University of Mumbai

Examination 2021 under cluster __(Lead College: _________)

Examinations Commencing from 15th June 2021 to 24th June 2021

Program: **BE (Automobile)**

Curriculum Scheme: Rev 2016 (CBCGS)

Examination: SE Semester III

Course Code: AEC301 and Course Name: APPLIED MATHEMATICS - III

Time: 2 hours | Max. Marks: 80

Note: All Questions are compulsory

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	$L\{t^2 + e^{2t}\}$ equals
Option A:	$\frac{2}{s^3} + \frac{1}{s-2}$
Option B:	$\frac{2}{s^3} + \frac{1}{s+2}$
Option C:	$\frac{1}{s^3} + \frac{1}{s-2}$
Option D:	$\frac{3}{s^3} + \frac{2}{s+2}$
2.	$L\{e^{-3t} \sin 4\, t\}$ equals
Option A:	$\frac{s+3}{(s+3)^2+16}$
Option B:	$\frac{4}{(s-3)^2+16}$
Option C:	$\frac{4}{(s+3)^2+16}$
Option D:	$\frac{s-3}{(s-3)^2+16}$
3.	If L{f(t)} = F(s), then $L\{\int_0^t f(u)du\}$ equals
Option A:	$sF(s)$
Option B:	$-F'(s)$
Option C:	$\frac{1}{s}\, F(s)$
Option D:	$-sF'(s)$
4.	$L^{-1}\{\frac{s+2}{s^2+4s+8}\}$ equals
Option A:	$e^{2t} \cos 2t$
Option B:	$e^{-2t} \cos 2t$
Option C:	$e^{-2t} \sin 2t$
Option D:	$e^{2t} \sin 2t$

5.	$L^{-1}\{\frac{1}{(s+2)(s+3)}\}$ equals
Option A:	$e^{2t}-e^{3t}$
Option B:	$e^{-2t}+e^{-3t}$
Option C:	$e^{2t}+e^{3t}$
Option D:	$e^{-2t}-e^{-3t}$
6.	If $L^{-1}\{F(s)\}=f(t)$ and $L^{-1}\{G(s)\}=g(t)$ then $L^{-1}\{F(s)G(s)\}$ equals
Option A:	$\int_0^\infty f(u)g(u)du$
Option B:	$\int_{-\infty}^\infty f(t)g(t-u)du$
Option C:	$\int_0^t f(u)g(u)du$
Option D:	$\int_0^t f(u)g(t-u)du$
7.	If $f(z)=u+iv=sinhx\cos y+i\cosh x\sin y$ then
Option A:	$u_x=-v_x$
Option B:	$u_y=-v_y$
Option C:	$u_y=-v_x$
Option D:	$u_x=u_y$
8.	If $u=e^{2x}\cos\,2y$ then
Option A:	$u_x=-u_y$
Option B:	$u_{xx}=u_{yy}$
Option C:	$u_{xy}=-u_{yy}$
Option D:	$u_{xx}=-u_{yy}$
9.	The image of the circle $x^2+y^2=4$ under the transformation $w=\frac{1}{z}$ is
Option A:	The circle with center origin and radius $\frac{1}{2}$
Option B:	The circle with center origin and radius 2
Option C:	A straight line passing through the origin
Option D:	A straight line parallel to the imaginary axis
10.	The poles of $f(z)=\frac{5z^2}{(z-1)^2(z+7)}$ are
Option A:	1, 7
Option B:	-1,-7
Option C:	-1,7
Option D:	1,-7
11.	The residue at the pole z = -3 of $f(z)=\frac{2}{(z-5)(z+3)}$ is
Option A:	-1/4
Option B:	¼

Option C:	-1
Option D:	0
12.	$\oint_C \frac{5}{z-2}\,dz$ where C is the circle $\lvert z\rvert = 4$ is
Option A:	0
Option B:	$10\pi i$
Option C:	$2\pi i$
Option D:	$-\pi i$
13.	The functions $f(x) = 1$ and $g(x) = x$ are defined in the interval (-1,1). Then
Option A:	$f(x)$ and $g(x)$ are orthonormal in (-1,1)
Option B:	$f(x)$ and $g(x)$ are orthogonal, but not orthonormal in (-1,1)
Option C:	$f(x)$ and $g(x)$ are not orthogonal in (-1,1)
Option D:	$f(x)$ and $g(x)$ are orthonormal, but not orthogonal in (-1,1)
14.	Suppose $f(x) = \sqrt{1-\cos x}$ in $(0,2\pi)$. Then the Fourier coefficient a_0 where $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx$ is the Fourier Series of $f(x)$ is equal to
Option A:	0
Option B:	$\frac{4\sqrt{2}}{\pi}$
Option C:	$\frac{2\sqrt{2}}{\pi}$
Option D:	π
15.	Suppose $f(z) = \frac{1}{z-1} + 1 + \frac{z-1}{2!} + \frac{(z-1)^2}{3!} + \cdots$. Then z = 1 is
Option A:	A pole of order 2
Option B:	A pole of order 1
Option C:	A pole of order 3
Option D:	Not a pole
16.	Suppose $f(x) = x$ in $(-\pi,\pi)$. Then the Fourier coefficient a_n where $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin nx$ is
Option A:	$\frac{1}{n}$
Option B:	$\frac{-1}{n}$
Option C:	0
Option D:	$\frac{1}{\pi}$
17.	The coefficient C_n in the expansion of $f(x)$ in $(0,2\pi)$ *as a* complex form of the Fourier Series is
Option A:	$\frac{1}{\pi}\int_0^{2\pi} f(x)e^{-inx}dx$
Option B:	$\frac{1}{2\pi}\int_0^{2\pi} f(x)e^{-inx}dx$

Option C:	$\frac{1}{\pi}\int_0^{2\pi} f(x)e^{inx}dx$
Option D:	$\frac{1}{2\pi}\int_0^{2\pi} f(x)e^{inx}dx$
18.	By the Bilinear Transformation $w = \frac{z+2}{-z+1}$ the images of the points z=1,0, -1 are respectively
Option A:	$(\infty, 0,1)$
Option B:	$(\infty, -2, \frac{-1}{2})$
Option C:	$(\infty, 2, \frac{1}{2})$
Option D:	$(\infty, 0, -1)$
19.	Suppose the two regression coefficients are $b_{yx} = \frac{-1}{2}$, $b_{xy} = \frac{-3}{8}$ then the correlation coefficient r is
Option A:	$-\frac{\sqrt{3}}{4}$
Option B:	$\pm\frac{\sqrt{3}}{4}$
Option C:	$-\frac{3}{4}$
Option D:	$\pm\frac{3}{4}$
20.	The rank correlation coefficient of the following marks in Subjects X and Y is X 12 15 11 13 18 Y 4 20 16 12 19
Option A:	0.8
Option B:	-0.6
Option C:	-0.8
Option D:	0.6

Subjective/Descriptive questions

Q2 **(20 Marks)**	**Solve any Four out of Six (5 marks each)**
A	Evaluate using Laplace Transforms: $\int_0^\infty e^{-2t} cos\ 3t \cos 5t\ dt$
B	Find $L^{-1}\{\frac{s-2}{((s^2+4s+8)}\}$
C	Suppose the regression lines are given by $3x + 2y = 7$ and $2x + y = 5$ Find the correlation coefficient and the means of X and Y.
D	Suppose $f(a) = \int_C \frac{3z^2+2z-7}{z-a} dz$ where C is the circle $\|z + 2\| = 2.$ Obtain $f(3)$ and $f'(-3)$
E	Obtain the Fourier series of $f(x) = \sin x, \quad -\pi \leq x \leq \pi$
F	Solve using Bender-Schmidt method: $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$; subject to the conditions: $u(0,t) = 0; u(2,t) = 0; u(x,0) = x^2(4-x^2)$ taking $h = 1$ upto 2 seconds

