University of Mumbai

Examination 2021 under cluster __ (Lead College: _)

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

Program: **BE** (**Mechanical Engineering)**

Curriculum Scheme: Rev 2016 (CBSGS)

Examination: SE Semester III

Course Code: MEC301 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.	$L\{e^{-3t}\sin 4t\}$ 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:	$u_{x\,x} = u_{yy}$
Option C:	$u_{xy} = -u_{yy}$
Option D:	$u_{x\,x} = -u_{yy}$
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 $\lvert z+2\rvert = 2$. Obtain $f(3)$ and $f'(-3)$
E	Obtain the Fourier series of $f(x) = \sin x, \quad -\pi \le x \le \pi$
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 $\lvert z\rvert = 3$
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: $\frac{\partial^2 u}{\partial x^2} - 16\frac{\partial u}{\partial t} = 0,\ 0 \le x \le 1$; 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 2020 under cluster 09(FAMT)
Examinations from 15th June 2021 to 26th June 2021

Program: **Mechanical Engineering**

Curriculum Scheme:R 2016

Examination: SE Semester: III

Course Code: **MEC302** 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 .Considerall 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 the polytropic process equation pv^nConstant, 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 30^0C 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 2020 under cluster 09 (FAMT)

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: Mechanical Engineering

Curriculum Scheme: Rev2016

Examination: SE Semester: III

Course Code: MEC303 and Course Name: Strength of Materials

Time: 2 hoursMax. Marks: 80

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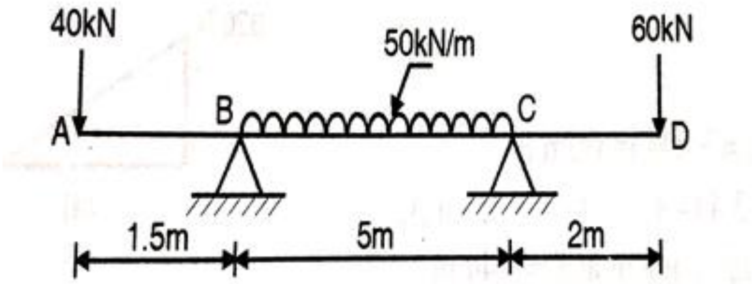
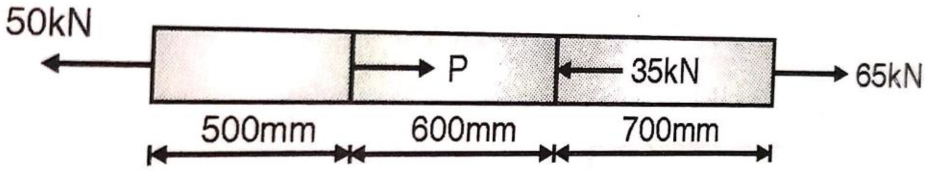
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The dimension of strain is?
Option A:	LT-2
Option B:	N/m2
Option C:	N
Option D:	Dimensionless
2.	The law which states that within elastic limits strain produced is proportional to the 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 = σ/y = E/R
Option B:	b) M/R = σ/y = E/I
Option C:	c) M/y = σ/R = E/I
Option D:	d) M/I = σ/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 Six. (5 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 2020 under cluster 09 (FAMT)
Examinations Commencing from 15th June 2021 to 26th June 2021

Program: Mechanical Engineering

Curriculum Scheme: Rev2016

Examination: SE SemesterIII

Course Code: MEC304 and Course Name: Production Process-I

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.	The ability of the moulding sand to withstand the heat of melt without showing any sign of softening is called as
Option A:	Strength or Cohesiveness
Option B:	Refractiveness
Option C:	Collapsibility
Option D:	Adhesiveness
2.	Which of the following is not included in weldability?
Option A:	Ability of mechanical soundness
Option B:	Serviceability of joint
Option C:	Strain relieving brittleness
Option D:	Metallurgical compatibility of metal
3.	Which of the following manufacturing processes is mainly considered for producing the components of very high strength?
Option A:	Casting
Option B:	Forging
Option C:	Extrusion
Option D:	Rolling
4.	Which of the following material is not used in extrusion?
Option A:	Wax
Option B:	Granules
Option C:	Powder
Option D:	Pellets
5.	Which type of surface is produced by turning operation in lathe machine?
Option A:	Flat
Option B:	Cylindrical
Option C:	Taper
Option D:	Zig-Zag
6.	CNC machining centers do not include operations like
Option A:	Milling
Option B:	Boring
Option C:	Welding
Option D:	Tapping

7.	A model of casting, constructed to use for forming a mould in damp sand, is called as
Option A:	Sand Construction
Option B:	Pattern
Option C:	Cover
Option D:	Core
8.	On which of the following factor, does weldability does not depend?
Option A:	Boiling point
Option B:	Melting point
Option C:	Thermal expansion
Option D:	Thermal conductivity
9.	Which of the following metal forming processes is best suitable for making the wires?
Option A:	Forging
Option B:	Extrusion
Option C:	Drawing
Option D:	Rolling
10.	Which of the following is not an application of polymer extrusion?
Option A:	Door insulation seals
Option B:	Chewing gums
Option C:	Cables
Option D:	Circuit boards
11.	Which of the following machine is superior to other machines as regards accuracy and better surface finish?
Option A:	Lathe
Option B:	Drill
Option C:	Shaper
Option D:	Milling
12.	Which of the following is not the advantage of CNC machines?
Option A:	Higher Flexibility
Option B:	Improved Quality
Option C:	Reduced Scrap Rate
Option D:	Improved Strength of the Components
13.	The sand in its natural or moist state is called as
Option A:	Loam sand
Option B:	Green sand
Option C:	Dry sand
Option D:	Face sand
14.	Which of the following is not a type of arc welding?
Option A:	Plasma
Option B:	Electro-slag
Option C:	Submerged
Option D:	Air-acetylene

15.	Which of the following method is used for making wheel discs?
Option A:	Drop forging
Option B:	Press forging
Option C:	Open die forging
Option D:	Closed die forging
16.	Injection molding is the ideal method of processing
Option A:	Plastics
Option B:	Thermo-setting plastics
Option C:	Thermoplastics
Option D:	Non-ferrous materials
17.	Hobbing process is also used for which of the following application?
Option A:	Punching
Option B:	Metal bending
Option C:	Rust removal
Option D:	Sprocket cutting
18.	The machine tool, in which calculation and setting of the operating conditions like depth of cut, feed, speed are done during the machining by the control system itself, is called
Option A:	Computer Numerical Control System
Option B:	Direct Numerical Control System
Option C:	Machining Center System
Option D:	Adaptive Control System
19.	Which of the following cannot be regarded as an internal structure defect?
Option A:	Edge crack
Option B:	Zipper cracks
Option C:	Alligatoring
Option D:	Quivering
20.	The process of combining two or more distinct polymer molecules to form a new product with different characteristics is called as
Option A:	Binding
Option B:	Stabilizing
Option C:	Filling
Option D:	Blending

Q2	**Solve any Four out of Six. (5 marks each)**
A	Explain casting defects with causes and remedies.
B	Discuss types of flames in gas welding.
C	Describe in detail various rolling defects.
D	Explain the process of blow moulding.
E	Write note on types of shaping machines.
F	Write short note on machining centre.

Q3	**Solve any Two Questions out of Three. (10 marks each)**
A	With the help of a neat sketch explain the complete gating system in casting process.
B	What is meant by solid state welding process? List various solid state welding processes. draw neat, labeled sketch of any one solid state welding process
C	What is mean by forging? Explain open die forging and closed die forging with neat sketch.

