

**University of Mumbai Examination 2022**

**Examinations Commencing MAY22**

Program: **Mechanical Engineering**

Curriculum Scheme: **2019**

Examination: **SE Semester: IV**

Course Code: **MEC404** and Course Name: **CAD/CAM**

Time: \_\_\_\_\_ hour

Max. Marks: 80

<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	In shearing along X axis, the image coordinate X' is , (Shx-Shearing factor along X direction, object coordinates are (X,Y) )
Option A:	X'=0
Option B:	X'=1
Option C:	X'= Y+X(Shx)
Option D:	X'=X+ Y(Shx)
2.	Combination of geometric primitives are used for following type of modeling
Option A:	Wire frame modeling
Option B:	Surface modeling
Option C:	Constructive Solid Geometry (CSG)
Option D:	Parametric modeling
3.	With reference to the manual part programming of CNC Machine, Tool change and coolant off refers to:
Option A:	M03 and M07
Option B:	G03 and G07
Option C:	M06 and M09
Option D:	M06 and M08
4.	For a billet having dia 40mm and tool is set at position Z-1 and X40 to take 1mm facing cut , followed by ejection of 2mm ,the line of code would be (Given:zero,zero of the work part is Set at center and last free end of the billet and using dimetral format,absolute CS)
Option A:	N200 G01 X-1 F100; N300 G00 Z2;
Option B:	N200 G00 X0 F100; N300 G00 Z2;
Option C:	N200 G01 X0 F100; N300 G01 X2;
Option D:	N200 G00 X-1 F100; N300 G01 Z2;
5.	Choose the correct sequence to generate prototype.
Option A:	STL file - CAD Model - Slicing - Post processing - Build object
Option B:	CAD Model - STL file - Slicing - Build object - Post processing
Option C:	CAD Model - Slicing - STL file - Post processing - Build object
Option D:	CAD Model - STL file - Post processing - Build object - Slicing
6.	For a Bezier curve, having 5 control points $P_0P_1P_2P_3P_4$ , and having value of parameter "u" as, "0" at $P_0$ and "1" at $P_4$ , the resulting equation of a this Bezier

	curve will be,
Option A:	$P(u) = P_0(1 - u)^4 - 4(P_1)(u)(1 - u)^3 - 6(P_2)(u)^2(1 - u)^2 - 4(P_3)(u)^3(1 - u) - P_4(u)^4$
Option B:	$P(u) = P_0(1 - u)^4 + 4(P_1)(u)(1 - u)^3 + 6(P_2)(u)^2(1 - u)^2 + 4(P_3)(u)^3(1 - u) + P_4(u)^4$
Option C:	$P(u) = P_0(1 + u)^4 + 4(P_1)(u)(1 + u)^3 + 6(P_2)(u)^2(1 + u)^2 + 4(P_3)(u)^3(1 + u) + P_4(u)^4$
Option D:	$P(u) = P_0(1 - u)^4 + 4(P_1)(u)(1 - u)^3 - 6(P_2)(u)^2(1 - u)^2 - 4(P_3)(u)^3(1 - u) + P_4(u)^4$
7.	The Z coordinate of a 3D point A(9, 12, 15, 3) is
Option A:	3
Option B:	5
Option C:	12
Option D:	15
8.	In which process solid wire is used as the medium for building a solid body layer by layer?
Option A:	Stereo-lithography Approach (SLA)
Option B:	Selective Laser Sintering (SLS)
Option C:	Fused deposition modeling (FDM)
Option D:	Laminated object manufacturing (LOM)
9.	Tool is currently at point A and now it has to travel from Point A to B in a circular path, in clockwise direction, with radius of 10 mm. The coordinate position of source Point A is (50,50) and coordinate position of destination Point B is (60,40), and the programming is in absolute positioning system. Then the command for this movement would be,
Option A:	G03 X60 Y40 R10;
Option B:	G02 X40 Y60 R10;
Option C:	G02 X60 Y40 R10;
Option D:	G03 X40 Y40 R10;
10.	Standard file format to be used for Medical Imaging is
Option A:	STL
Option B:	STEP
Option C:	DICOM
Option D:	IGES