Q3 **(20 Marks)**	**Solve any Four out of Six (5 marks each)**
A	Obtain $L\{\int_0^t u \cos 2u\ du\}$
B	Find: $L^{-1}\{\frac{s}{(s^2+4)(s^2+1)}\}$ using convolution theorem
C	Obtain the analytic function whose imaginary part is $e^{-x} \sin y$.
D	Evaluate $\int_C \frac{z}{(z+4)(z+1)} dz$ where C is the circle $\|z\| = 3$
E	Obtain the Bilinear transformation that transforms the points $z = 2, -1, 1$ respectively to the points $w = \infty, 0, -2$
F	Solve using Crank-Nicolson formula: $\frac{\partial^2 u}{\partial x^2} - 16 \frac{\partial u}{\partial t} = 0,\ 0 \leq x \leq 1$; subject to the conditions: $u(0,t) = 0; u(1,t) = 0; u(x,0) = 100\ x\ (1-x)$ taking $h = 0.25$ for one step

University of Mumbai

Examination 2021 under cluster 08 (Lead College: PHCET)

Examinations from 15th June 2021 to 24th June 2021

Program: **Automobile Engineering**

Curriculum Scheme:R 2016

Examination: SE Semester: III

Course Code: **AEC302** and Course Name: **Thermodynamics**

Time: 2 hours 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.	Which of the following is not true for a closed system?
Option A:	Mass does not enter or leave the system
Option B:	Energy does not enter or leave the system
Option C:	Energy transfer may be more or less
Option D:	Mass does not enter or leave the system but energy can
2.	30 kg water heater is heated for 35 minutes by using 3000 J/s power source.Specific heat for water cp for water is 4.8 kJ/kgK .Consider all the electrical energy has gone into heating the water, increase of water temperature in degree is
Option A:	41.3
Option B:	14.5
Option C:	43.75
Option D:	16.8
3.	Which among these is an Intensive property.
Option A:	Specific heat capacity
Option B:	Specific volume
Option C:	Surface tension
Option D:	pressure
4.	The first law of thermodynamics, for steady flow
Option A:	Accounts for all energy entering and leaving a control volume
Option B:	Is an energy balance for the specified mass of fluid
Option C:	Is an expression of the conservation of linear momentum
Option D:	Is primarily concerned with heat transfer
5.	An increase in enthalpy leads to an increase in ___________
Option A:	Increase in pressure
Option B:	Increase in volume
Option C:	Increase in internal energy
Option D:	Increase in mass
6.	In thepolytropic process equation pv^n Constant, if n = 0 the process is termed as
Option A:	Constant volume
Option B:	Constant pressure

Option C:	Constant temperature
Option D:	Isothermal
7.	The entropy may be expressed as a function of
Option A:	Pressure and temperature
Option B:	Temperature and volume
Option C:	Heat and work
Option D:	velocity
8.	Which of the following is the correct sentence.
Option A:	All the reversible engines have the same efficiency
Option B:	All the reversible and irreversible engines have the same efficiency
Option C:	Irreversible engines have maximum efficiency
Option D:	All engines are designed as reversible in order to obtain maximum efficiency
9.	Kelvin plank law deals with
Option A:	Conservation of energy
Option B:	Conservation of heat
Option C:	Conservation of mass
Option D:	Conversion of heat into work
10.	Which among the following represents high grade energy
Option A:	Electrical energy
Option B:	Thermal energy
Option C:	Both thermal energy and Electrical energy
Option D:	Neither of the thermal energy nor of Electrical energy
11.	Clausius-Clapeyron equation pertains to the relationship between
Option A:	Pressure and temperature
Option B:	Volume and temperature
Option C:	Volume and pressure
Option D:	Volume and Velocity
12.	The slopes of sublimation and vaporization curves for all substances are
Option A:	negative
Option B:	positive
Option C:	zero
Option D:	infinity
13.	Moiler diagram is plot of
Option A:	temperature and entropy
Option B:	enthalpy and entropy
Option C:	pressure and enthalpy
Option D:	pressure and volume
14.	The work input to air compressor is minimum if the compression law followed
Option A:	$PV^{1.35}=C$
Option B:	Isothermal $PV=C$
Option C:	Isentropic $PV^{\gamma}= C$
Option D:	$PV^{1.2}=C$

15.	The clearance volume in reciprocating air compressor is provided
Option A:	To reduce the work done per kg of air delivered
Option B:	To increase the volumetric efficiency of the compressor
Option C:	To accommodate valves in the head of the compressor
Option D:	To create turbulence in the air to be delivered
16.	In isentropic process
Option A:	$W=2(u_2-u_1)$
Option B:	$W=u_2+u_1$
Option C:	$W=2(u_2+u_1)$
Option D:	$W=u_2-u_1$
17.	The air standard Otto cycle comprises
Option A:	Two constant pressure processes and two constant volume processes.
Option B:	Two constant pressure processes and two constant entropy processes
Option C:	Two constant volume processes and two constant entropy processes.
Option D:	One constant volume processes and three constant entropy processes.
18.	For the same compression ratio
Option A:	Thermal efficiency of Otto cycle is greater than that of Diesel cycle
Option B:	Thermal efficiency of the Otto cycle is less than that of Diesel cycle
Option C:	Thermal efficiency of Otto cycle is same as that for Diesel cycle.
Option D:	Thermal efficiency of Otto cycle cannot be predicted
19.	Carnot engine working between 377^0C and 37^0C produces 120 kJ of work. The heat added in kJ will be
Option A:	209.5 kJ
Option B:	320.4 kJ
Option C:	420.5 kJ
Option D:	229.5 kJ
20.	Thermal efficiency of a Carnot engine whose hot and cold bodies have temperatures of 154^0C and 15^0C respectively, will be
Option A:	25.7%
Option B:	32.55%
Option C:	23.4%
Option D:	29.6%

Q2. (20 Marks)	Solve any FourQuestions out of six 05 marks each
A	Define intensive and extensive properties with example.
B	Explain p-T diagram for pure substance
C	Explain throttling process and Joule-Thompson porous plug experiment
D	Derive Steady Flow Energy Equation
E	Explain modified Rankine cycle
F	Derive the expression of efficiency of Otto cycle.

Q3 (20 Marks)	Solve any Two Questions out of Three 10 marks each
A	A single stage single acting air compressor delivers 0.6 kg of air per minute at 6 bar. The temperature and pressure at the end of suction stroke are 30^{0}C and 1 bar. The bore and stroke of the compressor are 100 m and 150 mm respectively. The clearance is 3% of the swept volume. Assuming the index of compression and expansion to be 1.3 find: i) Volumetric efficiency ii) Power required if the mechanical efficiency is 85% and iii) Speed of the compressor (r.p.m)
B	Steam enters a turbine operating at steady state with a mass flow rate of 4600 kg/h. The turbine develops a power output of 1000 kW. At the inlet, the pressure is 60 bar, the temperature is 400 0C, and the velocity is 10 m/s. At the exit, the pressure is 0.1 bar, the quality is 0.9, and the velocity is 30 m/s. Calculate the rate of heat transfer between the turbine and surroundings, in kW.
C	In a steam power cycle, the steam supply is at 15 bar and dry and saturated. The condenser pressure is 0.4 bar, Calculate the Carnot and Rankine efficiencies of the cycle. Neglect pump work.(Use steam table for required data)

University of Mumbai

Examination 2021 under cluster _08_(Lead College: PHCET)

