University of Mumbai

Examination 2020 under cluster 9 (FAMT)

Examinations Commencing from 23rd December 2020 to 6th January 2021

Program: **Mechanical Engineering**

Curriculum Scheme: Rev2016

Examination: SE Semester IV

Course Code: MEC405 and Course Name: Kinematics of Machinery

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Law of gearing states that in order to have constant angular velocity ratio between the gears in mesh
Option A:	Common tangent drawn at the point of contact must pass through pitch point
Option B:	Common normal drawn at the point of contact must pass through pitch point
Option C:	Common normal drawn at the point of contact must pass through point of tangency
Option D:	Common tangent drawn at the point of contact must pass through point of tangency
2.	Which of the following statement is TRUE in case of cycliodal and involute gear teeth profiles
Option A:	Cycliodal teeth profile is generated upon base circle and involute teeth profile is generated upon pitch circle
Option B:	Both profiles are generated upon base circle
Option C:	Both profiles are generated upon pitch circle
Option D:	Cycliodal teeth profile is generated upon pitch circle and involute teeth profile is generated upon base circle
3.	Calculate the maximum possible length of path of contact for a gear pinion of 50 mm radius in mesh with wheel of 200 mm radius for a 20 degree pressure angle.
Option A:	56.87
Option B:	77.89
Option C:	85.50
Option D:	45.12
4.	Calculate the circular pitch for the gear with 30 teeth and 300 mm PCD
Option A:	30 mm
Option B:	10 mm
Option C:	31.41 mm
Option D:	35.45 mm
5.	With increase in centrifugal tension the power output of belt drive will
Option A:	increase
Option B:	remains unchanged
Option C:	decrease
Option D:	Increases up to certain speed and then decreases

6.	What will be the pitch of the chain with PCD of 300 mm and 45 number of teeth?
Option A:	6.66 mm
Option B:	14.76 mm
Option C:	23.27 mm
Option D:	20.92 mm
7.	A car moving on a level road has a wheel base 5 m, distance of C.G. from ground level is 600 mm and the distance of C.G. from rear wheels 1.2 m. What will be the retardation of car if brakes are applied only at front wheel when coefficient of friction is 0.6.
Option A:	4.17 m/s^2
Option B:	1.52 m/s^2
Option C:	8.34 m/s^2
Option D:	18.32 m/s^2
8.	According to Aronhold Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centers will lie on a
Option A:	straight line
Option B:	parabolic curve
Option C:	ellipse
Option D:	circle
9.	In a four bar mechanism the input link rotates with an angular velocity of ω1 and the output link rotates with an angular velocity of ω2. The mechanical advantage of the mechanism in terms of velocity will be
Option A:	$\omega_1 + \omega_2$
Option B:	ω_2 / ω_1
Option C:	ω_1 / ω_2
Option D:	$\omega_1 . \omega_2$
10.	A point B on a rigid link AB moves with respect to A with angular velocity ω rad/s. The total acceleration of B with respect to A will be equal to
Option A:	vector sum of radial component and coriolis component
Option B:	vector sum of tangential component and coriolis component
Option C:	vector sum of radial component and tangential component
Option D:	vector difference of radial component and tangential component
11.	The magnitude of coriolis component of acceleration of a link rotating at angular speed 10 rad/sec with a slider moving on it with linear velocity of 5 m/sec is
Option A:	100 m/sec^2
Option B:	50 m/sec2
Option C:	2 m/sec2
Option D:	10 m/sec2
12.	When a slider moves on a straight surface, its instantaneous centre relative to that surface lies at
Option A:	At point of contact between slider and surface
Option B:	At pin joint of slider
Option C:	At a line perpendicular to motion of slider at infinity
Option D:	At a line parallel to motion of slider at infinity