<b>Q2</b> <b>(20 Marks=5MX4)</b>	<b>Solve any Four out of Six (5 marks each)</b>
A	Compare between analytical and synthetic curves.
B	Explain the working principle of Cone Beam CT with its advantages and disadvantages.
C	Draw and explain product life cycle with CAD/CAM.
D	Explain augmented reality and virtual reality along with its examples.
E	Explain any turning canned cycle with appropriate example used in Part Programming.
F	Explain wire frame modeling and compare with solid modeling.

<b>Q3</b> <b>(20 Marks =10Mx2 )</b>	<b>Solve any Two Questions out of Three 10 marks each</b>
A	Construct a Bezier Curve of order three with four vertices of the control polygon $P_0(3,4)$ , $P_1(4,7)$ , $P_2(6,7)$ , $P_3(5,4)$ . Generate at least five points on the curve.
B	A triangle PQR with vertices P (2,2), Q (5,2) and R (4,7) is to be reflected about the line $y=0.5x+3$ . Determine: (i) the concatenated transformation matrix and (ii) the coordinates of the vertices for a reflected triangle. Show the original triangle and reflected triangle on the graph paper.
C	A triangle ABC having vertices A (10, 5), B (20, 15) and C (25, 30) is rotated by 40 degree CCW about a point P (5, 5). Determine the composite transformation matrix and the new coordinates of the triangle.

<b>Q4.</b> <b>(20 Marks )</b>	
A	<b>Solve any Two 5 marks each</b>
i.	Explain the scope of the Virtual Manufacturing.
ii.	Explain Magnetic Resonance Imaging with its advantages, disadvantages and applications.
iii.	Explain the basic steps in Rapid prototyping process.
B	<b>Solve any One 10 marks each</b>
i.	Write the complete Manual Part Program using G & M codes to machine the outline of geometry for the part as shown in figure. The thickness of the plate is 3mm thick. The end mill is 10 mm in diameter. Assume suitable speed and feed for machining parameters.
ii.	Explain in brief with neat sketch Fused deposition Modeling along with its advantages, disadvantages and applications.

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Find the angle between the normals to the surface $xy = z^2$ at the points $(1,4,2)$ and $(-3,-3,3)$ .
Option A:	$\sec^{-1}\left(\frac{1}{\sqrt{22}}\right)$
Option B:	$\cos^{-1}\left(\frac{1}{\sqrt{22}}\right)$
Option C:	$\sec^{-1}\left(\frac{1}{\sqrt{2}}\right)$
Option D:	$\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$
2.	Using Stoke's theorem, $\int_C \vec{F} \cdot \vec{dr}$ where $\vec{F} = yzi + xzj + xyk$ and C is the boundary of the circle $x^2 + y^2 + z^2 = 1, z = 0$ is
Option A:	-13
Option B:	33
Option C:	13
Option D:	0
3.	If correlation coefficient, $r = 0.6$ then $b_{yx} = 1.2$ then $b_{xy}=?$
Option A:	0.45
Option B:	0.2
Option C:	0.72
Option D:	0.3
4.	If two variables oppose each other then the correlation will be
Option A:	Positive correlation
Option B:	Negative correlation
Option C:	Perfect correlation
Option D:	No correlation
5.	In a Poisson distribution if $P(X = 2) = P(X = 3)$ then $P(X = 5)$ is
Option A:	0.84125
Option B:	0.084125

