University of Mumbai
Examination 2020 under cluster 9 (FAMT)
Examinations Commencing from 15th June 2021 to 26th June 2021

Program: Mechanical Engineering
Curriculum Scheme: Rev2016
Examination: TE Semester V
Course Code: MEC501 and Course Name: Internal Combustion Engine

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.	Scavenging process is carried out during _____ stroke, in 2 stroke engine.
Option A:	suction
Option B:	compression
Option C:	expansion
Option D:	Dilution
2.	Main purpose of LHR engine is to _____ engine coolant heat losses, hence _____ engine performance.
Option A:	Reduce, Increases
Option B:	Reduce, Reduce
Option C:	Increase, Increase
Option D:	Increase, Reduce
3.	_____ Engine works on thermodynamic cycle with constant volume heat addition process.
Option A:	Diesel
Option B:	CI
Option C:	Gas turbine
Option D:	Petrol
4.	Carburetor should provide _____ air-fuel mixture in idling range.
Option A:	rich
Option B:	stoichiometric
Option C:	lean
Option D:	Chemically corrected
5.	Fuel is injected in intake manifold in case of _____ injection system in SI engine.
Option A:	Timed
Option B:	Continuous
Option C:	direct
Option D:	Pulsating
6.	Auxiliary valve is used in carburetor to _____ richness of air-fuel mixture.

Option A:	Prevent
Option B:	increases
Option C:	accelerate
Option D:	decelerate
7.	_____ Ignition delay period in S.I. engine and _____ ignition delay period in C.I. engine is desirable to avoid knocking.
Option A:	More, lesser
Option B:	Lesser, more
Option C:	More. more
Option D:	Lesser, lesser
8.	_____ Combustion chamber is not used in SI engine.
Option A:	T-head type
Option B:	L-head type
Option C:	Toroidal
Option D:	F-head type
9.	Ignition quality of Diesel is expressed by _____.
Option A:	Cetane number
Option B:	Octane number
Option C:	Self-ignition temperature
Option D:	Calorific value
10.	Ignition delay is duration between start of _____ of fuel and start of _____ of fuel.
Option A:	ignition, injection
Option B:	injection, ignition
Option C:	injection, flame propagation
Option D:	ignition, flame propagation
11.	Open combustion chambers are _____ type of combustion chamber.
Option A:	Direct injection
Option B:	Direct ignition
Option C:	Indirect injection
Option D:	Indirect ignition
12.	Volumetric efficiency is _____ in induction swirl as compared to compression swirl in combustion chamber.
Option A:	Low
Option B:	high
Option C:	equal
Option D:	Better
13.	A four cylinder four stroke engine develops 250 kW at 3000 r.p.m. Its b.s.f.c. is 300 g/kWh. Fuel consumption per cylinder is _____ kg/h.
Option A:	18.75
Option B:	9.375
Option C:	37.5
Option D:	75

14.	_____ lubrication system is cheapest among all lubrication systems in I.C. Engine.
Option A:	Mist
Option B:	Dry sump
Option C:	Wet sump
Option D:	Cross
15.	Supercharging air compressor is driven by _____.
Option A:	Exhaust gases
Option B:	Engine itself
Option C:	Separate electric motor
Option D:	Generator
16.	_____ Cooling system is used in motor bikes.
Option A:	Air
Option B:	water
Option C:	Thermo syphon
Option D:	Pressurized
17.	If engine produces 8 kW brake power and absorbs 2 kW power to overcome the frictional losses by consuming 4 Kg/hr fuel. Then isfc of an engine is _____ Kg/kWh.
Option A:	2/5
Option B:	1/3
Option C:	2.5
Option D:	1/4
18.	Heat balance sheet is an account of _____ supplied and _____ utilized in various ways in the system/engine.
Option A:	Heat, work
Option B:	Work, Heat
Option C:	Heat, Heat
Option D:	Work, work
19.	ECU receives signal from _____.
Option A:	Sensors
Option B:	Actuators
Option C:	Ignition coil
Option D:	Fuel injector
20.	Biodiesel blend B20 consist of_____ % of biodiesel and B5 consist of _____ % of petroleum diesel
Option A:	20, 95
Option B:	20, 5
Option C:	80, 95
Option D:	80, 5

Q2	Solve any Four out of Six. (5 marks each)

A	Illustrate construction and working of battery ignition system with the help of neat sketch.
B	Describe construction and working of thermosyphon cooling system with the help of Sketch.
C	State the advantages and disadvantages of Hydrogen and LPG as a fuel.
D	Differentiate 2-stroke engine and 4-stroke engine.
E	Describe construction and working of CRDI injection system with the help of sketch.
F	Differentiate knocking in SI engine and CI engine.