13.	The size of a cam depends upon
Option A:	base circle
Option B:	pitch circle
Option C:	prime circle
Option D:	pitch curve
14.	A radial follower is one
Option A:	that reciprocates in the guides
Option B:	that oscillates
Option C:	in which the follower rotates
Option D:	in which the follower translates in any direction irrespective of the cam axis
15.	Offset is provided to a cam follower mechanism to
Option A:	minimize the side thrust
Option B:	Accelerate the follower
Option C:	avoid jumping of follower
Option D:	maximize the side thrust
16.	A Crank and slotted lever mechanism used in a shaper has a centre distance of 300 mm between the centre of oscillation of the slotted lever and the centre 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:	1.72
Option B:	1.5
Option C:	17.2
Option D:	1.9
17.	Two shafts are connected by a Universal joint. The driving shaft rotates at a speed of 1200 rpm. The total fluctuation of speed does not exceed 200 rpm. The greatest permissible angle between shaft axes is ---------- degree
Option A:	32.6
Option B:	23.6
Option C:	16.8
Option D:	40.9
18.	Ackermann steering gear fulfils the condition of correct gearing at
Option A:	one position
Option B:	two positions
Option C:	three positions
Option D:	all positions
19.	Maximum velocity of the driven shaft of a Hooke's joint is observed at θ equal to
Option A:	0^o and 180^o
Option B:	90^o and 270^o
Option C:	90^o and 180^o
Option D:	180^o and 270^o
20.	Which steering gear mechanism fulfills condition of correct steering at all position?
Option A:	Ackermann steering gear mechanism

Option B:	Davis steering gear mechanism
Option C:	Center point steering gear mechanism
Option D:	Positive drive steering gear mechanism

Q2. **(20 Marks Each)**	**Solve any Four out of Six** **5 marks each**
A	A Cylinder of mass 'm' and radius 'r', resting on an inclined plane is released from rest and rolls down the inclined plane. Assume angle of inclination of plane is with horizontal is 'θ'. Determine the acceleration of its mass centre in terms of θ and g (Acceleration due to gravity).
B	A Hooke's joint is used to couple two shafts together. The driving shaft rotates at a uniform speed of 1000rpm. Determine the greatest permissible angle between the shaft axes so total fluctuations of speed may not exceed 150rpm.
C	Discuss the methods to determine the direction of coriolis component of acceleration.
D	A cam drives a flat reciprocating follower in the following manner : During first 120° rotation of the cam, follower moves outwards through a distance of 20 mm with UARM. The follower dwells during next 30° of cam rotation. During next 120° of cam rotation, the follower moves inwards with Cycliodal motion. The follower dwells for the next 90° of cam rotation. Determine the maximum velocity during ascent and maximum acceleration during descent.
E	Compare involute and cycliodal gear teeth profiles.
F	The number of teeth on each of the two equal spur gears in mesh are 40. The teeth have 20° involute profile and the module is 6 mm. If the arc of contact is 1.75 times the circular pitch, find the addendum.

Q3. **(20 Marks Each)**	**Solve any Four out of Six** **5 marks each**
A	Define degrees of freedom and derive expression for the same.
B	With neat sketch elaborate working of pantograph.
C	Elaborate the procedure to determine the velocity of point on the slotted bar of a shaper mechanism which is coinciding with end of point on a crank.
D	A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below : 1. To raise the valve through 50 mm during 120° rotation of the cam ; 2. To keep the valve fully raised through next 30°; 3. To lower the valve during next 60°; and 4. To keep the valve closed during rest of the revolution i.e. 150° ; The displacement of the valve, while being raised is to take place with simple harmonic motion and while being lowered is to take place by uniform acceleration and retardation motion. Determine the maximum acceleration of the valve rod when the cam shaft rotates at 100 r.p.m.
E	Elaborate different methods to avoid interference in gears.
F	State and prove law of gearing.

University of Mumbai

Examination 2020

Examinations Commencing from 23rd December 2020 to 6th January 2021

Program: S.E. (Mechanical)