Option C:	0.37256
Option D:	0.037256
6.	For a probability density function of a continuous random variable, the probability of a single point is
Option A:	1
Option B:	2
Option C:	0
Option D:	constant
7.	Which of the following tests would be used to test the mean of a continuous random variable to a population mean?
Option A:	One-sample $t$ -test
Option B:	Independent-samples $t$ -test
Option C:	Chi-squared $t$ -test
Option D:	Dependent-samples $t$ -test
8.	Which of the following is not true for a normal distribution?
Option A:	It is a symmetrical distribution.
Option B:	The mean is always zero.
Option C:	The mean, median, mode are always equal.
Option D:	It is a bell-shaped distribution.
9.	The value of $\int_c \frac{\sin z \, dz}{z^6}$ , where $c$ is the circle $ z  = 1$ is
Option A:	$\frac{2\pi i}{25}$
Option B:	$\frac{\pi i}{60}$
Option C:	$\frac{3\pi i}{20}$
Option D:	$\frac{5\pi i}{12}$
10.	The value of integral $\oint_c \frac{1}{z-1} \, dz$ , where $c$ is $ z - 1  = 2$ is
Option A:	0
Option B:	1
Option C:	$-2\pi i$
Option D:	$2\pi i$

<b>Q2</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	Obtain Laurent's expansion of $f(z) = \frac{z-1}{z^2-2z-3}$ in (i) $1 <  z  < 3$ (ii)	

	$ z  > 3$																								
B	<p>The following results of ranks of were recorded for 11 students. Find Spearman's rank correlation coefficient between the ranks obtained.</p> <table border="1"> <thead> <tr> <th>Pre-module</th> <th>Post-module</th> </tr> </thead> <tbody> <tr><td>18</td><td>22</td></tr> <tr><td>21</td><td>25</td></tr> <tr><td>16</td><td>17</td></tr> <tr><td>22</td><td>24</td></tr> <tr><td>19</td><td>16</td></tr> <tr><td>24</td><td>29</td></tr> <tr><td>17</td><td>20</td></tr> <tr><td>21</td><td>23</td></tr> <tr><td>23</td><td>19</td></tr> <tr><td>18</td><td>20</td></tr> <tr><td>14</td><td>15</td></tr> </tbody> </table>	Pre-module	Post-module	18	22	21	25	16	17	22	24	19	16	24	29	17	20	21	23	23	19	18	20	14	15
Pre-module	Post-module																								
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C	A person draws 3 balls from a bag containing 7 blue, 5 yellow, 3 purple balls. He is offered Rs. 7, Rs. 5, Rs. 3 if he draws 3 balls of same colour, 2 balls of same colour, 1 ball of each colour respectively. Find his expectation.																								
D	A brochure inviting subscriptions for a new diet program states that the participants are expected to lose on an average 22 pounds in five weeks. Suppose that, from the data of the five-week weight losses of 26 participants, the sample mean and sample standard deviation are found to be 23.5 and 10.2, respectively. Could the statement in the brochure be substantiated based on these findings? Test at the $\alpha = 0.05$ level of significance.																								
E	Evaluate using Green's theorem $\int_c (x^2 y dx + y^3 dy)$ where $c$ is the boundary of the region bounded by $y = x^2$ and $y = x$ from (0,0) to (1,1) then to (0,0) traversed in positive sense																								
F	Show that the vector, $\vec{F} = (x^2 - yz)i + (y^2 - xz)j + (z^2 - xy)k$ is irrotational and hence, find $\phi$ such that $\vec{F} = \nabla\phi$ .																								
<b>Q3</b>	<b>Solve any Four out of Six</b> <span style="float: right;"><b>5 marks each</b></span>																								
A	The IQs of individuals admitted to a state school for the mentally retarded are approximately normally distributed with a mean of 60 and a standard deviation of 10. (a) What is the probability that an individual picked at random will have an IQ between 55 and 75? (b) what is the lowest IQ of top 30% individuals?																								
B	If the mean age at death of 64 men engaged in an occupation is 52.4 years with standard deviation of 10.2 years, what are the 98% confidence limits for the mean age of all men in that population? Also determine can it be safely assume at 5% level of significance that that mean age of death of population is 56?																								
C	If the directional derivative of $\phi = ax^2 + by + 2z$ at (1,1,1) is maximum in the direction of $i + j + k$ , find a and b.																								
D	Evaluate $\int_c \frac{(12z-7) dz}{(z-1)^2(2z+3)}$ , where $c$ is the circle (i) $ z + i  = \sqrt{3}$																								