University of Mumbai
Examination 2021 under cluster 09 (FAMT)
Examinations Commencing from 15th June 2021 to 26th June 2021

Program: Mechanical Engineering

Curriculum Scheme: Rev2016

Examination: SE Semester III

Course Code: MEC305 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 inHexagonal 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 converted to 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 recrystallization Annealing?Discuss the stages in detail.

University of Mumbai

Examination 2021 under cluster __(Lead College: _________)

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

Program: BE (MECHANICAL)

Curriculum Scheme: Rev 2019 C-Scheme

Examination: **SE** Semester **III**

Course Code: MEC301 and Course Name: Engineering Mathematics-III

Time: 2 hour | Max. Marks: 80

Q1 Choose the correct option for following questions. All the Questions are compulsory and carry equal marks

40 Marks

1.	L$[e^{-2t} - sin5t]$ is
Option A:	$\frac{1}{s-2} - \frac{s}{s^2+25}$
Option B:	$\frac{1}{s+2} - \frac{s}{s^2+25}$
Option C:	$\frac{1}{s+2} - \frac{5}{s^2+25}$
Option D:	$\frac{1}{s-2} - \frac{5}{s^2+25}$
2.	L$[cos^2(2t)]$ is
Option A:	$\frac{1}{2}\left[\frac{1}{s} + \frac{s}{s^2+16}\right]$
Option B:	$\frac{1}{2}\left[\frac{1}{s} - \frac{s}{s^2+16}\right]$
Option C:	$\frac{1}{2}\left[\frac{1}{s} + \frac{s}{s^2+4}\right]$
Option D:	$\frac{1}{2}\left[\frac{1}{s} - \frac{s}{s^2+4}\right]$
3.	$L[(sin3t)(sin5t)]\ is$
Option A:	$\frac{1}{2}\left[\frac{s}{s^2+4} + \frac{s}{s^2+64}\right]$

Option B:	$\frac{1}{2}\left[\frac{s}{s^2+4}-\frac{s}{s^2+64}\right]$
Option C:	$\frac{1}{2}\left[\frac{1}{s^2+4}-\frac{1}{s^2+64}\right]$
Option D:	$\frac{1}{2}\left[\frac{1}{s^2+4}+\frac{1}{s^2+64}\right]$
4.	Value of $\int_0^{\infty} e^{-3t}t^5$dt is
Option A:	$\frac{240}{243}$
Option B:	$\frac{40}{81}$
Option C:	$\frac{80}{243}$
Option D:	$\frac{40}{243}$
5.	Inverse L.T. of $\frac{3}{9s^2-16}$ is
Option A:	$\frac{1}{4}\sinh\left(\frac{4t}{3}\right)$
Option B:	$\frac{4}{9}\sinh\left(\frac{4t}{3}\right)$
Option C:	$\frac{1}{3}\sinh\left(\frac{4t}{3}\right)$
Option D:	$\frac{1}{9}\sinh\left(\frac{4t}{3}\right)$
6.	Inverse L.T. of $\frac{1}{s(s^2+1)}$ is
Option A:	$cost-1$
Option B:	$sint$
Option C:	$cost$
Option D:	$1-cost$
7.	Inverse L.T. of $\frac{1}{s^2-2s+2}$ is

Option A:	$e^{2t} sint$
Option B:	$e^{t} sint$
Option C:	$e^{-t} sint$
Option D:	$e^{-2t} sint$
8.	Inverse L.T. of $log\left[\frac{s-1}{s+1}\right]$ is
Option A:	$\frac{1}{t}(e^{t} - e^{-t})$
Option B:	$\frac{1}{t}(e^{t} + e^{-t})$
Option C:	$\frac{1}{t}(e^{-t} - e^{t})$
Option D:	$\frac{-1}{t}(e^{t} + e^{-t})$
9.	In the Fourier series of $f(x) = \begin{cases} sinx, & 0 \leq x \leq \pi \\ 0 \ , & \pi \leq x \leq 2\pi \end{cases}$ Value of the Fourier Coefficient a_1 is
Option A:	$\frac{1}{2}$
Option B:	$\frac{1}{2\pi}$
Option C:	$\frac{1}{\pi}$
Option D:	0
10.	Fourier series expansion for $\mathrm{f(x)} = -\mathrm{x}\,;\ \frac{-1}{2} < \mathrm{x} < \frac{1}{2}$ is
Option A:	$\sum_{n=1}^{\infty} b_n \sin(n\pi x)$
Option B:	$\sum_{n=1}^{\infty} b_n \sin(2n\pi x)$
Option C:	$\sum_{n=1}^{\infty} b_n \sin\left(\frac{n\pi x}{2}\right)$

Option D:	$\sum_{n=1}^{\infty} b_n \sin(2nx)$
11.	$If\ v(x,y) = 2xy$ is the imaginary part of an analytic function $f(z) = u(x,y) + iv(x,y)$, then its corresponding harmonic conjugate is
Option A:	$x^2 - y^2$
Option B:	$2(x^2 - y^2)$
Option C:	$x^2 + y^2$
Option D:	$2(x^2 + y^2)$
12.	$If\ f(z) = u + iv$ is analytic , then f'(z) is given by
Option A:	$u_x + iv_y$
Option B:	$u_y + iv_x$
Option C:	$u_x - iv_x$
Option D:	$u_x + iv_x$
13.	If $u(x,y) = (sinx)(sinhy)$ is the real part of an analytic function f(z)= u+iv , then f(z) is equal to
Option A:	$isinz + c$
Option B:	$sinz + c$
Option C:	$icosz + c$
Option D:	$-icosz + c$
14.	$u = e^{bx}\cos(5y)$ is harmonic , then value of b is
Option A:	25
Option B:	± 5
Option C:	± 1
Option D:	$\pm\sqrt{5}$

15.	Eigen vector corresponding to the eigen value λ=-3 of the matrix A=$\begin{bmatrix} -2 & 5 & 4 \\ 5 & 7 & 5 \\ 4 & 5 & -2 \end{bmatrix}$
Option A:	$[1 \quad 1 \quad 1]'$
Option B:	$[1 \quad 0 \quad 1]'$
Option C:	$[1 \quad 5 \quad -5]'$
Option D:	$[1 \quad -1 \quad 1]'$
16.	$If\ 1\ and\ 2\ are\ the\ eigenvalues\ of$ A ,then A^4 is
Option A:	$A - 16I$
Option B:	$15A + 14I$
Option C:	$15A - 14I$
Option D:	$14A - 15I$
17.	$\lambda^3 - 2\lambda^2 - 4\lambda + 8 = 0$ is the characteristic equation of a square matrix of order 3 , then the sum and product of the eigen values of A are respectively
Option A:	$\{2, -8\}$
Option B:	$\{-2, -8\}$
Option C:	$\{2,8\}$
Option D:	$\{-2,8\}$
Q18	$The\ algebraic\ and\ geometric\ multiplicity\ of\ the\ eigen\ value$ $\lambda = 2$ of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ 0 & 2 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ are respectively
Option A:	$\{2,2\}$
Option B:	$\{2,3\}$
Option C:	$\{1,2\}$
Option D:	$\{2,1\}$