Examinations Commencing from 15th June 2021 to 24th June 2021

Program: Automobile Engineering

Curriculum Scheme: Rev2016

Examination: SESemester: III

Course Code: AEC303 and Course Name: Strength of Materials

Time: 2 hoursMax. Marks: 80

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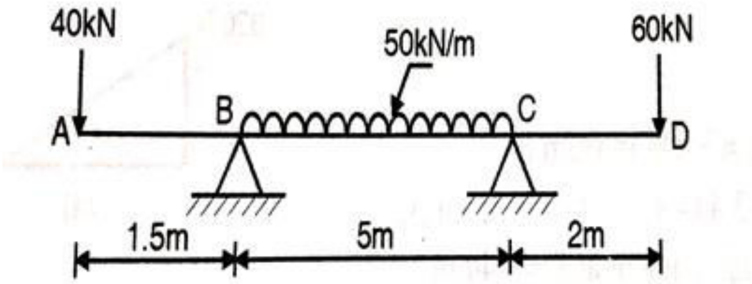
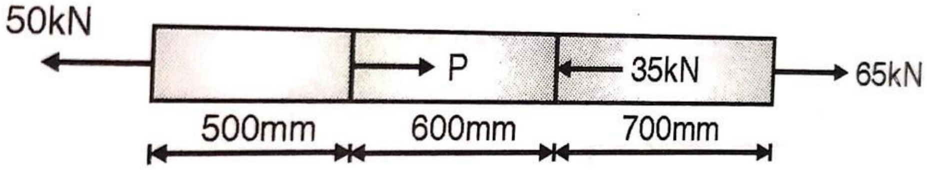
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The dimension of strain is?
Option A:	LT-2
Option B:	N/m2
Option C:	N
Option D:	Dimensionless
2.	The law which states that within elastic limits strain produced is proportional to the stress producing it is known as _____________
Option A:	Bernoulli’s law
Option B:	Hooke’s law
Option C:	Stress law
Option D:	Poisson’s law
3.	The phenomenon of slow extension of materials having a constant load, I.e. increasing with the time is called
Option A:	Creeping
Option B:	Yielding
Option C:	Breaking
Option D:	Hogging
4.	The ability of a material to absorb energy when elastically deformed and to return it when unloaded is called __________
Option A:	Elasticity
Option B:	Resilience
Option C:	Plasticity
Option D:	Strain resistance
5.	The mathematical expression for resilience ‘U’ is __________
Option A:	$U = \sigma^2/E$ x volume
Option B:	$U = \sigma^2/3E$ x volume
Option C:	$U = \sigma^2/2E$ x volume
Option D:	$U = \sigma/2E$ x volume
6.	At ________ the shearing stress in a beam are maximum.
Option A:	Extreme fibres
Option B:	Modulus of section
Option C:	Neutral axis
Option D:	Along the cross-sectional area

7.	Shear stress in a beam is zero at ______
Option A:	Neutral axis
Option B:	Extreme fibres
Option C:	Cross section
Option D:	Junctions
8.	Shear stress distribution over rectangular section will be __________
Option A:	parabolic
Option B:	elliptical
Option C:	triangular
Option D:	trapezoidal
9.	Circumferential stress is same as of __________
Option A:	Hoop stress
Option B:	Longitudinal stress
Option C:	Transverse stress
Option D:	Phreatic stress
10.	Twisting moment is a product of ___________ and the radius.
Option A:	Direction
Option B:	Velocity
Option C:	Force
Option D:	Acceleration
11.	The angle of twist can be written as _________
Option A:	TL/J
Option B:	GJ/TL
Option C:	TL/GJ
Option D:	T/J
12.	Hogging is_________
Option A:	Negative bending moment
Option B:	Positive shear force
Option C:	Positive bending moment
Option D:	Negative shear force
13.	At the point of contraflexure, the value of bending moment is _____________
Option A:	Zero
Option B:	Maximum
Option C:	Can't be determined
Option D:	Minimum
14.	__________ positive/negative bending moments occur where shear force changes its sign.
Option A:	Minimum
Option B:	Zero
Option C:	Maximum
Option D:	Remains same

15.	What is the other name for a positive bending moment ?
Option A:	Hogging
Option B:	Sagging
Option C:	Inflation
Option D:	Contraflexure
16.	In cantilever beams, the slope is ______________ at fixed end.
Option A:	Maximum
Option B:	Zero
Option C:	Minimum
Option D:	Uniform
17.	Slope is maximum at _______ in simply supported beams.
Option A:	Mid span
Option B:	Through out
Option C:	Supports
Option D:	At point of loading
18.	What is the expression of the bending equation?
Option A:	a) $M/I = \sigma/y = E/R$
Option B:	b) $M/R = \sigma/y = E/I$
Option C:	c) $M/y = \sigma/R = E/I$
Option D:	d) $M/I = \sigma/R = E/y$
19.	The maximum strain energy stored at elastic limit is ___________
Option A:	Resilience
Option B:	Proof resilience
Option C:	Elasticity
Option D:	Malleability
20.	Which of the following is also known as axial stress?
Option A:	Shear stress
Option B:	Longitudinal stress
Option C:	Bending stress
Option D:	Hoop stress

Q2	**Solve any Four out of Six5 marks each**
A	A bar of 20mm diameter is subjected to a pull of 50 KN. The measured extension over a gauge length of 20 cm is 0.1 mm and the change in diameter is 0.0035 mm. calculate the Poisson's ratio and modulus of Elasticity.
B	A Circular solid shaft transmits 300 KW at 250 rpm. A permissible shear stress is 30 N/mm2 and allowable twist 10 in a length of 2 m. Determine the diameter of shaft take G=1 x 105 N/mm2.
C	A seamless spherical shell is of 8m internal diameter and 4mm thickness. It is filled with fluid under pressure until its volume increases by 50 cm^3 .Determine the fluid pressure , taking E= 2 x 10^5 $N/mm^2$and μ=0.3
D	Derive the relation between the rate of loading, shear force and bending moment at a section of a beam
E	What are the assumptions made in theory of bending? Derive Flexure Formula for pure Bending
F	Assumptions made in theory of torsion ? Derive Torsional Formula.

Q3.	**Solve any Two Questions out of Three 10 marks each**
A	A hollow shaft of diameter ratio 3/5 is to transmit 250 KW at 70 rpm. The maximum torque =20 % greater than mean torque. The shear stress is not to exceed 60 MPa and twist in length of 4m is not to exceed 3^0. Calculate the external and internal diameters which would satisfy both the above conditions. Take modulus of rigidity G= 80 GPa.
B	A beam 8.5 m long rest on a 5 m apart beam carries the load as shown in the fig .Draw the S.F and B.M diagram and state all the important point including point of contraflexure. 
C	A circular bar having 200 mm^2 area is subjected to the axial load as shown in fig. Find the value of P and the total Elongation. Take E =200 KN/mm^2. 

University of Mumbai
Examination 2021 under cluster 8 (Lead College: PHCET, Rasayani)
Examinations Commencing from 16th June 2021 to 28th June 2021

Program: Automobile Engineering
Curriculum Scheme: Rev 2016
Examination: TE Semester V

Course Code: AEC504 — Course Name: Automotive System

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.	What happens when clutch is disengaged?
Option A:	Engine & flywheel get disconnected
Option B:	Brakes pads & brake drum get disconnected
Option C:	Differential & transmission get disconnected
Option D:	Engine & transmission get disconnected
2.	In case of clutch, which statement is correct?
Option A:	Inertia of the rotating components of the clutch should be maximum
Option B:	Inertia of the rotating components of the clutch should be minimum
Option C:	Lower component weight increases the inertia of clutch assembly
Option D:	Higher component weight reduces the inertia of the clutch assembly
3.	In case of disc type clutch, the clutch disc acts as a …………..
Option A:	driving member
Option B:	driven member
Option C:	neutral member
Option D:	non rotating member
4.	What among the following is not a function of gear box for front engine rear wheel drive arrangement?
Option A:	To vary the speed of output shaft
Option B:	To vary the torque at output shaft
Option C:	To vary the direction of rotation of output shaft
Option D:	To vary the engine power output
5.	When does the torque multiplication in torque converter becomes unity?
Option A:	When turbine speed equals impeller speed
Option B:	When turbine speed is greater than impeller speed
Option C:	When turbine speed is lower than impeller speed
Option D:	When impeller speed is greater than wheel speed
6.	In what type of gear box synchromesh device is used?
Option A:	Synchromesh gear box
Option B:	CVT box
Option C:	Constant mesh gear box
Option D:	Sliding mesh gear box