E	Use Stokes' theorem to evaluate $\int_c \vec{F} \cdot d\vec{r}$ where $\vec{F} = (x^2 - y^2)i + 2xyj$ and $c$ is the boundary of region bounded by $y = 0, x = 2, y = x$ in the $xy$ plane.																						
F	For given the table of points <table border="1" style="margin-left: 20px;"> <tr> <td>X</td> <td>0</td> <td>2</td> <td>4</td> <td>6</td> <td>8</td> <td>12</td> <td>20</td> </tr> <tr> <td>Y</td> <td>10</td> <td>12</td> <td>18</td> <td>22</td> <td>20</td> <td>30</td> <td>30</td> </tr> </table> <p>Use normal equations, fit the straight line <math>y = ax + b</math> to the data and find the value of <math>y(22)</math>.</p>	X	0	2	4	6	8	12	20	Y	10	12	18	22	20	30	30						
X	0	2	4	6	8	12	20																
Y	10	12	18	22	20	30	30																
<b>Q4</b>	<b>Solve any Four out of Six</b> <span style="float: right;"><b>5 marks each</b></span>																						
A	In a study of the effectiveness of an insecticide against a certain insect, a large area of land was sprayed. Later the area was examined for live insects by randomly selecting squares and counting the number of live insects per square. Past experience has shown the average number of live insects per square after spraying to be 0.5. If the number of live insects per square follows a Poisson distribution, find the probability that a selected square will contain: (a) One or more live insects (b) Two live insects																						
B	On an average 20% of population in an area, suffer from T.B. What is the probability that out of 6 persons chosen at random from this area (a) at least 2, (b) none suffer from T.B.?																						
C	Evaluate $\int_c \vec{F} \cdot d\vec{r}$ where $\vec{F} = yzi + (xz + 1)j + xyk$ along the line joining A (1,0,0) to B (2,1,4).																						
D	The following figures show the distribution of the digits in numbers chosen at random chosen from a telephone directory. Test at 5% level whether the digits may be taken to occur equally frequently in the directory. <table border="1" style="margin-left: 20px;"> <tr> <td>Digits</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> </tr> <tr> <td>Frequ.</td> <td>1026</td> <td>1107</td> <td>997</td> <td>966</td> <td>1075</td> <td>933</td> <td>1107</td> <td>972</td> <td>964</td> <td>853</td> </tr> </table>	Digits	0	1	2	3	4	5	6	7	8	9	Frequ.	1026	1107	997	966	1075	933	1107	972	964	853
Digits	0	1	2	3	4	5	6	7	8	9													
Frequ.	1026	1107	997	966	1075	933	1107	972	964	853													
E	Show that $\vec{F} = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)j + (3xy - 2xz + 2z)k$ is both irrotational and solenoidal.																						
F	Use divergence theorem to show that $\iint_s \vec{N} \cdot \nabla r^2 ds = 6V$ where S is any enclosed surface enclosing volume V.																						

