks

1. Obtain the Fourier cosine series of $f(x) = x \sin x$ in $(0, \pi)$ and show that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \frac{1}{7.9} + \dots = \frac{\pi - 2}{4}$

OR

2. Obtain a half range cosine series for $f(x) = \begin{cases} kx, & 0 \leq x \leq \frac{1}{2} \\ k(1-x), & \frac{1}{2} \leq x \leq 1 \end{cases}$

3. Find the inverse Z-Transforms of $\frac{z}{(z+3)^2(z-2)}$

OR

4. Use Z-Transform solve the difference equation $u_{n+2} - 6u_{n+1} + 9u_n = 3^n$ with $y_0 = 0, y_1 = 1$.
5. Evaluate $\int_0^\pi \frac{\sin x}{x} dx$ by using i) Trapezoidal rule ii) Simpson's 1/3 rd rule by taking $n=6$

OR

6. Evaluate integral $\int_0^6 \frac{dx}{1+x^2}$ using Trapezoidal rule, Simpson's 1/3rd rule and Simpson's 3/8th rule using $n=6$.
7. Use Milne's Predictor - corrector method to obtain the solution of the equation $\frac{dy}{dx} = x-y^2$ at $x=0.8$ given that $y(0)=0, y(0.2) = 0.02, y(0.4) = 0.0795, y(0.6) = 0.1762$.

OR

8. Given $\frac{dy}{dx} = x^2(1+y)$ and $y(1)=1, y(2) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979$ evaluate $y(1.4)$ by Predictor-Corrector method.
9. Solve by the method of separation of variables $4u_x + u_y = 3u$ $u(0, y) = e^{-5y}$.

OR

10. Solve the equation $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$ by the method of separation of variables.