7.	What among the following is not the advantage of synchromesh gear box over sliding mesh gear box?
Option A:	Jerk free engagement of gears
Option B:	Higher torque transmission
Option C:	Reduction in operating noise
Option D:	Availability of infinite number of gear ratios
8.	If any one member in an epicyclic gear box is rotated and the remaining two members are allowed to run free, what is the condition?
Option A:	Direct Drive
Option B:	Forward drive
Option C:	Reverse drive
Option D:	Neutral
9.	Which among the following is not a manual transmission?
Option A:	Sliding mesh gear box
Option B:	CVT
Option C:	Constant mesh gear box
Option D:	Synchromesh gear box
10.	Why differential is used in automobile?
Option A:	To increase the speed of road wheel
Option B:	To avoid skidding at straight road
Option C:	To avoid skidding while turning
Option D:	To avoid pitching effect
11.	When power has to be transmitted at an angle, what is used?
Option A:	Slip joint
Option B:	Centrifugal Clutch
Option C:	Gear Box
Option D:	Universal Joint
12.	Why propeller shaft is made hollow?
Option A:	To reduce whirling effect
Option B:	To reduce the aesthetic look
Option C:	To increase whirling effect
Option D:	To increase the aesthetic look
13.	What is the function of brake valve?
Option A:	To control the flow of compressed air from air reservoir to air chamber
Option B:	To control the flow of compressed air from master cylinder to air chamber
Option C:	To control the flow of compressed air from air reservoir to master cylinder
Option D:	To control the flow of compressed air from master cylinder to air reservior
14.	What is spring rate?
Option A:	Load required to break the spring
Option B:	Load required to deflect the axle by spring
Option C:	Load required to deflect the spring per unit distance
Option D:	Load required to provide rigidity to the spring

15.	What will happen if brakes of only one side get applied for a running car?
Option A:	Car will continue its motion
Option B:	Car will be pulled to that side on which brakes does not get applied
Option C:	Car will be pulled to that side on which brakes get applied
Option D:	Pitching movement will occur for a car
16.	What is brake bleeding?
Option A:	Process of removing air from the hydraulic brake system
Option B:	Process of adding air into the hydraulic brake system
Option C:	Process of removing oil from air brake system
Option D:	Process of adding oil into air brake system
17.	What suspension system does?
Option A:	It helps to increase the speed of vehicle
Option B:	It provides more torque in uptrend
Option C:	It absorbs heat energy in down trend
Option D:	It provides cushioning action
18.	What is a condition called when the vehicle move away from its desired path during cornering and to keep it on the right path there is need to steer a little more?
Option A:	Understeer
Option B:	Oversteer
Option C:	Reversibility
Option D:	Irreversibility
19.	When the top of the wheel is tilted outward, then it is called as ……….
Option A:	King pin inclination
Option B:	Positive camber
Option C:	Negative camber
Option D:	Caster angle
20.	Where does wear occur for under inflated tyre?
Option A:	Near center
Option B:	Near the edge
Option C:	In the cross direction
Option D:	In the lateral direction

Q2	**Solve any Four out of Six** **(05 marks each)**
A	Explain the clutch plate construction.
B	Explain the construction of sliding mesh gearbox.
C	Explain the role of constant velocity joint in automobile.
D	Explain the any one type of rear axle arrangement in detail.
E	Explain the working of master cylinder with neat labeled diagram.
F	Explain the rack & pinion steering gear.

Q3	**Solve any Four out of Six** **(05 marks each)**
A	Write short note on centrifugal clutch

B	Write short note on overdrive
C	Write short note drive line arrangements.
D	Write short note on transfer case.
E	Write note on types of adaptive suspension system.
F	Write short note on types of road wheels.

University of Mumbai

Examination 2021 under cluster 08 (Lead College: PHCET)

Examinations Commencing from 15th June 2021 to 24th June 2021

Program: AutomobileEngineering

Curriculum Scheme: Rev2016

Examination: SE Semester III

Course Code: AEC305 and Course Name:Material Technology

Time: 2 hours Max. Marks: 80

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Q.1	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which of the following is a point defect in crystals?
Option A:	Edge dislocation
Option B:	Vacancy
Option C:	Grain boundaries
Option D:	Tilt boundary
2.	How many slip systems are there in Hexagonal Closed Packed structure?
Option A:	3
Option B:	5
Option C:	9
Option D:	18
3.	The hot working of metal is accomplished at
Option A:	below re-crystallization temperature
Option B:	Above re-crystallization temperature
Option C:	At melting temperature
Option D:	Above melting temperature
4.	Strain Hardening occurs when_______
Option A:	The material is cold worked
Option B:	The material is hot worked
Option C:	The material undergo heavy machining
Option D:	The material undergo drilling operation
5.	Endurance limit is defined for
Option A:	Non ferrous metals
Option B:	Ferrous metals
Option C:	Plastic materials
Option D:	Ceramic materials
6.	Cup cone fracture is an example of _______
Option A:	brittle failure
Option B:	fatigue failure
Option C:	ductile failure
Option D:	creep failure

7.	Ductile to Brittle transition occur due to
Option A:	Increase in temperature
Option B:	Decrease in temperature
Option C:	At constant temperature
Option D:	At variable temperature
8.	In the Creep there are
Option A:	Only one stage
Option B:	Two stages
Option C:	Three stages
Option D:	Four Stages
9.	Eutectoid Transformation is
Option A:	Solid to Solid1 and Solid 2
Option B:	Liquid to Liquid1 and Solid 2
Option C:	Liquid to Liquid1 and Liquid 2
Option D:	Solid to Solid1 and Liquid 2
10.	Range of Cast Iron is
Option A:	0.008% to 0.2%
Option B:	0.3% to 0.6%
Option C:	0.8% to 1.0%
Option D:	2.0% to 6.67%
11.	For 0.4% carbon steel the approximate percentage of two phases would
Option A:	Pearlite 60% and α-Ferrite 40%
Option B:	Pearlite 40% and α-Ferrite 60%
Option C:	Pearlite 45% and α-Ferrite 55%
Option D:	Pearlite 50% and α-Ferrite 50%
12.	Which method is used to determine hardenability of a material
Option A:	Jominy end-quench
Option B:	Charpy
Option C:	Rockwell
Option D:	Izod
13.	Which Statement is correct in case of heat treatment of steel?
Option A:	Faster cooling results in low hardness
Option B:	Slow cooling results in high hardness
Option C:	Fast cooling results in high hardness
Option D:	No effect of cooling
14.	Flame hardening is used to
Option A:	Make core harder
Option B:	Make core and surface harder
Option C:	Make surface harder
Option D:	Clean the surface
15.	How mild steel can be convertedto high carbon steel

Option A:	Annealing
Option B:	Normalizing
Option C:	Through hardening
Option D:	Nitriding
16.	Ausforming is used to
Option A:	Increase ductility of metal
Option B:	Increase toughness of metal
Option C:	Decrease strength of metal
Option D:	Increase machinability of metal
17.	Stainless steel is classified as
Option A:	Maraging steel and austempering steel
Option B:	High, medium and low speed steel
Option C:	Austenitic, ferritic and martensitic steel
Option D:	High, medium and low carbon steel
18.	If we add more chromium to steel then
Option A:	Ductility increases
Option B:	Red hardness increases
Option C:	Corrosion resistance decreases
Option D:	Corrosion resistance increase
19.	Which of the following is a property of ceramics?
Option A:	High Thermal Expansion
Option B:	Bad insulation
Option C:	Resistant to corrosion
Option D:	Low melting point
20.	The size of nano particles is between
Option A:	100 to 1000 nm
Option B:	1 to 100 nm
Option C:	0.01 to 1nm
Option D:	0.1 to 10nm

Q2	
A	**Solve any Two** **5 marks each**
i.	Classify engineering Materials with suitable example.
ii.	Write a short note on Smart Materials.
iii.	Write a short note on Induction hardening.
B	**Solve any One** **10 mark each**
i.	Draw a neat Iron-Iron carbide diagram and explain three phase transformations on it.
ii.	Explain in detail Fatigue testing.
Q.3	
A	**Solve any Two** **5 marks each**
i.	What are Composite materials?
ii.	Explain the Allotropic form of iron.
iii.	Explain Martempering process.
B	**Solve any One** **10 mark each**
i.	What is creep?Explain in detail the experiment to determine Creep.
ii.	What is re crystallization Annealing?Discuss the stages in detail.