Q19	$Given: A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$, the eigen values of adj(A) are
Option A:	$\{3,2,5\}$
Option B:	$\{\frac{1}{10},\frac{1}{15},\frac{1}{6}\}$
Option C:	$\{10,15,6\}$
Option D:	$\{\frac{1}{3},\frac{1}{2},\frac{1}{5}\}$
Q20	$\frac{\partial^2 u}{\partial x^2} - 2\frac{\partial u}{\partial t} = 0$ is the one dimensional heat equation with the conditions $\mathrm{u}(0,\mathrm{t}) = 0;\ \mathrm{u}(4,\mathrm{t}) = 0;\ \mathrm{u}(\mathrm{x},0) = \mathrm{x}(4-\mathrm{x});$ and h=1 , the value of u(x,t) for (x=2;t=1), using Bender –Schmidt method is
Option A:	2
Option B:	3
Option C:	4
Option D:	0
Q2	**Solve any Four out of Six** **5 marks each**
A)	Find L.T. of the following functions:- $(i)\ te^{-4t}sin3t$ (ii) $\frac{1}{t}[\cos(2t) - \cos(3t)]$
B)	Find the inverse Laplace Transform of the following functions (i) $cot^{-1}(s+1)$ (ii) $\frac{s+29}{(s+4)(s^2+9)}$
C)	Find the Fourier series of $f(x) = \begin{cases} -1, & -\pi < x < 0 \\ 1, & 0 < x < \pi \end{cases}$ .Hence deduce : $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots \ldots = \frac{\pi}{4}$
D)	Given:$The\ imaginary\ part\ v(x,y) = tan^{-1}\left(\frac{y}{x}\right)$, construct the analytic function f(z)=u+iv in terms of z.
E)	Given:$A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$, determine the matrix

	$A^6 - 4A^5 + 8A^4 - 12A^3 + 14A^2$ *using Cayley Hamilton theorem*
F)	Solve $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$, under the conditions $\mathrm{u}(0,\mathrm{t}) = 0;\ \mathrm{u}(1,\mathrm{t}) = \mathrm{t}, \mathrm{u}(\mathrm{x}, 0) = 0$ h=$\frac{1}{4}$ (one –time step) using Crank Nicholson's method
Q3	**Solve any Four out of Six** **5 marks each**
A)	$Evaluate\ \int_0^{\infty} e^{-2t}[\int_0^t \frac{1-e^{-t}}{t}$ dt]dt using L .T
B)	Using convolution theorem find inverse Laplace transform of $\frac{s}{(s^2+1)(s^2+4)}$
C)	Find Half Range Cosine Series for f(x)=x; 0<x<2
D)	Find the Modal matrix that diagonalizes $A = \begin{bmatrix} 8 & -12 & 5 \\ 15 & -25 & 11 \\ 24 & -48 & 19 \end{bmatrix}$
E)	Find the orthogonal trajectory of the family of curves $(x-1)^3 - 3xy^2 + 3y^2 = constant$
F)	An elastic string stretched between the fixed points(0,0) and (1,0) initially in the position y=Asin(πx) and released from rest. Find the displacement y(x,t)

University of Mumbai
Examination 2020 under cluster 09 (FAMT)
Examinations Commencing from 15th June 2021 to 26th June 2021

Program: **Mechanical Engineering**
Curriculum Scheme: Rev 2019 C Scheme
Examination: SE Semester III
Course Code: MEC302 and Course Name: Strength of Materials

Time: 2 hours Max. Marks: 80

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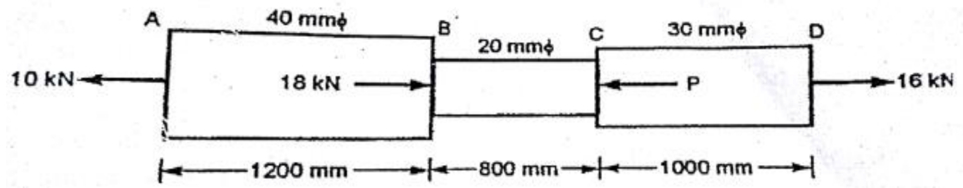
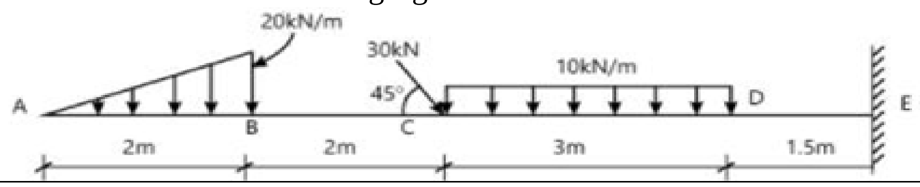
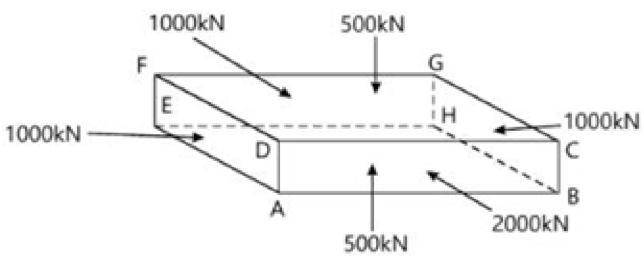
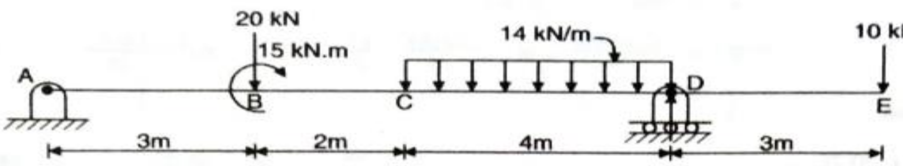
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The modulus of rigidity and poissons ratio of a material are $0.8\text{x}10^5$ N/mm^2 and 0.22, then what are the value of Young's modulus and bulk modulus
Option A:	E=$1.753\text{x}10^5$ N/mm^2 and K= $1.958\text{x}10^5$ N/mm^2
Option B:	E=$1.825\text{x}10^5$ N/mm^2 and K= $1.625\text{x}10^5$ N/mm^2
Option C:	E= $1.952\text{x}10^5$ N/mm2 and K= $1.162\text{x}10^5$ N/mm^2
Option D:	E=$2\text{x}10^5$ N/mm^2 and K=$1.825\text{x}10^5$ N/mm^2
2.	A cantilever beam of 6 m span carries a UVL varying from 0 at free end and 12 KN/m at the support. Find the maximum shear force and bending moment.
Option A:	30 KN & 60 KN-m
Option B:	6 KN & 12 KN-m
Option C:	60 KN & 60 KN-m
Option D:	36 KN & 72 KN-m
3.	A rectangular cross section beam having dimensions 100 mm width and 200 mm depth is subjected to a bending moment of 100 KN-m. What is the bending stress at the top of the section.
Option A:	300 N/mm^2
Option B:	75 N/mm^2
Option C:	100.85 N/mm^2
Option D:	150 N/mm^2
4.	The maximum shear stress is ______ times the average shear stress For rectangular cross section of beams.
Option A:	2.5
Option B:	3
Option C:	1.2
Option D:	1.5
5.	A simply supported beam of length 6 m carries a UDL of 12 KN/m over the entire span. If E= $2\text{x}10^5$ and I= $6\text{x}10^{10}$ mm^4 what is the deflection at the centre of the beam.
Option A:	1.6875 mm
Option B:	16.875 mm
Option C:	168.75 mm
Option D:	0.16875 mm
6.	A M.S. rod of 15 mm diameter, 2000 mm long is heated from room temperature 30