Curriculum Scheme: Rev 2016

Examination: SE Semester IV

Course Code: MEC401 and Course Name: APPLIED MATHEMATICS-IV

Time: 2 hour Max. Marks: 80

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Q1. **(40 Marks)**	**All the Questions are compulsory and carry 2 marks each.**
1.	If A = $\begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$ find A^{50}
Option A:	$\begin{bmatrix} -149 & -150 \\ 150 & 151 \end{bmatrix}$
Option B:	$\begin{bmatrix} 149 & -150 \\ 150 & 151 \end{bmatrix}$
Option C:	$\begin{bmatrix} 149 & 150 \\ -150 & 151 \end{bmatrix}$
Option D:	$\begin{bmatrix} 149 & -150 \\ -150 & 151 \end{bmatrix}$
2.	If A =$\begin{bmatrix} 1 & 2 \\ 2 & 2 \end{bmatrix}$ find $2A^4 - 5A^3 - 7A + 6I$
Option A:	$\begin{bmatrix} 36 & -32 \\ -32 & -52 \end{bmatrix}$
Option B:	$\begin{bmatrix} 36 & 32 \\ 32 & 52 \end{bmatrix}$
Option C:	$\begin{bmatrix} 36 & 32 \\ -32 & -52 \end{bmatrix}$
Option D:	$\begin{vmatrix} 36 & 52 \\ 52 & 52 \end{vmatrix}$
3.	The mean weekly sales of powder in a super market is 146.3. After a special advertisement campaign, the mean weekly sales in 22 branches increases to 153.7 with a S.D of 17.2. Find the calculated value of 't' .
Option A:	4.22
Option B:	1.97
Option C:	9.88
Option D:	16
4.	A simple sample of 400 students is taken from a large population. The mean height of students in the sample is 171.38 cm , while the mean height in the population is 171.17 cm & S.D is 3.3 cm. Find the calculated value of 'z'
Option A:	1.27
Option B:	8.21
Option C:	3.98
Option D:	11.21

5.	In an experiment on pea – breeding Mendle obtained the following results.315 round seeds of yellow colour, 101 wrinkled seeds of yellow colour, 108 round seeds of green colour, 32 wrinkled seeds of green colour. According to his theory of heredity, this no. should be in the proportion 9:3:3:1. Find the calculated value of chi – square.
Option A:	1.89
Option B:	7.82
Option C:	8.72
Option D:	0.47
6.	A random variable X has the following p.d.f X = x | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 P(X= x) | 0 | k | 2k | 2k | 3k | k^2 | $2k^2$ | $7k^2 + k$
Option A:	0.1
Option B:	0.5
Option C:	0.9
Option D:	1.5
7.	A continuous R.V X has a p.d.f given by f(x) = $kx^2(2-x) 0 \le x \le 2$; 0 o.w Find k , mean & variance
Option A:	3/4 , 1.2 , 0.16
Option B:	5 , 3.7 , 3.8
Option C:	1/2 , 1/3 , 3
Option D:	1/2 , 3 , 1/3
8.	Out of 800 families with 4 children each, how many families would be expected to have at least 1boy
Option A:	600
Option B:	100
Option C:	250
Option D:	750
9.	The average marks scored by 32 boys is 72 , with a S.D of 8 while that for 36 girls is 70 with a S.D of 6. . find the calculated value of 'z'
Option A:	3.2
Option B:	5.5
Option C:	1.15
Option D:	6
10.	The mean height and S.D height of 8 randomly chosen sailors are 166.9 cm and 8.29 cm respectively.The corresponding values of 6 randomly chosen soldiers are 170.3 cm and 8.5 cm respectively. Based on these data find the calculated value of 't'.
Option A:	0.1
Option B:	0.7
Option C:	1.9
Option D:	3.6
11.	A skilled typist on routine work kept a record of mistakes made per day during 300 working days. If she made one mistake on 143 days & two

	mistakes on 110 days. Find the number of days on which on which she made 3 mistakes using Poisson's distribution?
Option A:	55
Option B:	68
Option C:	39
Option D:	93
12.	In a distribution exactly normal 7% of items are under 35 & 89% are under 63. Find the mean & S.D
Option A:	m = 50.3 , σ = 10.33
Option B:	m = 10.33 , σ = 50.3
Option C:	m = 25.1 , σ = 5.15
Option D:	m = 5.15 , σ = 25.1
13.	A continuous R.V X has the p.d.f defined by f(x) = A + Bx $0 \leq x \leq 1$ 0 other wise If the mean of the distribution is 1/3. Find A & B.
Option A:	A = 2 , B = -2
Option B:	A = 2 , B = 2
Option C:	A = -2 , B = -2
Option D:	A = 3 , B = -2
14.	The standard deviations calculated from two random samples of sizes 9 & 13 are 1.99 & 1.9 respectively. Find the calculated value of 'F'
Option A:	1.139
Option B:	2.52
Option C:	6.61
Option D:	5.65
15.	If the random variable X takes the values 1,2 , 3 & 4 such that 2P(X=1) = 3P(X=2) = P(X=3) = 5P(X=4) .Find P(X=1).
Option A:	15/61
Option B:	10/61
Option C:	30/61
Option D:	6/61
16.	Using Green's Theorem evaluate $\int(xy + y^2)dx + x^2dy$ over the curve C where C is the closed region bounded by $y = x$ & $y = x^2$
Option A:	$\frac{1}{20}$
Option B:	$\frac{19}{20}$
Option C:	$\frac{-19}{20}$
Option D:	$-\frac{1}{20}$
17.	Using Stoke's theorem evaluate $\int \bar{F} \cdot d\bar{r}$ where $\bar{F} = (2x - y)\bar{\imath} - yz^2\bar{\jmath} - y^2z\bar{k}$& S is the surface of the hemisphere $x^2 + y^2 + z^2 = a^2$ lying above the xy - plane
Option A:	πa^2