Q3	**Solve any Two Questions out of Three. (10 marks each)**
A	A four stroke engine using 0.272 kg/kWh fuel of 32 ^{0}API develops 15 kW per cylinder at 2000 r.p.m. The fuel injection pressure is 120 bar and the combustion chamber pressure is 30 bar. If the duration of injection is 25^0 of crack travel and velocity coefficient is 0.9. Determine the diameter of the fuel orifice. Take Specific gravity $=\dfrac{141.5}{131.5+\ API}$
B	In a trial of single cylinder oil engine working on duel cycle, the following observation were made: Compression ratio = 15 Oil consumption = 10.2 kg/h Calorific value of fuel = 43890 kJ/kg Air consumption = 3.8 kg/min Speed = 1900 r.p.m. Torque on the brake drum = 186 N-m Quantity of cooling water used = 15.5 kg/min Temperature rise = 36^0C Exhaust gas temperature = 410^0C Room temperature = 20^0C Cp for exhaust gas = 1.17 kJ/kgK Determine the required parameters and draw heat balance sheet.
C	An 8 cylinder 4 stroke engine of 9 cm bore and 8 cm stroke with a compression ratio of 7 is tested at 4500 rpm on a dynamo-meter which has 54 cm arm. During a 10 minutes test the dynamo-meter scale beam reading was 42 kg and the engine consumed 4.4 kg of gasoline having a calorific value of 44000 kJ/kg. Air at 1 bar and 27^0C was supplied to the carburetor at the rate of 6 kg/min. Determine (i) brake power, (ii) brake mean effective pressure, (iii) brake specific fuel consumption, (iv) brake specific air consumption, (v) brake thermal efficiency, (vi) volumetric efficiency and (vii) air fuel ratio.

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 2016
Examination: TE SemesterV
Course Code: MEC502 and Course Name: MMC

Time: 2hour   Max. Marks: 80

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	If the instrument input is increased gradually from zero, there will be some minimum value below which no output change can be detected. The minimum value of input is called _____
Option A:	Hysteresis
Option B:	Threshold
Option C:	Drift
Option D:	Dead zone
2.	The "dead zone" in a certain pyrometer is 0.125 percent of span. The calibration is 400 ° C, to 1000 ° C. What temperature change might occur before it is detected _____
Option A:	0.65° C
Option B:	0.75° C
Option C:	0.35° C
Option D:	0.86° C
3.	A moving coil voltmeter has a uniform scale with 100 divisions, the full scale reading is 200 V and 1/10 of a scale division can be estimated with a fair degree of certainty. The the resolution of the instrument in volt is _____
Option A:	0.2 V
Option B:	2 V
Option C:	2.2 V
Option D:	0.4 V
4.	Rotameter is a _____
Option A:	drag force flow meter
Option B:	variable area flow meter
Option C:	variable head flow meter
Option D:	rotating propeller type flow meter
5.	Thermopile is a _____
Option A:	combination of a number of thermocouples connected in series
Option B:	combination of a number of thermocouples connected in parallel

Option C:	combination of a number of thermocouples some of which are connected in series and some in parallel
Option D:	single thermocouple
6.	A flow meter that measures flow rates which are independent of density is _____
Option A:	Rotameter
Option B:	electromagnetic flow meter
Option C:	Venturimeter
Option D:	orifice meter
7.	In a generalized measurement system, the function of a variable manipulation element is to _____.
Option A:	convert the measurand into an analogous signal
Option B:	change the magnitude of the input signal retaining its nature
Option C:	perform linear operations
Option D:	perform non-linear operations
8.	A stroboscope is used to measure_____.
Option A:	Angular Velocity
Option B:	Pressure
Option C:	Strain
Option D:	Flow
9.	Bonded wire strain gauges are _____
Option A:	Exclusively used for construction of transducers
Option B:	Used for both stress analysis and construction of transducer
Option C:	Pressure measurement
Option D:	Exclusively used for stress analysis
10.	Nozzle flapper is used as _____ controller
Option A:	Pneumatic
Option B:	Hydraulic
Option C:	Electric
Option D:	Robotic
11.	Seismic transducer is used for measurement of _____
Option A:	angular velocity
Option B:	linear velocity
Option C:	acceleration
Option D:	pressure
12.	Consider a negative feedback closed loop system whose open loop transfer function is $\frac{2(s+10)}{s^2+9s-10}$.The open loop poles are _____
Option A:	-1 and 10
Option B:	1 and -10
Option C:	-1 and -10
Option D:	1 and 10