**University of Mumbai**  
**Examination summer 2022**

Program: Mechanical  
Curriculum Scheme: REV- 2019 'C' Scheme  
Examination: SE Semester: IV  
Course Code: 402 and Course Name: **Fluid Mechanics**

Time: 3 hour

Max. Marks: 80

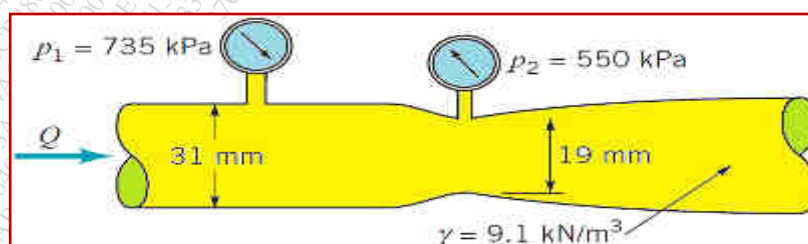
<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	The viscosity of liquids ..... With increase in temperature.
Option A:	decreases
Option B:	increases
Option C:	first decreases and then increases
Option D:	first increases and then decreases
2.	Find Reynolds number if velocity of fluid is 2 m/s and density of fluid 800 kg/m <sup>3</sup> and Viscosity 0.2 N.s/m <sup>2</sup> is flowing through 0.25 m diameter pipe.
Option A:	2000
Option B:	200
Option C:	20
Option D:	2
3.	..... is the square root of the ratio of the inertia force to the pressure force.
Option A:	Reynolds number
Option B:	Mach's number
Option C:	Euler's number
Option D:	Froude's number
4.	The term $V^2/2g$ is known as
Option A:	Potential energy
Option B:	pressure energy
Option C:	kinetic energy per unit weight
Option D:	kinetic energy
5.	<b>Which property of the fluid accounts for the major losses in pipes?</b>
Option A:	Density
Option B:	Specific gravity
Option C:	Viscosity
Option D:	Compressibility
6.	If liquid has specific gravity 0.2, then what is weight density of the liquid?
Option A:	200 N/m <sup>3</sup>
Option B:	2000 N/m <sup>3</sup>
Option C:	1962 N/m <sup>3</sup>
Option D:	1.962 N/m <sup>3</sup>
7.	<b>The Reynolds transport theorem establishes a relationship between _____ and _____</b>
Option A:	Control mass system, Control volume system
Option B:	Differential equation, Integral equation
Option C:	Non-conservative equation, Conservative equation



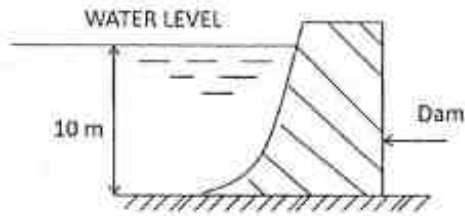
Option D:	Substantial derivative, Local derivative
8.	The coefficient of discharge of Venturimeter lies within the limits:
Option A:	0.95 to 0.99
Option B:	0.8 to 0.85
Option C:	0.7 to 0.8
Option D:	0.6 to 0.7
9.	The maximum velocity in a circular pipe when flow is laminar occurs at
Option A:	the top of the pipe
Option B:	the bottom of the pipe
Option C:	the centre of the pipe
Option D:	not necessarily at the centre
10.	<b>What is the graph that is represented in the airfoil section?</b>
Option A:	Lift-moment ratio
Option B:	Coefficient of lift-coefficient of drag ratio
Option C:	Angle of attack-drag ratio
Option D:	Lift-angle of attack ratio

<b>Q2.</b>	
<b>A</b>	<b>Solve any Two 5 marks each</b>
i.	What is Pascal law and Archimedes Principle?.
ii.	How do you determination of head loss in pipes due to friction
iii.	Write short notes on types of fluids.
<b>B</b>	<b>Solve any One 10 marks each</b>
i.	A 1 m wide and 1.5 m deep rectangular plane surface lies in water in such a way that its plane makes an angle of 30° with the free water surface. Determine the total pressure and position of centre of pressure when the upper edge is 0.75 m below the free water surface.
ii.	In a two-dimensional incompressible flow, the fluid velocity components are given by $u = x - 4y$ and $v = -y - 4x$ . Show that velocity potential exists and determine its form as well as stream function.