Option B:	πa
Option C:	$\frac{\pi a^2}{2}$
Option D:	$\frac{\pi a}{2}$
18.	Use Gauss – Divergence theorem to evaluate $\iint \bar{N} \cdot \bar{F}\, ds$ where $\bar{F} = 4x\bar{\imath} - 2y^2\bar{\jmath} + z^2\bar{k}$& S is the region bounded by $x^2 + y^2 = 4, z = 0$ & $z = 3$
Option A:	7π
Option B:	12π
Option C:	28π
Option D:	84π
19.	Minimize $Z = 2y_1 + 3y_2$ subject to $y_1 + y_2 \geq 5$, $y_1 + 2y_2 \geq 6$ $y_1, y_2 \geq 0$
Option A:	$Z_{min} = 13$
Option B:	$Z_{min} = 15$
Option C:	$Z_{min} = 11$
Option D:	$Z_{min} = -11$
20.	Use Dual Simplex method to Maximize $Z = -3x_1 - 2x_2$ subject to $x_1 + x_2 \geq 1$, $x_1 + x_2 \leq 7$, $x_1 + 2x_2 \geq 10$, $x_2 \leq 3$ x_1 , $x_2 \geq 0$
Option A:	$Z_{max} = 18$
Option B:	$Z_{max} = -18$
Option C:	$Z_{max} = 9$
Option D:	$Z_{max} = -9$

Q2 **(20 Marks)**	**Solve any Four out of Six, 5 marks each.**
A	Show that the matrix $\begin{bmatrix} 2 & -3 & 3 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix}$ is derogatory , hence find the minimal polynomial.
B	A total number of 3759 individuals were interviewed in a public opinion survey on a political proposal. Of them, 1872 were men & the rest women.A total of 2257 individuals were in favour of the proposal & 917 were opposed to it. A tptal of 243 men were undecided & 442 women were opposed to the proposal. Do you justify the hypothesis that there is no assosciation between sex and attitude.
C	Solve by simplex method the following L.P.P Minimize $Z = x_1 - 3x_2 + 3x_3$ subject to $3x_1 - x_2 + 2x_3 \leq 7$, $2x_1 + 4x_2 \geq -12$, $-4x_1 + 3x_2 + 8x_3 \leq 10 x_1, x_2, x_3 \geq 0$
D	Two independent samples of sizes 8 & 7 contained the following values. Sample1: 19, 17, 15, 21, 16, 18, 16, 14 Sample2: 15, 14, 15, 19, 15, 18, 16, --- Is the difference between the sample means significant.
E	Let X be a continuous random variable with p.d.f f(x) = kx(1-x) $0 \leq x \leq 1$ Find k and determine a number b such that P(X≤b) = P(X≥b).

F	If the vector field $\bar{F}$ is irrotational find constants a , b , c where $\bar{F}$ is given by $\bar{F}$ = (x + 2y + az)$\bar{\imath}$ + (bx – 3y – z)$\bar{\jmath}$ + (4x + cy +2z)$\bar{k}$. Hence find the work done in moving a particle in this field from (1 , 2 ,-4) to (3 , 3 , 2) along the straight line joining these points.