University of Mumbai

Examination 2021 under cluster __ (Lead College: _________)

Examinations Commencing from 1st June 2021 to 10th June 2021

Program: BE (Automobile)

Curriculum Scheme: Rev 2016

Examination: SE Semester IV

Course Code: AEC401 and Course Name: Applied Mathematics IV

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.	Find the Eigen values of matrix A = $\begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$
Option A:	3, -2 -2
Option B:	3, 4 1
Option C:	3 ,2,2
Option D:	-3,-4,1
2.	If matrix A = $\begin{bmatrix} -1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{bmatrix}$ find Eigen values of A^3 +5A + 8I
Option A:	-1,3,-2
Option B:	2,-10, 50
Option C:	-2, 10 ,50
Option D:	-1, 27,-8
3.	If A = $\begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$ find 5^A
Option A:	$\begin{bmatrix} 325 & 300 \\ 300 & 325 \end{bmatrix}$
Option B:	$\begin{bmatrix} 300 & 125 \\ 100 & 325 \end{bmatrix}$
Option C:	$\begin{bmatrix} 300 & 125 \\ 100 & 325 \end{bmatrix}$
Option D:	$\begin{bmatrix} 300 & 325 \\ 315 & 325 \end{bmatrix}$
4.	Write down the matrix of quadratic form $x^2 - 2y^2 + 3z^2$ – 4 x y + x z -2 y z
Option A:	$\begin{bmatrix} 1 & -4 & 1 \\ -4 & 2 & -2 \\ 1 & -2 & 34 \end{bmatrix}$
Option B:	$\begin{bmatrix} 1 & -2 & 1/2 \\ -2 & -2 & -1 \\ 1/2 & -1 & 3 \end{bmatrix}$
Option C:	$\begin{bmatrix} 1 & -1 & -3 \\ -1 & -2 & 5 \\ -3 & 5 & 3 \end{bmatrix}$

Option D:	$\begin{bmatrix} 1 & -2 & 3 \\ -2 & 2 & -1 \\ 3 & -1 & 3 \end{bmatrix}$
5.	Find the directional derivative of $\emptyset(x,y,z) = xy^2 + yz^3$ at the points (2,-1,1) In the direction of the vector i + 2j +2k.
Option A:	$\frac{11}{3}$
Option B:	$-\frac{11}{3}$
Option C:	$\frac{22}{3}$
Option D:	$-\frac{22}{3}$
6.	A vector field $\bar{F}$ = (y sin z- sin x) i + (x sin z + 2 y z) j + (x y cos z + y^2) k is irrotational what is value of curl $\bar{F}$
Option A:	1
Option B:	-1
Option C:	2
Option D:	0
7.	Evaluate by Green's Theorem $\bar{F} = x^2\, i - xy\, j$ and c is the triangle Having vertices A (0,2) B (2, 0) , C (4,2) .
Option A:	$\frac{16}{3}$
Option B:	$\frac{32}{3}$
Option C:	$-\frac{32}{5}$
Option D:	$-\frac{16}{3}$
8.	Maximize z = $x_1 + 3x_2 + 3x_3$ Subject to $x_1 + 2x_2 + 3x_3 = 4$ $2x_1 + 3x_2 + 5x_3 = 7$ find optimal basic feasible solution.
Option A:	(2,1,0)
Option B:	(1, 3,0)
Option C:	(1 ,0 4)
Option D:	(0 , 2 3)
9.	A continuous random variable X has probability density function f (x) = k $x^2\ (1 - x^3)$, $0 \le x \le 1$ find k .
Option A:	3
Option B:	4
Option C:	5
Option D:	6
10.	If X is Binomially distributed with E (X) = 2 and Var. (X) = 4/3 Find n
Option A:	4
Option B:	5
Option C:	2

Option D:	6
11.	A discrete random variable X has probability density function given below X : -2 -1 0 1 2 3 P(X = x) : 0.2 3/25 0.1 6/25 0.1 6/25 Find E (X)
Option A:	$\frac{3}{25}$
Option B:	$\frac{16}{25}$
Option C:	$\frac{3}{625}$
Option D:	$\frac{3}{325}$
12.	If a random variable X follows Poisson distribution such that p (X = 2) = 9 p (X = 4) + 90 p (X = 6) find mean .
Option A:	2
Option B:	3
Option C:	4
Option D:	1
13.	In small sample test what is sample size n.
Option A:	n > 30
Option B:	n > 40
Option C:	n< 30
Option D:	n < 60
14.	A random sample of 50 items gives the mean 6.2 and variance 10.24. Can it be regarded as drawn from population mean 5.4 find computed value of $[z]\|$ |
Option A:	1.77
Option B:	2.77
Option C:	1.27
Option D:	1.61
15.	The ki-square test x^2 is defined as
Option A:	$\sum\left(\frac{(O+E)^2}{E}\right)$
Option B:	$\sum\left(\frac{(O-E)^2}{E}\right)$
Option C:	$\sum\left(\frac{(O-E)^2}{O}\right)$
Option D:	$\sum\left(\frac{(O-E)^2}{2E}\right)$
16.	What is F- Test distribution?
Option A:	$\frac{n_1 {s_1}^2}{n_2 {s_2}^2}$
Option B:	$\frac{n_1 {s_1}^3}{n_2 {s_2}^3}$
Option C:	$\frac{n_1 {s_1}^2/(n_1-1)}{n_2 {s_2}^2/(n_2-1)}$

Option D:	$\frac{s_2^2}{s_1^2}$
17.	What is the type of the given matrix A=$\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$
Option A:	Derogatory
Option B:	Non derogatory
Option C:	Non Diagonalisable
Option D:	Symmetric
18.	The means of two random samples of size 9 and 7 are 196.42 and 198.82 respectively The sum of the squares of the deviations from the means are 26.94 and 18.73 respectively. can T The samples be considered to have been drawn from same population find $\lvert t \rvert$
Option A:	2.64
Option B:	1.64
Option C:	3.64
Option D:	4.64
19.	If $\bar{F}$= (x + 3y) i + (y – 2z) j + (a z + x) k is Solenoidal , find the value of a .
Option A:	1
Option B:	2
Option C:	3
Option D:	-2
20.	If the product of two Eigen values of matrix A =$\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ is 16, Find the third Eigen value.
Option A:	1
Option B:	3
Option C:	2
Option D:	-1

Q2	**Solve any Four out of Six5 marks each**
A	Show that the matrix A =$\begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is Diagonalisable. Find the diagonal form D and the transforming matrix .
B	Solve the L.P.P by simplex method. Maximize z = 3 x_1 + 2 x_2 Subject to 3 x_1 + 2 x_2 $\leq$ 18 ; $0 \leq x_1 \leq 4$; $0 \leq x_2 \leq 6$; $x_1, x_2 \geq 0$
C	The marks obtained by 1000 students in an examination are found to be normallyDistributed with mean 70 and s. d. 5.Estimate the number of students

	whose marks will be (i) between 60 and 75 (ii) more than 75.
D	The standard deviation calculated from two random samples of sizes 9 and 13 are 1.99 and 1.9. Can the samples be regarded as drawn from the normal populations with the same standard deviations ? (given $F_{0,025}$ = 3.51 with d.o.f. 8 and 12 and $F_{0,025}$ = 4.20 with d.o.f.12 and 8
E	Ten individuals are chosen at random from a population and their heights are found to be 63, 63,64,65,66,69, 69, 70, 70, 71 inches. Discuss the suggestion that the mean height of the Universe is 65 inches.
F	Reduce the quadratic form $6x^2 + 3y^2 + 3z^2 - 4xy + 4xz - 2yz$ to canonical form through congruent transformations. Find its rank ,index, signature and class value