	degree to 120 degree C. If the coefficient of linear expansion and Young's modulus of material are 13×10^{-6} /degree C & 2×10^{5} N/mm^2. Then the thermal stress developed in the material if expansion is prevented
Option A:	203 N/mm^2
Option B:	110 N/mm^2
Option C:	234 N/mm^2
Option D:	345 N/mm^2
7.	The strain energy in a member is proportional to ___________
Option A:	Product of stress and the strain
Option B:	Total strain multiplied by the volume of the member
Option C:	The maximum strain multiplied by the length of the member
Option D:	Product of strain and Young's modulus of the material
8.	If diameter of a shaft is doubled the power transmitted capacity will be
Option A:	Either twice or half
Option B:	Four times
Option C:	Eight times
Option D:	Same
9.	The columns whose slenderness ratio is less than 80, are known as
Option A:	Short columns
Option B:	Long columns
Option C:	Weak columns
Option D:	Medium columns
10.	Assumptions to derive bending flexural formula are mentioned below. Select the wrong statement from following,
Option A:	The transverse sections of the beam remain plane before and after bending.
Option B:	Material of beam is isobaric, homogeneous and follows hooks law.
Option C:	Beam is initially straight and of constant cross section.
Option D:	Modulus of elasticity is same in tension and compression.
11.	In an experiment, the bulk modulus of elasticity of a material is twice its modulus of rigidity. The Poissons ratio of the material is ____________
Option A:	1/7
Option B:	2/7
Option C:	3/7
Option D:	4/7
12.	A simply supported beam of span 8 m carries a UDL of 10 KN/m for a span of 3 m starting from right hand support. What is the bending moment at the Centre.
Option A:	22.5 KN-m
Option B:	24.375 KN-m
Option C:	5.625 KN-m
Option D:	45 KN-m
13.	Using Euler's equation, the crippling load for a hollow cylindrical column, 100 mm outer and 80 mm inner diameter and 3000 mm (both ends hinged) having E= 2×10^{5} N/mm^2
Option A:	63.56 KN

Option B:	6671 KN
Option C:	6.35 KN
Option D:	635.63 KN
14.	Gas pipes is examples of ______________
Option A:	Thick shells
Option B:	Thin cylinders
Option C:	Hoop cylinders
Option D:	Longitudinal cylinders
15.	Poisson's ratio is the ratio of,
Option A:	Lateral strain to longitudinal strain
Option B:	Longitudinal strain to volumetric strain
Option C:	Lateral strain to Shear Strain
Option D:	Shear Strain to longitudinal strain
16.	A solid shaft 40 mm diameter transmitting 60 KW at 660 rpm. The maximum shear stress induced in shaft material is
Option A:	79.08 N/mm
Option B:	69.08 N/mm^2
Option C:	120 N/mm^2
Option D:	77.82 N/mm^2
17.	At the extreme fibre of a beam cross-section, bending stress is______
Option A:	Minimum
Option B:	Zero
Option C:	Constant
Option D:	Maximum
18.	What is the maximum shear force, when a cantilever beam is loaded with udl of 10 kN/m throughout and length of beam is 5 m?
Option A:	50 kN
Option B:	5 kN
Option C:	20 kN
Option D:	15 kN
19.	What is the formula of theorem of perpendicular axis?
Option A:	$I_{zz}=I_{xx}-I_{yy}$
Option B:	$I_{zz} = I_{xx} + Ah^2$
Option C:	$I_{zz} - I_{xx} = I_{yy}$
Option D:	$I_{zz} + I_{xx} = I_{yy}$
20.	Point of contra-flexure in beam is a
Option A:	Point where Shear force is maximum
Option B:	Point where Bending moment is maximum
Option C:	Point where Bending moment is zero
Option D:	Point where Bending moment zero but also changes sign from positive to negative

<table>
<tr><th>Q2</th><th>Solve any Four out of Six 5 marks each</th></tr>
<tr><td>A</td><td>A rectangular beam of 200mm deep and 300mm wide is simply supported over span of 8m. what UDL W kN/m the beam can carry. If the bending stress is not to exceed 120Mpa</td></tr>
<tr><td>B</td><td>A 5m long simply supported beam AB, loaded with shear force of 120KN. The T section of the web is of 80X20 mm and Flange 100X20mm. Compute and draw shear stress distribution diagram. If I=15.478X10^{6}mm^4, $\overline{Y} = 146.28mm$ from bottom .</td></tr>
<tr><td>C</td><td>Compute the value of "P" and Change in length if E=200Gpa, take Diameters for portion AB, BC, CD as 40mm, 20mm, and 30mm respectively

</td></tr>
<tr><td>D</td><td>Calculate the safe compressive load on hollow Column (OD-200, ID-130mm). The column 9m long and both ends are fixed. If FOS 4, E= 105Gpa. Use Euler's Equation.</td></tr>
<tr><td>E</td><td>Determine instantaneous stress and deformation of a rod of diameter 8mm, length 1.2m, if mass of 100kg falls through a height of 120mm and strikes the bottom of the rod. The rod is freely suspended and fixed at the top, Take E=210Gpa</td></tr>
<tr><td>F</td><td>A closed cylindrical vessel made of steel plates 4mm thick with plane ends carries fluid under a pressure of 3N/mm^2. The diameter of cylinder is 250mm and the length is 750mnm. Calculate longitudinal and hoop stresses in cylinder wall and determine changes in diameter and length. Take E= 2.1 x 10^5 N/mm^2, 1/m = 0.286</td></tr>
</table>

<table>
<tr><th>Q3</th><th>Solve any Two out of Three 10marks each</th></tr>
<tr><td>A</td><td>Draw SFD and BMD for following figure

</td></tr>
<tr><td>B</td><td>Compute change in dimensions, change in volume, stress and strain induced in all directions for Figure. Take μ=0.3, E=210Gpa, AB=500mm, BC=200mm and AE= 400mm

</td></tr>
<tr><td>C</td><td>Determine slope and deflection at point B & D

</td></tr>
</table>

University of Mumbai

Examination JUNE 2021 under cluster 09 (FAMT)

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: Mechanical Engineering

Curriculum Scheme: Rev 2019 C Scheme

Examination: SE Semester: III (DSE)

Course Code: MEC303 and Course Name: PRODUCTION PROCESSES

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.	In a gating system of sand mould, which of the following passage is used to carry molten metal from runner to mould cavity?
Option A:	sprue
Option B:	riser
Option C:	gate
Option D:	pouring basin
2.	In Jolt-Squeeze moulding machine, the principles of which two moulding machines are combined?
Option A:	squeeze moulding machine and jolt moulding machine
Option B:	sand slinger and straight draw moulding machine
Option C:	straight draw and stripping plate moulding machine
Option D:	sand slinger and turn over moulding machine
3.	Which of the following castings is the art of rapidly producing accurately dimensioned parts by forcing molten metal under pressure into split metal dies which resemble a common type of permanent mould?
Option A:	sand casting
Option B:	investment casting
Option C:	slush casting
Option D:	die casting
4.	In which of the following moulding processes the mould is formed from a mixture of fine sand and thermosetting resin binder that is placed against heated metal pattern?
Option A:	machine moulding
Option B:	sweep moulding
Option C:	shell moulding
Option D:	plate moulding
5.	Which of the following welding technique is not using heat as a source for welding
Option A:	MIG welding
Option B:	explosive welding
Option C:	friction welding
Option D:	gas welding
6.	Which of the following welding process uses high frequency vibratory energy

	into overlapping area of metal plates to be joined?
Option A:	explosive welding
Option B:	ultrasonic welding
Option C:	resistance welding
Option D:	arc welding
7.	Which of the following welding defects results from the presence of non-metallic substance?
Option A:	porosity
Option B:	crack
Option C:	undercut
Option D:	slag inclusion
8.	Which of the following fusible alloy or metal is used for uniting two metals in brazing process?
Option A:	solder
Option B:	spelter
Option C:	tungsten
Option D:	thermit
9.	Which of the following components is mainly manufactured by performing metal forging?
Option A:	Piston
Option B:	Engine block
Option C:	Connecting rod
Option D:	Crankcase
10.	Which of the following can help in determining the behavior of the material in metal forming?
Option A:	Stress-strain curve
Option B:	Size of material
Option C:	Shape of material
Option D:	Color of material
11.	In drawing operation, the metal flows due to
Option A:	Ductility
Option B:	Work hardening
Option C:	Yielding
Option D:	Plasticity
12.	The cutting process of sheet metal at 45 or 90 degrees is called as __________.
Option A:	Perforating
Option B:	Drilling
Option C:	Bending
Option D:	Notching
13.	In blanking operation, the clearance is provided on
Option A:	Die
Option B:	Half and half on both Die and Punch
Option C:	Punch