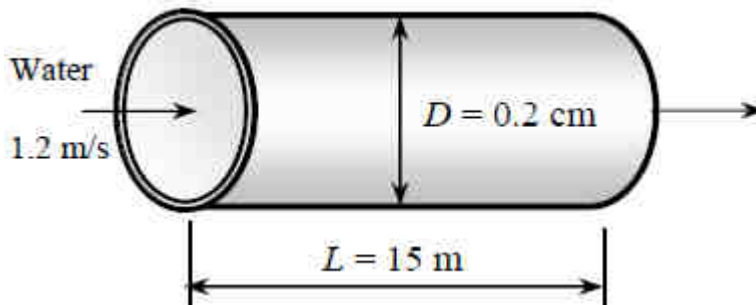
<b>Q3.</b>	
<b>A</b>	<b>Solve any Two 5 marks each</b>
i.	What are the properties of Newtonian and non-Newtonian fluids?
ii.	With neat sketch explain working and construction of venturimeter
iii.	Write a short note on Buckingham's $\pi$ theorem.
<b>B</b>	<b>Solve any One 10 marks each</b>
i.	Determine the flow rate through the Venturimeter shown in figure ( $\gamma = \rho g$ )



- ii. Find the magnitude and direction of the resultant water pressure acting on a curved face of a dam which is shaped according to the relation  $y = (x^2/8)$  as shown in fig. The height of the water retained by the dam is 10 m. Consider the width of the dam as unity.



<b>Q4.</b>	
<b>A</b>	<b>Solve any Two 5 marks each</b>
i.	What is Reynolds transport theorem? What purpose does it serve?
ii.	Define stream function and velocity potential function.
iii.	Write short note on boundary layer separation and methods to control it
<b>B</b>	<b>Solve any One 10 marks each</b>
i.	An oil of viscosity 9 poise and specific gravity 0.9 is flowing through a horizontal pipe of 60 mm diameter. If the pressure drop in 100 m length of the pipe is $1800 \text{ kN/m}^2$ determine the rate of flow of oil.
ii.	Water ( $\rho = 999.7 \text{ kg/m}^3$ and $\mu = 1.307 \times 10^{-3} \text{ kg/m.s}$ ) is flowing in a 0.20-cm-diameter 15-m-long pipe steadily at an average velocity of 1.2 m/s. <b>Determine</b> (a) the pressure drop and (b) The pumping power requirement to overcome this pressure drop



**University of Mumbai**  
**Examinations Summer 2022**

Time: 2hour 30 minutes

Max. Marks: 80

<b>Q1. 20 Marks</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	Which of the following is a common application of UJT?
Option A:	Amplifier
Option B:	Rectifier
Option C:	Multivibrator
Option D:	Sawtooth generator
2.	Which of the following is a characteristics of an ideal Op-Amp?
Option A:	Finite voltage gain
Option B:	Finite Bandwidth
Option C:	Infinite output resistance
Option D:	Infinite input resistance
3.	In inverters, to make the supply voltage constant
Option A:	an inductor is placed in series with the load
Option B:	capacitor is connected in parallel to the load side
Option C:	an inductor is placed in parallel with the load
Option D:	capacitor is connected in parallel to the supply side
4.	NAND gate means
Option A:	Inversion followed by AND gates
Option B:	AND gate followed by an inverter
Option C:	AND gate followed by OR gate
Option D:	OR gate followed by AND gate
5.	MSP 430 microcontroller has a dual _____ D/A converters with synchronization
Option A:	8-bit
Option B:	16-bit
Option C:	12-bit
Option D:	32-bit
6.	What happens when the speed of a DC motor increases ?
Option A:	Back emf falls and line current increase.
Option B:	Both back emf as well as line current increase.
Option C:	Both back emf as well as line current fall.
Option D:	Back emf increase but line current falls.
7.	Typical brushless motor doesn't have _____
Option A:	Commutator
Option B:	Permanent magnet
Option C:	Electronic controller
Option D:	Fixed armature
8.	Zener diodes allow a current to flow in the reverse direction, when the
Option A:	voltage reaches above a certain value
Option B:	temperature reaches above a certain value
Option C:	current always flows in the reverse direction only