Q3. **(20 Marks)**	**Solve any Four Questions out of Six, 5 marks each.**
A	Fit a Poisson distribution to the following data & test the goodness of fit. x: 0 1 2 3 4 5 f: 142 156 69 27 5 1
B	Show that the matrix $\begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalisable
C	Construct the dual of the problem and hence solve Maximize Z = $2x_1 + x_2$ subject to $-x_1 + 2x_2 \leq 2$, $x_1 + x_2 \leq 4$, $x_1 \leq 3, x_1, x_2 \geq 0$
D	Find the equations of lines of regression for the following data X: 2 4 6 7 8 10 12 Y: 1600 1500 1800 1900 1700 2100 2000
E	$if\ A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}, prove\ that\ A^{50} - A^{49} = \begin{bmatrix} -4 & 4 \\ 2 & -2 \end{bmatrix}$.
F	$Calculate\ the\ rank\ correlation\ coefficient\ from\ the\ following\ data$ Marks in paper I: 52, 63, 45, 36, 72, 65, 45, 25 Marks in paper II: 62, 53, 51, 25, 79, 43, 60, 33

University of Mumbai

Examination 2020 under cluster 9 (FAMT)

Examinations Commencing from 23rd December 2020 to 6th January 2021

Program: Mechanical

Curriculum Scheme: Rev-2016

Examination: SE Semester: IV

Course Code: MEC402 and Course Name: Fluid Mechanics

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	A fluid is said to be ideal, if it is
Option A:	viscous and compressible
Option B:	non-viscous and compressible
Option C:	non-viscous and incompressible
Option D:	viscous and incompressible
2.	When the net force acting on a fluid is the sum of only gravity force, pressure force and viscous force, the equation is called as
Option A:	Reynolds equation of motion
Option B:	Navier-stokes equation of motion
Option C:	Bernoulli's equation
Option D:	Euler's equation of motion
3.	The type of flow in which the velocity at any given time does not change with respect to space is called
Option A:	steady flow
Option B:	unsteady flow
Option C:	uniform flow
Option D:	rotational flow
4.	The ratio of absolute viscosity to mass density is known as
Option A:	specific viscosity
Option B:	kinematic viscosity
Option C:	coefficient of viscosity
Option D:	viscosity index
5.	What are the reasons for minor head loses in a pipe?
Option A:	Friction
Option B:	Heat
Option C:	Valves and bends
Option D:	Temperature
6.	Drag force is defined as the force exerted by a flowing fluid on a solid body
Option A:	in the direction of flow
Option B:	perpendicular to the direction of flow
Option C:	in the direction which is at an angle of 45 degree to the direction of flow
Option D:	in the direction which is at an angle of 60 degree to the direction of flow
7.	Which among the following is an example of a converging-diverging nozzle?
Option A:	De Laval nozzle

Option B:	High velocity nozzle
Option C:	Magnetic nozzle
Option D:	Vacuum nozzle
8.	The property of fluid by virtue of which it offers resistance to shear is called
Option A:	Surface tension
Option B:	Adhesion
Option C:	Cohesion
Option D:	Viscosity
9.	Which of the following is NOT a type of force considered in the Navier-Stokes equation?
Option A:	Gravity force
Option B:	Pressure force
Option C:	Surface tension force
Option D:	Viscous force
10.	_____is defined as a scalar function of space and time such that its negative derivative with respect to any direction gives the fluid _____ in that direction.
Option A:	Velocity potential function, velocity
Option B:	Stream function, pressure
Option C:	Circulation function, velocity
Option D:	Velocity potential function, pressure
11.	A stream line is one
Option A:	in which temperature remains constant
Option B:	in which the flow cannot cross the bounding surface
Option C:	which has a constant area throughout its length so that the velocity remains constant.
Option D:	in which the flow can cross the bounding surface
12.	Darcy-Weisbach equation is used to find loss of head due to
Option A:	sudden enlargement
Option B:	sudden contraction
Option C:	friction
Option D:	bend
13.	What is the velocity profile for Poiseuille flow?
Option A:	Zero
Option B:	Constant
Option C:	Linear
Option D:	Quadratic
14.	Reynolds number is used to
Option A:	detect pressure changes
Option B:	predict flow patterns
Option C:	detect Temperature
Option D:	detect Viscosity
15.	The Pitot tube is used for measurement of
Option A:	pressure
Option B:	flow
Option C:	velocity
Option D:	Discharge
16.	A body is called stream lined body when it is placed in a flow and the surface of the body
Option A:	coincides with streamlines