Option D:	Depends on the choice of the designer
14.	The grinding operation is a
Option A:	Shaping operation
Option B:	Forming operation
Option C:	Surface finishing operation
Option D:	Dressing operation
15.	The type of tool used on broaching machine is
Option A:	single-point cutting tool
Option B:	two-point cutting tool
Option C:	three-point cutting tool
Option D:	multi-point cutting tool
16.	In a planer
Option A:	both workpiece and tool rotates
Option B:	both tool and workpiece reciprocates
Option C:	tool reciprocates and workpiece is stationary
Option D:	workpiece reciprocates and tool is stationary
17.	Injection moulding is the ideal method of processing.......
Option A:	Plastics
Option B:	Thermo-setting plastics
Option C:	Thermoplastics
Option D:	Non-ferrous materials
18.	Which of the following process is used to manufacture plastic pipes?
Option A:	Injection moulding
Option B:	Blow moulding
Option C:	Extrusion moulding
Option D:	Vacuum moulding
19.	Specific gravity of the plastics is usually
Option A:	less than the specific gravity of metals
Option B:	more than the specific gravity of metals
Option C:	similar to the specific gravity of metals
Option D:	Unpredictable
20.	Porous product can be effectively produced using.
Option A:	Machining process
Option B:	Forging process
Option C:	Powder metallurgy
Option D:	Shell moulding process

Q2. (20 Marks Each)	**Solve any Four out of Six.** **5 marks each**
A	Write short note on ‘Investment casting process’
B	Write short note on types of risers in gating system of sand moulding.
C	Write short note on ‘Casting defects’
D	Write a short note on friction welding.
E	Write short note on metal inert gas welding.
F	Write a short note on ultrasonic welding.

Q3. (20 Marks Each)	**Solve any Four out of Six .** **5 marks each**
A	Draw labeled diagram of broaching tool.
B	Differentiate between shaping and planning machines.
C	Explain honing operation
D	What you understand by grinding wheel balancing.
E	Explain plastic injection moulding process.
F	Write a note on finishing operation in powder metallurgy.

University of Mumbai
Examination 2020 under cluster 09(FAMT)
Examinations Commencing from 15th June 2021 to 26th June 2021

Program: MECHANICAL ENGINEERING
Curriculum Scheme: Rev2019 C Scheme
Examination: SE Semester: III
Course Code: MEC303 and Course Name: PRODUCTION PROCESSES

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 two marks each.**
1	Which of the following types of sand is clean clay free silica sand which serves the same purpose of parting dust in molding process?
Option A:	core sand
Option B:	parting sand
Option C:	loam sand
Option D:	facing sand
2	Which of the following casting defects is caused due to core misplacement or mismatching of top and bottom parts of the casting usually at the parting line?
Option A:	swell
Option B:	shift
Option C:	poured short
Option D:	misrun
3	In which of the following processes the final product is formed by pouring molten metal in the mould and allowing it to solidify?
Option A:	machining
Option B:	turning
Option C:	casting
Option D:	welding
4	Which of the following defects in casting is due to dirt or sand embedded in the casting surface?
Option A:	swell
Option B:	shrinkage cavity
Option C:	fin
Option D:	dirt
5	What is weldability?
Option A:	capacity of getting machined easily
Option B:	reliability
Option C:	capacity of being welded into an inseparable joint having specified properties such as definite weld strength, proper structure etc.
Option D:	capacity of getting soldered together into an inseparable joint
6	In oxy-acetylene welding when there is excess of oxygen, which of the following flame is produced?

Option A:	natural flame
Option B:	carburizing flame
Option C:	oxidizing flame
Option D:	neutral flame
7	Which of the following welding process uses high frequency vibratory energy into overlapping area of metal plates to be joined?
Option A:	explosive welding
Option B:	ultrasonic welding
Option C:	resistance welding
Option D:	arc welding
8	Hot press forging _____________.
Option A:	Is used to force the end of a heated bar into a desired shape
Option B:	Is a forging method for reducing the diameter of a bar and in the process making it longer
Option C:	Is a forging operation in which two halves of rotating die open and close rapidly while impacting the end of the heated tube or shell
Option D:	Causes a steadily applied pressure instead of impact force
9	The important mechanical property for a material to be successfully rolled or forged is
Option A:	Brittleness
Option B:	Ductility
Option C:	Malleability
Option D:	Elasticity
10.	Metal flows in same direction of Ram movement in
Option A:	Direct Extrusion
Option B:	Forging
Option C:	Bending
Option D:	Indirect Extrusion
11	The unit of sheet metal thickness is?
Option A:	S.W.G.
Option B:	M.F.G.
Option C:	A.W.G.
Option D:	U.G.
12	Traditional machining usually takes place by _________ process.
Option A:	Erosion
Option B:	Abrasion
Option C:	Vaporization
Option D:	Corrosion
13	Which one of the following process conditions leads to better material removal in ECM process?
Option A:	Higher current, higher atomic weight
Option B:	Higher valency, lower atomic weight
Option C:	Higher current, higher valency

Option D:	Lower atomic weight, lower valency
14	The spark gap in Electrical Discharge Machining (EDM) process is maintained such that
Option A:	the gap voltage is around 15% of supply voltage
Option B:	the gap voltage is around 40% of supply voltage
Option C:	the gap voltage is around 70% of supply voltage
Option D:	the gap voltage is around 90% of supply voltage
15	The workpiece motion and tool motion respectively in a horizontal boring machine are.......
Option A:	Stationary and rotational
Option B:	Rotational and translational
Option C:	Translational and rotational
Option D:	Stationary and rotational with translation
16	In which type of operation, motion of cutting tool is rotating and translating?
Option A:	drilling and milling
Option B:	milling and turning
Option C:	turning and drilling
Option D:	turning and planning
17	The process of beveling sharp ends of a workpiece is called as ___
Option A:	knurling
Option B:	grooving
Option C:	facing
Option D:	chamfering
18	In lapping operation, the amount of metal removed is
Option A:	0.005 TO0.01 mm
Option B:	0.01 TO 0.1 mm
Option C:	0.05 TO 0.1 mm
Option D:	0.5 TO 1 mm
19	In American Standard Association (ASA) system, if the tool nomenclature is 8-6-5-5-10-15-2 mm, then the side rake angle will be
Option A:	50
Option B:	60
Option C:	70
Option D:	80
20	Which of the following moulding methods is generally not used for thermoplastic materials
Option A:	Extrusion
Option B:	Injection
Option C:	Casting
Option D:	Calendaring

Q2. **20 Marks**	**Solve any Four out of Six. (5 marks each)**
A	Write short note on types of risers in gating system of sand moulding.
B	Write short note on defects in welded joints.
C	Compare Hot working vs Cold working.
D	Write short note on: Laser Beam Machining.
E	Describe any one method of generation of a small taper in a center lathe.
F	What do you understand by Internet of Things (IoT)

Q3. **20 Marks**	**Solve any Four out of Six. (5 marks each)**
A	Any five casting Explain defects and state their remedies.
B	Write short note on tungsten inert gas welding.
C	What is the function of a Riser?
D	Write a short note on: Electro-chemical machining.
E	How is a milling machine specified?
F	Write a note on Cloud Manufacturing

University of Mumbai

Examination June 2021 under cluster 09 (FAMT)