Q3	**Solve any Four out of Six5 marks each**
A	*If* $A = \begin{bmatrix} 1 & 4 \\ 1 & 1 \end{bmatrix}$ *find* $A^7 + 31A^2 + I$.
B	Prove that $\bar{F}$ = (2 x y +z) i + $(x^2$ + 2 y $Z^3)$ j + ($3y^2Z^2 + x$) k is irrotational. Find the scalar potential $\bar{F}$ and work done in moving an object in this field from (1 , 2 ,0) to (2 , 2 , 1).
C	The average of marks scored by 32 boys is 72 with standard deviation 8 while that of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than the girls.
D	Use the dual simplex method to solve the L.P.P. maximize z = - 3 x_1 - 2 x_2 Subject to $x_1 + x_2 \geq 1$; $x_1 + x_2 \leq 7$; $x_1 + 2x_2 \geq 10$; $x_2 \leq 3$ $x_1, x_2 \geq 0$
E	Use Gauss Divergence Theorem to evaluate $\iint \overline{N}.\bar{F}$ ds where $\bar{F} = x^2 i + z j + y z k$ And s is the surface of the cube bounded by x = 0, x = 1, y = 0, y = 1, z = 0, z = 1 .
F	In an experiment on immunizations of cattle from Tuberculosis, the results were obtained Use ki- square test to determine the efficiency of vaccine in preventing tuberculosis. | | Affected | not affected | Total | Inoculated: 290, 110, 400 Not inoculated: 310, 90, 400 Total: 600, 200, 800

University of Mumbai

Examination 2021 under cluster 9 (Lead College: FAMT)

Examinations Commencing from 1st June 2021 to 15th June 2021

Program: Mechanical Engineering

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.	The vertical force on a submerged curved surface is equal to the
Option A:	force on the vertical projection of the curved surface
Option B:	force on the horizontal projection of the curved surface
Option C:	weight of the liquid vertically above the curved surface
Option D:	product of the pressure at the centroid and the area of the curved surface.
2.	The principle of floatation of bodies is based on
Option A:	Metacenter
Option B:	center of pressure
Option C:	center of gravity
Option D:	center of mass
3.	Decrease in temperature, in general, results in
Option A:	an increase in viscosities of both gases and liquid
Option B:	a decrease in the viscosities of both liquids and gases
Option C:	an increase in the viscosity of liquid and a decrease in that of gases
Option D:	a decrease in the viscosity of liquids and an increase in that of gases
4.	If the stream function given by $\Psi = 3xy$, then the velocity at a point (2, 3) will be
Option A:	7.21 unit
Option B:	10.82 unit
Option C:	18 unit
Option D:	54 unit.
5.	………… 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
6.	The quantity wQ/ g is called ……….. (where w = weight density, Q= discharge, g= gravitational constant)
Option A:	mass flux
Option B:	volume flux
Option C:	heat flux
Option D:	energy flux

7.	Bernoulli's theorem deals with the law of conservation of
Option A:	mass
Option B:	momentum
Option C:	Energy
Option D:	Heat
8.	In which of the following measuring devices Bernoulli's equation is not used:
Option A:	Venturimeter
Option B:	Orificemeter
Option C:	Pitot tube
Option D:	Manometer
9.	In Navier stokes equation consider following forces
Option A:	pressure and gravitational forces
Option B:	viscous, gravitational and pressure forces
Option C:	viscous, gravitational and surface tension forces
Option D:	pressure and viscous forces
10.	The total energy represented by the Bernoulli's equation has the unit
Option A:	Ns/m
Option B:	Nm/s
Option C:	N
Option D:	M
11.	What is fully developed flow?
Option A:	Where pressure is constant along flow direction
Option B:	Where velocity is constant along flow direction
Option C:	Where force is constant along flow direction
Option D:	Where temperature is constant along flow direction
12.	What is no slip boundary condition?
Option A:	Pressure at wall is minimum
Option B:	Velocity at wall is high
Option C:	Velocity at wall is zero
Option D:	Pressure at wall is zero
13.	When the pipes are connected in parallel, the total loss of head
Option A:	is equal to the sum of the loss of head in each pipe
Option B:	is same as in each pipe
Option C:	is equal to the reciprocal of the sum of loss of head in each pipe
Option D:	is equal to the difference of the losses of head in pipes
14.	Find Reynolds number if velocity is 2 m/s, density of fluid is 800 kg/m^3, and viscosity 0.1 N.s/m^2 is flowing through 0.25 m diameter pipe.
Option A:	4
Option B:	40
Option C:	400
Option D:	4000

15.	……….. thickness is the distance through which the total loss of momentum per second be equal to if it were passing a stationary plate.
Option A:	Displacement
Option B:	Momentum
Option C:	Energy
Option D:	Temperature
16.	The boundary layer exists in
Option A:	Flow of real fluids
Option B:	Flow of ideal fluids
Option C:	Flow over flat surfaces only
Option D:	Pipe-flow only
17.	The lift force that may act on an object is
Option A:	the component force due to the fluid displaced by the body
Option B:	the component of resultant fluid dynamic force in a direction normal to the general direction of flow
Option C:	the force due to shear stress that acts on the body surface
Option D:	the force due to viscosity that acts on the body surface
18.	In a normal shock in a gas, the
Option A:	upstream flow is supersonic
Option B:	upstream flow is subsonic
Option C:	downstream flow is sonic
Option D:	both downstream flow and upstream flow are supersonic.
19.	The sonic velocity in a fluid medium is directly proportional to
Option A:	mach number
Option B:	pressure
Option C:	square root of temperature
Option D:	viscosity
20.	A stagnation point is the point on the immersed body where the magnitude of velocity is
Option A:	small
Option B:	large
Option C:	zero
Option D:	negative

Q2. (20 Marks)	**Solve any Four Questions out of Six (5 marks each).**
A	A 400 mm diameter shaft is rotating at 200 r.p.m. in a bearing of length 120 mm. If the thickness of oil film is 1.5 mm and the dynamic viscosity of the oil is 0.7 N.s/m^2 , determine torque required to overcome friction in bearing. Assume a linear velocity profile.
B	Derive the continuity equation in cartesian coordinates
C	Explain Reynold's Transport theorem.
D	An oil of viscosity 0.02 poise and sp. gr. 0.8 is flowing through 50 mm diameter pipe of length 500 m at the rate of 0.19 lit./sec. Determine (i) Pressure gradient, (ii) Wall shear stress
E	Write short note on boundary layer separation.
F	Define Mach number, stagnation temperature and stagnation density.

Q3. (20 Marks)	**Solve any Two Questions out of Three (10 marks each).**
A	Starting from Navier stokes equation for incompressible laminar flows derive an equation for velocity profile of Couette flow. State the assumptions made.
B	Three pipes of diameters 300 mm, 200 mm and 400 mm and lengths 300 m, 170 m and 210 m respectively are connected in series. The difference in water surface levels in two tanks is 12 m. Determine the rate of flow if coefficients of frictions are 0·005, 0·0052 and 0·0048 respectively, considering Minor losses.
C	An aeroplane is flying at 1000 km/h through still air having a pressure of 78.5 kN/m^2 (abs.) and temperature – 8° C. Calculate on the stagnation point on the nose of the plane : (i) Stagnation pressure, (ii) Stagnation temperature, and (iii) Stagnation density. Take for air : R = 287 J/kg K and $\gamma = 1.4$

University of Mumbai

Examination 2021 under cluster 9 (Lead College: FAMT)

Examinations Commencing from 1st June 2021 to 15th June 2021

Program: Automobile Engineering

Curriculum Scheme: Rev 2016

Examination: SE Semester IV

Course Code: AEC403 and Course Name: Industrial Electronics

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.	An SCR is made of silicon and not germanium because silicon
Option A:	is inexpensive
Option B:	has low leakage current
Option C:	is mechanically strong
Option D:	is tetravalent
2.	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
3.	In a microprocessor based system, the stack is always in
Option A:	Microprocessor
Option B:	ROM
Option C:	RAM
Option D:	EPROM
4.	A single phase induction motor which has the lowest speed is
Option A:	Universal
Option B:	Hysteresis
Option C:	Repulsion
Option D:	shaded poles
5.	A half controlled converter uses
Option A:	Diodes only
Option B:	Thyristors only
Option C:	Both diodes and thyristors
Option D:	MOSFETS only
6.	In a combinational circuit, each output depends entirely on the............... inputs to the circuit.
Option A:	Same
Option B:	Different
Option C:	Common
Option D:	Immediate