Option B:	does not coincides with the streamlines
Option C:	is perpendicular to the streamlines
Option D:	is inclined to the streamlines
17.	Which among the following is an assumption of the compressible flow?
Option A:	Resistance to flow of object
Option B:	No-slip condition
Option C:	Known mass flow rate
Option D:	Resistance to flow of heat
18.	…….is defined as the distance, measured perpendicular to the boundary of the solid body, by which the boundary should be displaced to compensate for the reduction in flow rate on account of boundary layer formation
Option A:	Boundary Layer Thickness
Option B:	Displacement Thickness
Option C:	Momentum Thickness
Option D:	Energy Thickness
19.	Compressible flow is a flow that deals with
Option A:	fluid temperature
Option B:	fluid pressure
Option C:	fluid density
Option D:	fluid geometry
20.	Venturi relation is one of the applications of
Option A:	Equation of continuity
Option B:	Bernoulli's equation
Option C:	Light equation
Option D:	Speed equation

Q2. (20 Marks Each)	**Solve any Four out of Six** **5 marks each**
A	Find the kinematic viscosity of an oil having density 981 kg/m^3. The shear stress at a point in oil is 0.2353 and velocity gradient at that point is 0.3 per second.
B	State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression and state the assumptions made for such a derivation.
C	A stream function is given by $\Psi = 5\ x - 6\ y$, calculate the velocity component and resultant velocity at any point.
D	A rectangular plane surface 3 m wide and 4 m deep lies in water in such a way that its plane makes an angle 35˚with the free surface of water. Determine the total pressure force, when the upper edge is 2.5 m below the free surface.
E	A pitot-tube is inserted in a pipe of 300 mm diameter. The static pressure in pipe is 100 mm of mercury (vacuum). The stagnation pressure at the centre of the pipe, recorded by the pitot-tube is 0.981 N/cm^2. Calculate the rate of flow of water through pipe, if the mean velocity of flow is 0.85 times the central velocity. Take $C_v = 0.98$.
F	Sketch the stream lines represented by $\Psi^2 = x^2 + y^2$.

Q3. (20 Marks	**Solve any Two Questions out of Three** **10 marks each**

Each)	
A	Determine (i) the pressure gradient, (ii) the shear stress at the two horizontal parallel plates and (iii) the discharge per metre width for the laminar flow of oil with a maximum velocity of 2 m/s between two horizontal parallel fixed plates which are 100 mm apart. Given μ = 2.4525 Ns/m^2.
B	Define laminar boundary layer, turbulent layer, laminar sub-layer and boundary layer thickens.
C	Find the Mach number when an aeroplane is flying at 1100 km/h through still air having a pressure of 7 N/cm^2 and temperature -5 $^\circ$C. Wind velocity may be taken as zero. Take R = 287 J/kg K. Calculate the pressure and temperature of air at stagnation point on the nose of the plane. Take adiabatic index = 1.4.

University of Mumbai

Examination 2020 under cluster 9 (FAMT)

Examinations Commencing from 23rd December 2020 to 6th January 2021

Program: MECHANICAL Engineering

Curriculum Scheme: Rev2016

Examination: Second Year Semester: IV

Course Code: MEC 403 and Course Name: Industrial Electronics

Time: 2hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Value of the frequency of the AC supply in India.
Option A:	0 Hz
Option B:	50 Hz
Option C:	70 Hz
Option D:	60 Hz
2.	A direct on line starter is used for starting motors
Option A:	up to 5 H.P
Option B:	up to 10 H.P.
Option C:	up to 15 H.P.
Option D:	up to 20 H.P
3.	Which is used to store critical pieces of data during subroutines and interrupts
Option A:	Queue
Option B:	Accumulator
Option C:	Data register
Option D:	Stack
4.	Referred to a bidirectional trigger diode
Option A:	Triac
Option B:	UJT
Option C:	BJT
Option D:	Diac
5.	The form factor for half wave rectified sine wave is
Option A:	1.00
Option B:	1.11
Option C:	1.44
Option D:	1.57
6.	A certain noninverting amplifier has Ri of 1 kΩ and Rf of 100 kΩ. The closed-loop voltage gain is ……
Option A:	1,00,000
Option B:	1,000
Option C:	101
Option D:	100
7.	Voltage required to turn on any thyristor