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: Mechanical Engineering

Curriculum Scheme: Rev 2019 C Scheme

Examination: SE Semester: III_(DSE)

Course Code: MEC 304 and Course Name: **Materials and Metallurgy**

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**
Q1.	In Eutectic Transformation following reaction occurs
Option A:	Liquid to Solid1 and Solid 2
Option B:	Liquid to Liquid1 and Solid 2
Option C:	Liquid to Liquid1 and Liquid 2
Option D:	Liquid to Solid1 and Liquid 2
Q2.	For 0.4% carbon steel the two phases are
Option A:	Pearlite 60% and α-Ferrite 40%
Option B:	Pearlite 40% and α-Ferrite 60%
Option C:	Pearlite 50% and α-Ferrite 50%
Option D:	Pearlite 45% and α-Ferrite 55%
Q3.	Range of Medium carbon steel 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 2.6%
Q4.	Ledeburite is a combination of which two phases
Option A:	Austenite and Cementite
Option B:	Pearlite and Cementite
Option C:	Austenite and α-Ferrite
Option D:	α-Ferrite and Cementite
Q5.	Austenite on very slow cooling transfers into
Option A:	Pearlite
Option B:	Martensite
Option C:	Bainite
Option D:	Ferrite
Q6.	Which heat treatment can convert mild steel to high carbon steel
Option A:	Annealing
Option B:	Normalizing
Option C:	Case hardening
Option D:	Nitriding

Q7.	Sub-zero treatment of steel
Option A:	Is used to reduce the retained austenite in hardened steel
Option B:	Increases the ability of steel to work in sub-zero atmospheres
Option C:	Is used to suppress martensite transformation
Option D:	Is performed after hardening operation to induce temper brittleness is never used
Q8.	Typical composition for solid carburising is
Option A:	53 to 55% charcoal, 30 to 32% coke & remaining carbonates of Ba, Na, and Ca
Option B:	35 to 55% charcoal, 30 to 32% coke & remaining carbonates of Ba, Na, and Ca
Option C:	50% charcoal,50% coke
Option D:	90% charcoal remaining carbonates of Ba, Na, and Ca
Q9.	During *normalizing* process of steel, the specimen is heated
Option A:	between the upper and lower critical temperature and cooled in still air
Option B:	above the upper critical temperature and cooled in furnace.
Option C:	above the upper critical temperature and cooled in still air.
Option D:	between the upper and lower critical temperature and cooled in furnace.
Q10.	Figure out odd one in the following
Option A:	Frenkel defect
Option B:	Tilt boundary
Option C:	Twin boundary
Option D:	stacking fault
Q11.	_______ occurs when a foreign substance replaces an atom in a crystal.
Option A:	Vacancy defect
Option B:	Substitutional impurity
Option C:	Frankel defect
Option D:	Interstitial impurity
Q12.	Which of the following statement is false?
Option A:	Annealing twins occur during annealing heat treatment
Option B:	Mechanical twins generate due to plastic deformation
Option C:	Annealing twins form in high stacking fault energy metals
Option D:	Annealing twins are mostly observed in FCC metals
Q13.	Generation of dislocations can be explained using _______
Option A:	Schottky mechanism
Option B:	Burger’s vector
Option C:	Twist
Option D:	Frank-Read mechanism
Q14.	What are one-dimensional defects?
Option A:	Boundary defect
Option B:	Point defect
Option C:	Line defect
Option D:	Volume defect

Q15.	The cermets are example of
Option A:	Ceramic-metal composites
Option B:	Carbon-carbon composites
Option C:	Metal-polymer matrix composites
Option D:	Polymer ceramic composite
Q16.	Wood is a natural composite consisting of
Option A:	Lignin fibers in Collagen matrix
Option B:	Lignin fibers in apatite matrix
Option C:	Cellulose fibers in apatite matrix
Option D:	Cellulose fibers in lignin matrix
Q17.	Usually softer constituent of a composite is
Option A:	Matrix
Option B:	Reinforcement
Option C:	Both are of equal strength
Option D:	Can't define
Q18.	Creep is
Option A:	Deformation that occurs under fluctuacting load/stress and low temperatures which is time-dependent is known as creep.
Option B:	Deformation that occurs under constant load/stress and elevated temperatures which is time-dependent is known as creep.
Option C:	Deformation that occurs under zero load/stress and elevated temperatures which is time-dependent is known as creep.
Option D:	Deformation that occurs under constant load/stress and very low temperatures which is time-dependent is known as creep
Q19.	Higher the melting point of materials
Option A:	Lower is the creep resistance
Option B:	Higher is fatigue strength
Option C:	Lower is fatigue strength
Option D:	Higher is the creep resistance
Q20.	Fatigue limit is defined for
Option A:	Non ferrous metals
Option B:	Ferrous metals
Option C:	Plastic materials
Option D:	Ceramic materials

Q2	**Solve any Four out of Six. (5 marks each)**
A	What is crystal structure? write important crystallographic planes and directions for FCC, BCC and CPH crystal system.
B	Explain nucleation and growth process in solidification of metals.
C	Classify stainless steels and write composition, properties and applications of it.
D	State and explain factors affecting fatigue.
E	What are smart materials? write properties and applications of shape memory alloys.
F	What is nondestructive testing of materials? Explain principle of ultrasonic testing of materials.

Q3	**Solve any Two out of Three. (10 marks each)**
A	What is fatigue? What are the factors affecting fatigue life? How fatigue life of component is increased? Explain S-N curve for ferrous and non-ferrous metals.
B	Draw TTT diagram and explain annealing, normalizing and hardening with the help of it.
C	What is cold working? explain the recovery, recrystallization and growth in annealing process.

University of Mumbai

Examination 2020 under cluster 09 (FAMT)

Examinations Commencing from 15th June 2021 to 26th June 2021

Program:Mechanical Engineering
Curriculum Scheme: Rev 2019 C Scheme
Examination: Second year Semester: III
Course Code: MEC304and Course Name: Materials & Metallurgy
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**
Q1.	Pearlite is a combination of
Option A:	Ferrite& austenite
Option B:	Ferrite& cementite
Option C:	Ferrite& martensite
Option D:	Bainite& martensite
Q2.	The line differentiating between liquid and (liquid +solid) is called
Option A:	Solvus
Option B:	Solidus
Option C:	Tieline
Option D:	Liquidus
Q3.	The maximum concentration of solute that can be added is defined as
Option A:	Solution limit
Option B:	Solubilty limit
Option C:	Insolubilty limit
Option D:	No solution limit
Q4.	Two liquidus line meet at which point
Option A:	Eutectoid
Option B:	Eutectic
Option C:	Peritectic
Option D:	Isomorphous
Q5.	Which reaction is obtained by mixing of solid 1+ solid 2 = solid 3
Option A:	Peritectic
Option B:	Eutectic
Option C:	Peritectoid
Option D:	Eutectoid
Q6.	Case depth obtained by Nitriding is
Option A:	less than 0.5mm
Option B:	More than 5 mm
Option C:	Equal to 5mm
Option D:	less than 5 mm and more than 10 mm
Q7.	In Carbo-nitriding process
Option A:	atomic nitrogen diffuses in the ferrite phase and carbon diffuses in the austenite