7.	Choose the correct statement
Option A:	MOSFET is a uncontrolled device
Option B:	Has low leakage current
Option C:	MOSFET is a current controlled device
Option D:	MOSFET is a temperature controlled device
8.	Which of the following is not an application of optical amplifier?
Option A:	Power amplifier
Option B:	In-line repeater amplifier
Option C:	Demodulator
Option D:	Preamplifier
9.	To avoid loading during read operation, the device used is
Option A:	Latch
Option B:	Flipflop
Option C:	Buffer
Option D:	Tristate buffer
10.	BLDC can be used instead of _____________
Option A:	Synchronous motor
Option B:	Normal brushed DC motor
Option C:	Induction motor
Option D:	Air motor
11.	Three phase fully controlled bridge converter can be obtained by replacing six .... of an uncontrolled converter by six ....
Option A:	Thyristors; Diodes
Option B:	MOSFETs; Diodes
Option C:	Diodes; Thyristors
Option D:	Diodes; Transistors
12.	A......................circuit needs some type of memory to remember the past input values
Option A:	Logic circuit
Option B:	Sequential Circuit
Option C:	Parallel Circuit
Option D:	Comparator Circuit
13.	A diac is …………………. Switch
Option A:	An a.c.
Option B:	A d.c
Option C:	A mechanical
Option D:	both ac and dc
14.	555 TIMER pin 2 represent
Option A:	Discharge
Option B:	Trigger
Option C:	Threshold
Option D:	Reset

15.	The number of hardware interrupts present in 8085 microprocessor are
Option A:	5
Option B:	10
Option C:	8
Option D:	16
16.	No-load speed of which of the following dc motor will be highest?
Option A:	Shunt motor
Option B:	Series motor
Option C:	Cumulative compound motor
Option D:	Differentiate compound motor
17.	A three phase fully controlled converter can also operate in............mode.
Option A:	Counter
Option B:	Inverter
Option C:	Chopper
Option D:	Oscillator
18.	The NOR gate output will be high if the two inputs are ___________
Option A:	00
Option B:	01
Option C:	10
Option D:	11
19.	Typical brushless motor doesn't have _______________
Option A:	Commutator
Option B:	Permanent magnet
Option C:	Electronic controller
Option D:	Fixed armature
20.	What is the peak value of phase voltage in case of 3-phase VSI with 180° mode if the supply side consists of a constant dc voltage source of Vs.
Option A:	Vs
Option B:	3Vs/2
Option C:	2Vs/3
Option D:	3Vs

Q2. (20 Marks Each)	
A	**Solve any Two** **5 marks each**
i.	Compare DIAC and TRAIC.
ii.	Draw and explain second order low pars filter.
iii.	Explain different peripherals of MPS 430.
B	**Solve any One** **10 marks each**
i.	Explain use of rectifier-inverter pair for speed control of an induction motor.
ii.	Explain the block diagram of the MPS 430 microcontroller.

Q3. **(20 Marks Each)**	
A	**Solve any Two** **5 marks each**
i.	What is linear actuator motor? Give two applications.
ii.	Draw block diagram of closed loop control of a DC motor and explain the necessity of inner current control loop.
iii.	Explain Multiplexer and Demultiplexer with applicatios.
B	**Solve any One** **10 marks each**
i.	Write a short note on "Selection of motor and power rating for a pump".
ii.	With the help of connection diagram, derive the relation for voltage gain in Inverting mode of operation of OP-AMP and compare it with Non-inverting mode.

University of Mumbai
Examination 2021 under cluster 9 (Lead College: FAMT)
Examinations Commencing from 1st June 2021 to 15th June 2021

Program: Automobile Engineering
Curriculum Scheme: Rev 2016
Examination: SE Semester IV
Course Code: AEC 404 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 Small chip thickness, high cutting speed & large 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.	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
3.	For machining of plastic material which of the following unconventional process can be used effectively?
Option A:	Ultrasonic machining
Option B:	Laser beam machining
Option C:	Electrochemical machining
Option D:	Electro discharge machining
4.	In this type of dynamometer, dial indicators are used to measure the force on cutting tool.
Option A:	Mechanical dynamometer
Option B:	Pneumatic dynamometer
Option C:	Electrical dynamometer
Option D:	Strain gauge type dynamometer
5.	The following type of jig is used for machining in more than one plane.
Option A:	Open type jig
Option B:	Box type jig
Option C:	Plate type jig
Option D:	Template jig
6.	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
7.	In a Merchant circle, this force acts in a direction perpendicular to the main cutting force.
Option A:	Shear force
Option B:	Normal compressive force
Option C:	Thrust force
Option D:	Cutting force
8.	How many pins are used in 3-2-1 principle of location for location of a component.
Option A:	Four
Option B:	Six
Option C:	Eight
Option D:	Ten
9.	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
10.	As the cutting speed increases, the handling cost
Option A:	Remains same
Option B:	Increases
Option C:	Highly decreases
Option D:	Slightly decreases
11.	In which process, the material is removed from selected areas of the workpiece.
Option A:	Chemical Machining
Option B:	Water Jet Machining
Option C:	Electron beam machining
Option D:	Plasma arc machining
12.	This angle in single point cutting tool provides a clearance to the side flank of the tool to prevent rubbing of the workpiece.
Option A:	Back rake angle
Option B:	End relief angle
Option C:	End cutting edge angle
Option D:	Side relief angle
13.	Determine chip thickness ratio if uncut chip thickness is 0.2 mm and chip thickness is 0.4mm.
Option A:	0.5
Option B:	0.18
Option C:	0.28

Option D:	3.6
14.	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
15.	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
16.	The formation of depression at the tool-chip interface is called as
Option A:	Crater wear
Option B:	Flank wear
Option C:	Corrosive wear
Option D:	Adhesion wear
17.	Following element is used in the design of milling fixture.
Option A:	Toolpost
Option B:	Tailstock
Option C:	Chuck
Option D:	Setting block
18.	Following is an example of Solid based prototyping systems
Option A:	Fused Deposition Modelling
Option B:	Selective Laser Sintering
Option C:	3 D Printing
Option D:	Stereo lithography
19.	It is a multipoint tool whose teeth remove the whole machining allowance in a single stroke.
Option A:	Single point cutting tool
Option B:	Parting tool
Option C:	Broach
Option D:	Threading tool
20.	After the completion of cutting action, the blank is ejected by the following element out of cutting edge that may be jammed.
Option A:	stock stop
Option B:	knockout plate
Option C:	stock guide
Option D:	pilots

Q2	**Solve any Four out of Six** **5 marks each**
A	Explain Mechanics of chip formation.
B	Explain factors considered for selection of grinding wheel.
C	Explain constructional features of Compound die.
D	What are the basic steps in Rapid Prototyping.
E	Give classification of Nontraditional machining.
F	Explain Template jig and Plate jig.

Q3.	
A	**Solve any Two** **5 marks each**
i.	Explain in short: FDM process.
ii.	What are the advantages and disadvantages of Laser beam machining process.
iii.	Write note on: Scrap strip layout
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.	With the help of neat sketches, explain the methods of reducing cutting forces.