Option A:	Trigger voltage
Option B:	Breakover voltage
Option C:	Barrier voltage
Option D:	Supply voltage
8.	A monostable multivibrator has R = 120kΩ and the time delay T = 1000ms, calculate the value of C?
Option A:	0.9µF
Option B:	1.32µF
Option C:	7.5µF
Option D:	2.49µF
9.	What is the store by register?
Option A:	Data
Option B:	Operands
Option C:	Memory
Option D:	Instructions
10.	A UJT has …….
Option A:	Two pn junctions
Option B:	One pn junction
Option C:	No pn junctions
Option D:	Three pn junctions
11.	A bridge Inverter circuit converts
Option A:	DC Power to AC Power
Option B:	AC Power to DC Power
Option C:	DC Power to DC Power
Option D:	AC Power to AC Power
12.	A microprocessor is capable of addressing 64 K bytes of memory. Its address bus width is
Option A:	8
Option B:	16
Option C:	12
Option D:	20
13.	Choose the correct statement
Option A:	MOSFET is an uncontrolled device
Option B:	MOSFET is a voltage-controlled device
Option C:	MOSFET is a current controlled device
Option D:	MOSFET is a temperature-controlled device
14.	With sinusoidal input, Schmitt Trigger gives an output as
Option A:	Saw tooth Wave
Option B:	Square Wave
Option C:	Triangular Wave

Option D:	Cosine wave
15.	Which of the following finds applications in speed control of a DC motor?
Option A:	FET
Option B:	NPN transistor
Option C:	SCR
Option D:	Diode
16.	The number of hardware interrupts present in 8085 microprocessor are
Option A:	5
Option B:	10
Option C:	8
Option D:	16
17.	A Triac has three terminals viz ……
Option A:	Drain, source, gate
Option B:	Two main terminal and a gate terminal
Option C:	Cathode, anode, gate
Option D:	Cathode, anode, Drain
18.	Which D.C. motor will be preferred for machine tools?
Option A:	Series motor
Option B:	Shunt motor
Option C:	Cumulative compound motor
Option D:	Differential compound motor
19.	For an Op-amp with negative feedback, the output is …….
Option A:	equal to the input
Option B:	Increased
Option C:	fed back to the inverting input
Option D:	fed back to the noninverting input
20.	According to Boolean law: A + 1 =?
Option A:	1
Option B:	A
Option C:	0
Option D:	A'

Q2.	Solve any Four out of Six; 5 marks each
A	Draw the characteristics of power BJT, power MOSFET and IGBT.
B	Draw and explain equivalent circuit of an OP-AMP.
C	Draw circuit diagram of single phase fully controlled rectifier and derive the equation for average output voltage.
D	Write short note on: ALU
E	Write a short note on "Selection of motor and power rating for a pump".
F	Explain different peripherals of MSP 430

Q3.	Solve any Four out of Six; 5 marks each
A	Explain UJT triggering method of SCR in brief with circuit diagram.
B	Draw and explain first order low pars filter.
C	Explain basic principle of single-phase inverter.
D	Compare microprocessor & microcontroller.
E	Draw and explain R triggering method of SCR.
F	State and explain De-Morgan's theorem.

University of Mumbai

Examination 2020 under cluster 9 (FAMT)

Examinations Commencing from 23rd December 2020 to 6th January 2021

Program: Mechanical Engineering

Curriculum Scheme: Rev 2016

Examination: SE Semester IV

Course Code: MEC404 and Course Name: Production Process-II

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Cutting conditions like large chip thickness, low cutting speed & small rake angle are favorable for producing following types of chips.
Option A:	Continuous chips
Option B:	Discontinuous chips
Option C:	Continuous chips with built up edge
Option D:	Segmental chips
2.	In Rapid Prototyping process, the first step is
Option A:	Cleaning and Finishing
Option B:	CAD Model
Option C:	Part orientation
Option D:	Checking STL files
3.	The wear caused by chemical or electrochemical reactions is called as
Option A:	Diffusion wear
Option B:	Abrasion wear
Option C:	Adhesion wear
Option D:	Corrosive wear
4.	The extra material from a rough sheared edge is trimmed by cutting is called as
Option A:	Slitting
Option B:	Shaving
Option C:	Blanking
Option D:	Piercing
5.	Which one of the following bushings is used to locate the renewable bushing?
Option A:	Press fit bushing
Option B:	linear bushing
Option C:	Special bushing
Option D:	Knurled bushing
6.	Which locators provide a simple means of locating a drilled hole exactly on diameter or a cylindrical or spherical component?