Option D:	current cannot flow in the reverse direction
9.	Which of the following instructions means “Jump if carry = 0”?
Option A:	JNC label
Option B:	JNE label
Option C:	JNZ label
Option D:	JC label
10.	To turn off the SCR, which of the following is done?
Option A:	Reduce gate voltage to zero
Option B:	Reverse bias the gate
Option C:	Reduce anode voltage to zero
Option D:	Reduce cathode voltage to zero

<b>Q2.</b> <b>(20 Marks)</b>	
A	<b>Solve any Two</b> <span style="float: right;"><b>5 marks each</b></span>
i.	Compare DIAC and TRIAC.
ii.	Draw and explain astable mode of operation of IC 555.
iii.	Draw functional block diagram of microcontroller and explain it..
B	<b>Solve any One</b> <span style="float: right;"><b>10 marks each</b></span>
i.	Explain UJT triggering method of SCR in brief with circuit diagram.
ii.	Draw circuit diagram and waveforms of three phase bridge inverter with 180° conduction mode and explain the working of the same.

<b>Q3.</b> <b>(20 Marks)</b>	
A	<b>Solve any Two</b> <span style="float: right;"><b>5 marks each</b></span>
i.	State and prove De-Morgan’s theorem.
ii.	Draw and explain equivalent circuit of an OP-AMP.
iii.	List the feature of MSP 430.
B	<b>Solve any One</b> <span style="float: right;"><b>10 marks each</b></span>
i.	Explain the functional block diagram of IC-555 Timer.
ii.	What is a flip flop? Explain different types of flip flops.

<b>Q4.</b> <b>(20 Marks)</b>	
A	<b>Solve any Two</b> <span style="float: right;"><b>5 marks each</b></span>
i.	Explain the operation of JK flip-flop.
ii.	Draw and explain first order low pass filter.
iii.	Draw the characteristics of power BJT, power MOSFET and IGBT.
B	<b>Solve any One</b> <span style="float: right;"><b>10 marks each</b></span>
i.	Draw and Explain characteristics of DC shunt motor.
ii.	Explain speed control method of induction motor using microcontroller.

# University of Mumbai

## Examinations Summer 2022

Program: Mechanical Engineering

Examination: SE Semester IV

Course Code: 41223 and Course Name: Kinematics of Machinery

1T01434 // S.E.(Mechanical) Engineering)(SEM-IV)(Choice Base Credit Grading System ) ((R- 19)  
(C Scheme)

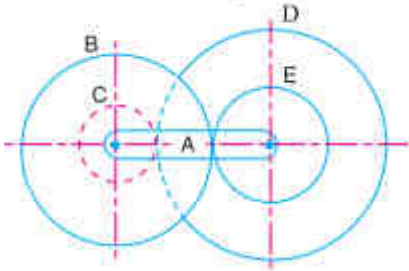
Time: 2 hour 30 minutes

Max. Marks: 80

<b>Q1. (20 Marks)</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>	<b>02 Marks each</b>
1.	A Crank and slotted lever mechanism used in a shaper has a center distance of 300 mm between the center of oscillation of the slotted lever and the center of rotation of the crank. The radius of the crank is 120 mm. Find ratio of the time of cutting to the time of return stroke.	
Option A:	1.5	
Option B:	17.2	
Option C:	1.72	
Option D:	1.9	
2.	Cam and follower is example of	
Option A:	Higher pair	
Option B:	Lower Pair	
Option C:	Rolling Pair	
Option D:	Sliding Pair	
3.	The Coriolis acceleration component	
Option A:	lags the sliding velocity by $90^\circ$	
Option B:	leads the sliding velocity by $90^\circ$	
Option C:	lags the sliding velocity by $180^\circ$	
Option D:	leads the sliding velocity by $180^\circ$	
4.	In simple gear train, if there is odd number of idlers , the direction of rotation of the driver and the driven gears will be	
Option A:	Opposite	
Option B:	Same	
Option C:	Depends upon number of teeth of the gears	
Option D:	Contact ratio	
5.	The total number of instantaneous centres for a mechanism consisting of n links are	
Option A:	n	
Option B:	$n/2$	
Option C:	$n(n-1)/2$	
Option D:	$n(n+1)/2$	
6.	On which of the following factor does the moment of inertia of an object not depend upon	
Option A:	Axis of rotation	
Option B:	Angular velocity	