Option B:	atomic nitrogen diffuses in the austenite phase and carbon diffuses in the ferrite
Option C:	atomic nitrogen diffuses in the austenite phase and carbon diffuses in cementite
Option D:	atomic nitrogen diffuses in the cementite phase and carbon diffuses in the ferrite
Q8.	In induction hardening higher is the frequency used
Option A:	thinner is the depth achieved
Option B:	thicker is the depth achieved
Option C:	medium is the depth achieved
Option D:	none depth is achieved
Q9.	Special alloy steels are required in ________
Option A:	induction hardening
Option B:	Nitriding
Option C:	flame hardening
Option D:	Carburizing
Q10.	Materials that undergo plastic deformation before breaking are called
Option A:	Brittle
Option B:	Ductile
Option C:	Amorphous
Option D:	Polymers
Q11.	Which material is a better conductor of electricity?
Option A:	ceramics
Option B:	polymers
Option C:	metals
Option D:	bakelite
Q12.	Which material is more brittle?
Option A:	Ceramics
Option B:	Metals
Option C:	Polymers
Option D:	steel
Q13.	In case of edge dislocation
Option A:	Burgers vector is parallel to dislocation line
Option B:	Burgers vector is perpandicular to dislocation line
Option C:	There is no relation between burgers vector and dislocation line
Option D:	Burgers vector is at 60 degree to dislocation line
Q14.	Which of the following is not true for cold working of metals?
Option A:	residual stresses are set up in the metal
Option B:	stress required to cause deformation is less than hot working of metals
Option C:	it reduces the corrosion resistance of the metal
Option D:	distortion of grains takes place in most of the cold working processes
Q15.	Quantum dots can be used in __________
Option A:	Crystallography

Option B:	Optoelectronics
Option C:	Mechanics
Option D:	Quantum physics
Q16.	What's the procedure in Top-down fabrication method?
Option A:	Nano-particles -> Powder -> Bulk
Option B:	Powder -> Bulk – > Nano-particles
Option C:	Bulk -> Powder – > Nano-particles
Option D:	Nano-particle – > Bulk -> Powder
Q17.	The extensively used nano particles as catalyst is__________
Option A:	Silver
Option B:	Copper
Option C:	Gold
Option D:	Cerium
Q18.	Brittle fracture occurs by
Option A:	Rapid crack propagation
Option B:	Slow crack propagation
Option C:	Excessive Plastic deformation
Option D:	Slow and steady crack growth
Q19.	As per Griffith criterion Crack propagates if
Option A:	Applied stress is below critical stress
Option B:	Applied stress is above critical stress
Option C:	Applied stress is equal to critical stress
Option D:	Not depends on applied stress
Q20.	To avoid brittle failure at low temperature design should be
Option A:	Below DBTT
Option B:	Above DBTT
Option C:	Not affected by DBTT
Option D:	Below low DBTT and should have high corrosive atmosphere

University of Mumbai

Examination 2020 under cluster 09 (FAMT)

Q2	Solve any Four out of Six. (5 marks each)
A	Derive equation for critical resolved shear stress.
B	Explain Isomorphous system of phase diagram with neat sketch.
C	Differentiate Carburizing & Nitriding.
D	What is DBTT? explain the factors affecting it.
E	What are nano materials? write applications of it.
F	What is nondestructive testing of materials? Explain principle of radiographic testing of materials.

Q3	Solve any Two out of Six. (10 marks each)
A	Draw a neat sketch of Fe-Fe3C diagram & explain reactions, phases and critical temperatures and curves on it.
B	What is crystal imperfection? Classify crystal imperfections. Discuss with neat sketches point defects & their significance
C	What is tempering? Classify and explain the purpose of it.

University of Mumbai
Examination 2021 under cluster 09 (FAMT)

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: Mechanical Engineering

Curriculum Scheme: Rev 2019 C Scheme

Examination: SE Semester: III_(DSE)

Course Code: MEC305 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.	If Mach no. is one the flow is
Option A:	Supersonic
Option B:	Sonic
Option C:	Subsonic
Option D:	Stagnant
2.	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
3.	A series of operations, which take place in a certain order and restore the initial condition is known as
Option A:	reversible cycle
Option B:	irreversible cycle
Option C:	thermodynamic cycle
Option D:	open system
4.	The gas constant (R) is equal to the ___________
Option A:	sum of two specific heats
Option B:	difference of two specific heats
Option C:	product of two specific heats
Option D:	ratio of two specific heats
5.	A process, in which the temperature of the working substance remains constant during its expansion or compression, is called
Option A:	Isothermal process
Option B:	Isobaric process
Option C:	Adiabatic process
Option D:	Polytrophic process
6.	Stirling cycle consist of
Option A:	two constant volume and two isentropic process
Option B:	two constant volume and two isothermal process
Option C:	two constant pressure and two isothermal process
Option D:	one constant volume, one constant pressure and two isentropic processes

7.	Otto cycle consist of
Option A:	two constant volume and two isentropic processes
Option B:	two constant pressure and two isentropic processes
Option C:	two constant volume and two isothermal processes
Option D:	One constant pressure, one constant volume and two isentropic processes
8.	In throttling process enthalpy...........
Option A:	does not change
Option B:	Increases
Option C:	Decreases
Option D:	first increases and then decreases
9.	Kelvin-Planck's law deals with........
Option A:	conservation of energy
Option B:	conservation of heat
Option C:	conversion of heat into work
Option D:	conversion of work into heat.
10.	Helmholtz function is expressed as...........
Option A:	(u + pv)
Option B:	(– sdT + vdp)
Option C:	(u – Ts)
Option D:	(h – Ts)
11.	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
12.	Entropy of the universe always tends to
Option A:	zero
Option B:	decrease
Option C:	increases
Option D:	unpredictable
13.	If compression ratio is 5 and specific heat ratio for air is 1.4, what is otto cycle efficiency ?
Option A:	47%
Option B:	52%
Option C:	72%
Option D:	35%
14.	Dryness fraction of steam is defined as
Option A:	mass of water vapour in suspension/(mass of water vapour in suspension + mass of dry steam)
Option B:	mass of dry steam/mass of water vapour in suspension
Option C:	mass of water vapour in suspension/mass of dry steam
Option D:	mass of dry steam/(mass of dry steam + mass of water vapour in suspension)

15.	Which Cycle consists of three reversible processes?
Option A:	Ericsson cycle
Option B:	Stirling cycle
Option C:	Lenoir cycle
Option D:	Atkinson cycle
16.	If the exit pressure from a nozzle is less than critical pressure , it is
Option A:	Convergent - Divergent
Option B:	Convergent
Option C:	Divergent
Option D:	throat
17.	The absolute zero pressure will be
Option A:	When molecular momentum of the system becomes zero
Option B:	at sea level
Option C:	at the temperature of -273K
Option D:	at the Centre of the earth
18.	Energy can neither be created nor destroyed, but it can be transformed from one form to another. This statement is known as
Option A:	Zeroth law of Thermodynamics
Option B:	First law of Thermodynamics
Option C:	Second law of Thermodynamics
Option D:	Kinetic theory of gases
19.	Which of the following is true for a closed system?
Option A:	Mass and energy does not enter or leave the system
Option B:	Energy does not enter or leave the system
Option C:	Mass and energy does enter or leave the system
Option D:	Mass does not enter or leave the system
20.	Heat supplied to dual cycle having usual notations is given by
Option A:	$C_v(T_3-T_2)$
Option B:	$C_p(T_4-T_3)$
Option C:	$C_v(T_3-T_2)+C_p(T_4-T_3)$
Option D:	$C_p(T3-T2)+C_v(T4-T_3)$

Q2 **(20 Marks)**	**Solve any Four out of Six. (5 marks each)**
A	An aeroplane is flying at height of 14 km where temperature is -45 ^{0}C. Find speed of plane in m/s if Mach no. is 2. Find the speed of the plane if R = 287 J/kg K and γ = 1.4.
B	Write four Maxwell relations.
C	Write short note on Modified Rankine Cycle.
D	Draw p-v, T-s diagram of otto diesel and dual cycle.
E	Define available energy, dead state and irreversibility.
F	State limitations of first law of thermodynamics.