Option A:	Conical and vee locators
Option B:	Conical locators
Option C:	Vee locators
Option D:	Diamond pin locators
7.	In this type of dynamometer, strain gauges are used to measure the strain on cutting tool.
Option A:	Hydraulic dynamometer
Option B:	Pneumatic dynamometer
Option C:	Electrical dynamometer
Option D:	Strain gauge type dynamometer
8.	In Abrasive jet machining, which medium is used for carrying the abrasive grains for machining?
Option A:	Gases
Option B:	Liquids
Option C:	Solid
Option D:	Semi solid
9.	In a Merchant circle, it is a backing up force on the chip provided by the work piece normal to shear plane.
Option A:	Shear force
Option B:	Normal compressive force
Option C:	Friction force
Option D:	Cutting force
10.	The sheet metal is fed through a coil strip, and a different operation is performed at the same station with each stroke of a series of punches
Option A:	compound die
Option B:	Combination die
Option C:	Progressive die
Option D:	Simple die
11.	This angle in single point cutting tool provides a clearance to the trailing end of the cutting edge to prevent rubbing of cutting edge with machined surface.
Option A:	Back rake angle
Option B:	End relief angle
Option C:	End cutting edge angle
Option D:	Side rake angle
12.	This wear produces wear lands on the side and end flanks of the tool due to rubbing action of machined surface.
Option A:	Crater wear
Option B:	Flank wear
Option C:	Corrosive wear
Option D:	Adhesion wear
13.	Principle of following states that “In order to achieve the maximum accuracy in

	location the locating points should, therefore, be placed as far apart from one another as it is possible".
Option A:	Mutually perpendicular planes
Option B:	Extreme positions
Option C:	Least points
Option D:	Six-point location
14.	the surface of a cutting die between its cutting edge and the beginning of the relief provided for cutting hard materials is called as
Option A:	Angular Clearance
Option B:	Clearance hole
Option C:	land
Option D:	Straight land
15.	In water jet cutting and abrasive water jet cutting, the separation between the nozzle opening and the work surface is called which one of the following.
Option A:	Standoff distance
Option B:	Gap
Option C:	Orifice
Option D:	Gap size
16.	This cost includes loading and unloading time of the workpiece.
Option A:	Handling cost per piece
Option B:	Machining cost per piece
Option C:	Tool changing cost per piece
Option D:	Tooling cost per piece
17.	Following is an example of Powder based prototyping systems
Option A:	Fused Deposition Modelling
Option B:	Selective Laser Sintering
Option C:	3 D Printing
Option D:	Stereo lithography
18.	Straight or helical grooves cut in the body of the drill to provide cutting edges, to allow chip removal, and to allow cutting fluid to reach the cutting edges is called as
Option A:	Margin
Option B:	Land
Option C:	Chisel edge
Option D:	Flutes
19.	In a Stereo lithography process, the liquid used in a Vat is called as
Option A:	Die-electric fluid
Option B:	Photopolymer Resin
Option C:	Kerosene
Option D:	Electrolyte
20.	Determine chip thickness ratio if uncut chip thickness is 0.125mm and chip thickness is 0.45mm.
Option A:	2.6

Option B:	0.18
Option C:	0.28
Option D:	3.6

Q2	**Solve any Four out of Six** **5 marks each**
A	Explain in short: Types of chips
B	Explain trueing and dressing of grinding wheel.
C	Explain constructional features of progressive die.
D	What is the difference between jigs and fixtures.
E	Give classification of Nontraditional machining.
F	What are the basic steps in Rapid Prototyping.

Q3.	
A	**Solve any Two** **5 marks each**
i.	Explain in short: Stereo lithography process.
ii.	What are the advantages and disadvantages of Electro-chemical machining process.
iii.	Explain Template jig and Plate jig.
B	**Solve any One** **10 marks each**
i.	A seamless tube of 50mm outside diameter is turned on a lathe with a cutting speed of 20 m/min. the tool rake angle is 15^0 and feed rate is 0.2mm/rev. the length of continuous chip in one revolution measures 80mm. Calculate i) Chip thickness ratio ii) Shear plane angle iii) Chip velocity iv) Shear strain v) Shear strain rate
ii.	Calculate the following for a blanking die to produce 12000 pieces of M.S. workpiece of diameter 32mm and 2mm thick. The material is having shear strength of 400 $N/mm^{2.}$ Assume suitable data if necessary. Find i) Scrap strip layout ii) Total length of strip to produce 12000 pieces iii)Percentage of stock used