Option C:	Distribution of mass
Option D:	Mass of an object
7.	The power transmitted by a belt is maximum when the maximum tension in the belt (T) is equal to
Option A:	$3T_c$
Option B:	$2T_c$
Option C:	$(1/3) TC$
Option D:	$4T_c$
8.	In a Davis steering mechanism the distance between pivot of front axle (b) 120cm, and the length of wheel base is (l) 260cm. When the vehicle moving straight path the angle of ( $\alpha$ ) inclination of track arm to the vertical is ----- degree.
Option A:	21.99
Option B:	32.81
Option C:	12.99
Option D:	19.33
9.	Chordal action in chain
Option A:	Changes the velocity ratio
Option B:	Increases overall length of chain
Option C:	Decreases overall length of chain
Option D:	Changes the center distance between sprockets
10.	A gear wheel turning at 20 radians per second is in mesh with pinion turning at double the speed of wheel. If the length of path of approach is 10 mm, what will be the sliding velocity at pitch point?
Option A:	600 mm/s
Option B:	60 mm/s
Option C:	6 mm/s
Option D:	0

<b>Q2.</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	Explain elliptical trammel	
B	Compare Cycloidal and involute tooth forms.	
C	Derive the expression for open belt drive	
D	Describe the procedure to draw velocity and acceleration diagrams of a four-link mechanism.	
E	Explain double block or shoe brake with a neat sketch.	
F	Classify various types of CAM and follower	
<b>Q3</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
A	The following data relate to knife edge follower. Minimum radius of CAM 45 mm Lift of follower 40 mm Angle of ascent $60^\circ$ angle of descent $120^\circ$ angle of dwell for the follower in the highest position $90^\circ$ . Plot the displacement, velocity acceleration plot if the ascent and descent motion of the CAM is Simple Harmonic Motion.	
B	An open belt running over two pulleys 240 mm & 600 mm diameter connects two parallel shafts 3 m apart & transmits 5 kW from the smaller pulley that rotates at 400 rpm coefficient of friction is 0.3 & the safe working tension is 10 N per mm width, Determine-i) Min width of the belt, ii) Initial belt tension, iii) Length of the belt required.	

C	<p>In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise.</p> 
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<b>Q4.</b> <b>(20 Marks)</b>	<b>Solve any Two</b>	<b>5 marks each</b>
A	What are centripetal and tangential components of acceleration? When do they occur? How are they determined?	
B	Derive the equation for centrifugal tension	
C	Explain successfully constrained motion with sketches of examples.	
	<b>Solve any any One</b>	<b>10 Marks each</b>
A	Two mating gears have 40 & 60 involute teeth of module 10 mm & 20° pressure angle. The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half the maximum possible length. Determine the a) addendum height for each gear wheel, b) length of path of contact, & arc of contact & c) contact ratio.	
B	<p>The dimensions of a mechanism as shown in the figure are as follows:  <math>AB = 0.45</math> m, <math>BD = 1.5</math> m, <math>BC = CE = 0.9</math> m.</p> <p>The crank AB turns uniformly at 180 rpm in the clockwise direction and the blocks at D and E are working in frictionless guides. Draw the velocity diagram for the mechanism and find the velocities of the sliders D and E in their guides using relative velocity method.</p> 