Q3. **(20 Marks)**	**Solve any Two Questions out of Three. (10 marks each)**
A	8 kg of air at 650 K and 5.5 bar pressure is enclosed in a closed system. If the atmospheric temperature and pressure are 300 K and 1 bar respectively, determine: (i) The availability if the system goes through the ideal work producing process. (ii) The availability and effectiveness if the air is cooled at constant pressure to atmospheric temperature without bringing it to complete dead state. Take c_v = 0.718 kJ/kg K ;c_p= 1.005 kJ/kg K.
B	Show application of Steady Flow Energy Equation in i) Water Turbine ii) Steam or Gas Turbine.
C	Explain statements of second law of thermodynamics and explain perpetual motion machine of second kind in details.

University of Mumbai

Examination 2021 under cluster09 (FAMT)

Examinations Commencing from 15th June 2021 to 26th June 2021

Program: **Mechanical Engineering**

Curriculum Scheme: Rev2019 C Scheme

Examination: SE Semester:III

Course Code: MEC305 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.	In a reversible adiabatic process the work transfer is equal to ________
Option A:	Decrease in enthalpy
Option B:	Decrease in internal energy
Option C:	Heat transfer
Option D:	The product of pressure and change in volume
2.	When the high temperature reservoir is supplying the heat to the heat engine, out of the following which will be correct?
Option A:	The temperature of the reservoir will decrease
Option B:	The temperature of the reservoir will increase
Option C:	The temperature of the reservoir will remain same
Option D:	Temperature and heat transfer both will decrease
3.	Steady flow occurs when ____
Option A:	Properties do not change with time
Option B:	System is in equilibrium with its surrounding
Option C:	Properties change with time
Option D:	When change of volume with change in temperature is constant
4.	In the isochoric process ________
Option A:	Free expansion takes place
Option B:	Very small amount of work is done
Option C:	No work is done
Option D:	All properties remain constant.
5.	In a closed system, change in enthalpy is equal to the heat transfer if the process is carried out at constant________
Option A:	Temperature
Option B:	Pressure
Option C:	Volume
Option D:	entropy
6.	Efficiency of Stirling cycle will _______ as compared to Carnot cycle when operating between same temperature limits.
Option A:	be more
Option B:	be less

Option C:	be equal
Option D:	depend on type of working fluid
7.	Identify the cycle in which heat is supplied at constant volume and rejected at constant pressure.
Option A:	Brayton Cycle
Option B:	Atkinson cycle
Option C:	Otto cycle
Option D:	Diesel cycle
8.	For the same compression ratio and heat rejection the efficiency of air standard dual cycle is _________
Option A:	Greater than Otto cycle
Option B:	Less than Diesel cycle
Option C:	Less than Otto cycle and greater than Diesel cycle
Option D:	Greater than both Otto cycle and Diesel cycle
9.	The relationship between entropy, enthalpy and work is given by ________
Option A:	Tds = dH+Vdp
Option B:	dH = Vdp – Tds
Option C:	Tds = dH − Vdp
Option D:	Vdp = dH/Tds
10.	Enthalpy of vaporization of a saturated liquid ___________
Option A:	decreases as the temperature or pressure increases
Option B:	increases as the temperature or pressure increases
Option C:	Does not depend on temperature and pressure
Option D:	first increases and then decreases as the temperature or pressure increases
11.	Regenerative Rankine cycle thermal efficiency________
Option A:	is always greater than simple Rankine thermal efficiency
Option B:	is greater than simple Rankine cycle thermal efficiency only when steam is bled at particular pressure
Option C:	is same as simple Rankine cycle thermal efficiency
Option D:	is always less than simple Rankine cycle thermal efficiency
12.	At _________ pressure and temperature, a substance exists in three phases in equilibrium.
Option A:	Critical point
Option B:	Triple point
Option C:	Boiling point
Option D:	Freezing point
13.	Flow of fluid is called transonic when ___
Option A:	Mach Number is greater than 1
Option B:	Mach Number is equal to 1
Option C:	Mach Number is less than 1
Option D:	Mach Number lies between 0.8 & 1.2
14.	What will be the effect on entropy when heat is added at constant temperature?

Option A:	It remains constant
Option B:	It will decreases
Option C:	It may increase or decrease
Option D:	It will increase
15.	For an ideal gas the value of Joule-Thomson coefficient is ______
Option A:	Positive
Option B:	Negative
Option C:	Zero
Option D:	Indeterminate
16.	Which of the following is called as Laval nozzle?
Option A:	Convergent nozzle
Option B:	Divergent nozzle
Option C:	Convergent divergent nozzle
Option D:	Venturi nozzle
17.	The ratio of the maximum volume formed in the cylinder to the minimum (clearance) volume is called ______________.
Option A:	Cutoff ratio
Option B:	Compression ratio
Option C:	Pressure ratio
Option D:	Expansion ratio
18.	The work done in an isothermal expansion of a gas depends upon ___
Option A:	Temperature
Option B:	Expansion ratio only
Option C:	Both temperature and expansion ratio
Option D:	Neither temperature nor expansion ratio
19.	Kelvin-Planck's statement deals with _____
Option A:	Conservation of energy
Option B:	Conservation of heat
Option C:	Conservation of mass
Option D:	Conservation of heat into work
20.	The efficiency of Diesel cycle approaches to Otto cycle efficiency when ________
Option A:	Cutoff is increased
Option B:	Cutoff is decreased
Option C:	Cutoff is zero
Option D:	Cutoff is constant

Q. 2	**Solve any TWO out of the following. (10 marks each)**
A.	The initial pressure and temperature are 1 bar and 30 °C in an air standard dual cycle. The compression ratio is 9 with maximum pressure limited to 60 bar. The heat is added during constant pressure process upto 4% of the stroke. Assuming cylinder bore and stroke as 250 mm and 300 mm respectively determine. :(a) Efficiency of the cycle (b) Power developed if the number of working cycles is 3/second. Take Cv = 0.71 kJ/kgK& Cp = 1 kJ/kgK
B.	Steam expands in a turbine from 25 bar and 300°C to a condenser pressure of 20 kPa. Calculate Rankine cycle efficiency. (a) What would be efficiency if the initial temperature of steam be 500 °C instead of 300°C? (b) If the boiler pressure is increased to 60 bar maintain the steam temperature at 500°C. Calculate the cycle efficiency. Assume condenser pressure remains constant in all cases.
C.	4 kg of air is compressed from 40°C & 125 kPa to 250°C and 875 kPa. It is then throttled to 257 kPa. Finally it is cooled to a pressure of 125 kPa and 180°C. Calculate the overall change in entropy and also for each process. Take Cv = 0.717 kJ/kgK& Cp = 1.005 kJ/kgK

Q. 3	**Solve any TWO out of the following. (10 marks each)**
A.	Air flows steadily at the rate of 0.5 kg/s through an air compressor entering at 7m/s velocity, 100 kPa pressure and 0.95 m^3/kg. The internal energy of the air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in the compressor jackets absorbs heat from the air at the rate of 58 kW. (a) Calculate the rate of shaft work input to the air in kW (b) Find the ratio of the inlet pipe diameter to outlet pipe diameter.
B.	Air flows steadily and isentropically in a convering diverging nozzle. At the throat the air is at 140 kPa (abs) and at 60°C. The throat cross sectional area is 0.05 m^2. At a certain section in the diverging part of the nozzle the pressure is 70 kPa (abs). Calculate velocity and area of the this section
C.	A rigid vessel of volume 0.86 m^3 contains 1 kg of steam at a pressure of 2 bar. Evaluate the specific volume, temperature, dryness fraction, internal energy, enthalpy and entropy of steam.