University of Mumbai
Examination 2021 under cluster 9 (Lead College: FAMT)
Examinations Commencing from 1st June 2021 to 15th June 2021

Program: Automobile Engineering

Curriculum Scheme: Rev 2016

Examination: SE Semester IV

Course Code: AEC405 and Course Name: Kinematics of Machinery

Time: 2 hour   Max. Marks: 80

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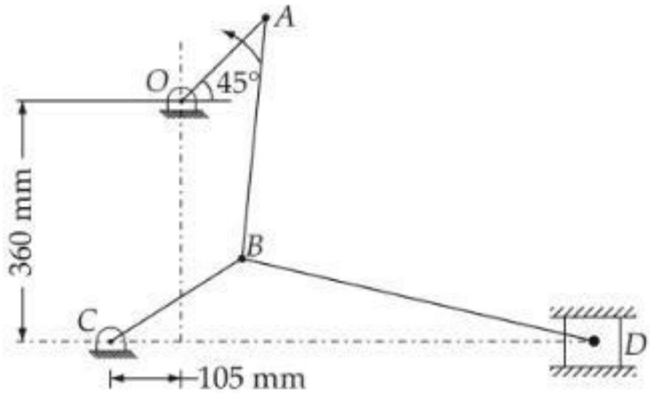
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	When a body of mass moment of inertia I (about a given axis) is rotated about that axis with an angular velocity, then the kinetic energy of rotation is
Option A:	0.5 I.ω
Option B:	I.ω
Option C:	0.5 $I.\omega^2$
Option D:	$I.\omega^2$
2.	Which of the following factors are related by work energy principle?
Option A:	force, displacement and time
Option B:	force, velocity, time and mass
Option C:	force, velocity, displacement
Option D:	displacement, time and mass
3.	The two elements of a pair are said to form a ____________ when they permit relative motion between them.
Option A:	open pair
Option B:	kinematic pair
Option C:	higher pair
Option D:	lower pair
4.	The Whitworth quick return motion mechanism is formed in a slider crank chain when the
Option A:	coupler link is fixed
Option B:	longest link is a fixed link
Option C:	slider is a fixed link
Option D:	smallest link is a fixed link
5.	Which of these is an approximate straight line motion mechanism?
Option A:	Scott Russell's mechanism
Option B:	Hart's mechanism
Option C:	Peaucellier mechanism
Option D:	Watt's mechanism
6.	___________mechanism is a crossed four bar chain mechanism in early steam engines to guide the piston rod in a cylinder to have an approximate straight line motion.
Option A:	Peaucellier's

Option B:	Chebychev’s
Option C:	Grasshopper
Option D:	Watt’s
7.	What is the purpose of double hooke’s joint?
Option A:	Have constant linear velocity ratio of driver and driven shafts
Option B:	Have constant acceleration ratio of driver and driven shafts
Option C:	Have constant angular velocity ratio of driver and driven shafts
Option D:	Have constant angular acceleration ratio of driver and driven shafts
8.	The linear velocity of a point relative to another point on the same link is ______ to the line joining the points.
Option A:	Perpendicular
Option B:	Parallel
Option C:	at 45°
Option D:	at 60°
9.	According to Aronhold Kennedy’s theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a
Option A:	straight line
Option B:	parabolic curve
Option C:	Ellipse
Option D:	Hyperbola
10.	In a rotary engine the angular velocity of the cylinder center line is 25 rad/sec and the relative velocity of a point on the cylinder center line w.r.t. cylinder is 10 m/sec. Corioli’s acceleration will be
Option A:	250 m/sec^2
Option B:	500 m/sec^2
Option C:	1000 m/sec^2
Option D:	2000 m/sec^2
11.	The linear velocity of a rotating body is given by the relation
Option A:	$v = r\omega$
Option B:	$v = r/\omega$
Option C:	$v = \omega/r$
Option D:	$v = 2\omega/r$
12.	Angle of ascent of cam is defined as the angle
Option A:	during which the follower returns to its initial position
Option B:	of rotation of the cam for a definite displacement of the follower
Option C:	through which the cam rotates during the period in which the follower remains in highest position
Option D:	moved by the cam from the instant the follower begins to rise, till it reaches its highest position
13.	In cycloidal motion of cam follower, the maximum acceleration of follower motion a_{max} at $\theta= \varphi/4$ is________(where : h = Maximum follower displacement ω = Angular velocity of cam, φ=Angle for the maximum follower displacement for cam rotation

Option A:	$\frac{h\pi\omega^2}{2\varphi^2}$
Option B:	$\frac{3h\pi\omega^2}{2\varphi^2}$
Option C:	$\frac{2h\pi\omega^2}{\varphi^2}$
Option D:	$\frac{3h\pi\omega^2}{\varphi^2}$
14.	When two pulleys of different diameters are connected by means of an open belt drive, then the angle of contact taken into consideration should be of the
Option A:	Larger pulley
Option B:	Smaller pulley
Option C:	Average of two pulleys
Option D:	difference of two pulleys
15.	Centrifugal tension in belts is
Option A:	Useful because it maintains some tension even when no power is transmitted
Option B:	Not harmful because it does not take part in power transmission
Option C:	Harmful because it increases belt tension and reduces the power transmitted
Option D:	A hypothetical phenomenon and does not actually exist in belts
16.	The percentage improvement in power capacity of a flat belt drive, when the wrap angle at the driving pulley is increased from 150° to 210° by an idler arrangement for a friction coefficient of 0.3, is
Option A:	25.21
Option B:	33.92
Option C:	40.17
Option D:	67.85
17.	What shall be the centre distance between the axes of pinion and gear when a 20° full-depth involute profile pinion with 20 teeth meshes with a gear that has 50 teeth for a module of 6 mm?
Option A:	70 mm
Option B:	140 mm
Option C:	210 mm
Option D:	280 mm
18.	To have a velocity ratio of 50,the appropriate gears will be
Option A:	Spur gears
Option B:	Helical gears
Option C:	Worm and worm wheel
Option D:	Bevel gears
19.	A differential uses_______ gear train
Option A:	Simple
Option B:	Epicyclic
Option C:	Reverted
Option D:	Compound

20.	Tooth interference in an external involute spur gear pair can be reduced by
Option A:	decreasing center distance between gear pair
Option B:	decreasing module
Option C:	decreasing pressure angle
Option D:	increasing number of gear teeth

Q2. (20 Marks Each)	
A	**Solve any Two 5 marks each**
i.	Sketch and explain any two inversions of a double slider crank chain.
ii.	Explain Peaucellier's mechanism
iii.	State and prove Kennedy's theorem
B	**Solve any One** **10 marks each**
i.	In the toggle mechanism shown in Fig. the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counterclockwise direction at a speed of 180 r.p.m. increasing at the rate of 50 rad/sec. The dimensions of the various links are as follows: OA = 180 mm; CB = 240 mm; AB = 360 mm and BD = 540 mm. For the configuration given, find acceleration of the slider D 
ii.	Use following data of cam in which a knife edge follower is raised with uniform acceleration and deceleration and is lowered with simple harmonic motion: least radius of cam = 60 mm, Lift of follower = 45 mm, Angle of ascent = 60°, dwell between ascent and descent = 40°, Angle of descent = 70° If cam rotates at 180 rpm, determine maximum velocity and acceleration during ascent and descent

Q3. (20 Marks Each)	
A	**Solve any Two 5 marks each**
i.	With the help of neat sketch explain the terms base circle, prime circle and pitch circle with respect to cams
ii.	Explain self-locking and self-energizing brakes
iii.	With neat sketch explain interference in involute gears
B	**Solve any One** **10 marks each**
i.	In an epicyclic gear train an annular wheel A having 54 teeth meshes with a

	planet wheel B which gears with a sun wheel C, the wheel A and C being co-axial. The wheel B is carried on a pin fixed on one end of arm P which rotates at 100 rpm about the axis of the wheel A and C. If the wheel A makes 20 rpm in clockwise sense and the arm rotates at 100 rpm in anti clockwise direction and C has 24 teeth, Sketch the arrangement and determine rpm and sense of rotation of wheel C
ii.	A v-belt having face width equal to 22 mm and nominal thickness equal to 14 mm is used to transmit power with 'V' groove angle 40°. If the mass of the belt is 0.4 kg/m and maximum allowable stress is 1.5 N/mm, determine the maximum power that can be transmitted. Angle of contact is 155° and co-efficient of friction is 0.2.