13.	Velocity error constant (K_v) of a system is measured when the input to the system is unit_____ function
Option A:	Parabolic
Option B:	Ramp
Option C:	Impulse
Option D:	step
14.	The closed loop transfer function for a given system is given $\frac{C(S)}{R(S)} = \frac{5K}{S^2 + 50.5\ S + 5K}$ and the static velocity error constant is $\frac{k}{10.1}$. Natural frequency is _____
Option A:	$\sqrt{5}k$
Option B:	5k
Option C:	$\sqrt{50.5}k$
Option D:	k
15.	The open loop transfer function for a given system is given G(S) $= \frac{20}{S^2 + 5\ S + 4}$, damping ratio is _____
Option A:	0.51
Option B:	0.73
Option C:	0.404
Option D:	1
16.	For a positive feedback system the forward transfer function G(S) $= \frac{3}{S(S+4)}$ and feedback transfer function H(S) = 3S , the characteristic equation is _____
Option A:	(S-5) = 0
Option B:	(S+5) = 0
Option C:	(S+6)=0
Option D:	(S-4)=0
17.	The closed loop transfer function for a unity feedback system is given by T.F = $\frac{5S+10}{S^2 + 6S + 10}$, steady state error for unit ramp input is _____
Option A:	0.1
Option B:	0.2
Option C:	0.3
Option D:	0.4
18.	_____is the time required for the response to reach 50 % of the final value in first attempt.
Option A:	Peak time
Option B:	Delay time
Option C:	Settling time
Option D:	Rise time

19.	For a stable system_____
Option A:	gain margin must be positive but phase margin can be positive or negative
Option B:	phase margin must be positive but gain margin can be positive or negative
Option C:	both gain margin and phase margin must be positive
Option D:	one of them must be zero
20.	If the Poles of the system lies on right hand side of the S plane then the system is said to be _____
Option A:	Unstable
Option B:	Stable
Option C:	Marginally stable
Option D:	Unpredictable

Q2	**Solve any Four out of Six. (5 marks each)**
A	A system is represented by the characteristic equation $P(S) = S^5+2S^4+2S^3+4S^2+S+1 =0$, **predict** the stability of the system by using Routh's criterion.
B	Define desired input , modifying input and interfering input for measuring instruments.
C	A unity feedback system has $G(S) = \frac{20\,(S+3)}{S(S+1)(S+4)}$, determine (i) static error coefficients and (ii) steady state error for a ramp input of magnitude 5.
D	Illustrate with neat diagrams the working principle of electromagnetic flow meter with its applications
E	Define the terms ' precision' and 'accuracy' , 'span' and 'range' w.r.t static characteristics of measuring instruments.
F	While measuring the speed of a steam turbine with stroboscope single line images were observed for stroboscope setting of 30000, 4000 and 5230 r.p.m. Calculate the speed of the turbine.

Q3.	**Solve any Two Questions out of Three. (10 marks each)**
A	The open loop transfer function of a unity feedback control system is given by $G(S) = \frac{K}{S(ST+1),}$, determine (i) by what factor 'k' be multiplied so that damping ratio is increase from 0.2 to 0.8. (ii) by what factor 'T' should be multiplied so that damping ratio is reduced from 0.9 to 0.3.
B	Illustrate with neat diagrams the construction and working principle of (i) McLeod Gauge and (ii) Bridgeman Gauge for pressure measurement with its industrial applications.
C	Draw the root locus and predict the stability of the system having $G(S)H(S)= \frac{K}{S(S+2)(S+4)}$.

University of Mumbai
Examination 2021 under cluster 9 (FAMT)
Examinations Commencing from 15th June 2021 to 26th June 2021
Program: Mechanical
Curriculum Scheme: Rev - 2016
Examination: TE Semester V
Course Code: MEC503 and Course Name: Heat Transfer

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.	Due to which of the following reasons most metals are good conductors of heat?
Option A:	Presence of many free electrons and frequent collision of atoms
Option B:	Capacity to absorb free energy electrons
Option C:	Energy transport due to molecular vibration
Option D:	Migration of neutrons from hot end to cold end
2.	The overall coefficient of heat transfer is used in the problems of
Option A:	Conduction
Option B:	Convection
Option C:	Conduction and convection
Option D:	Radiation
3.	ε-NTU method is particularly useful in thermal design of heat exchangers when
Option A:	outlet temperature of the fluid stream is known as a priori
Option B:	the outlet temperature of the fluid streams is not known as a priori
Option C:	the outlet temperature of the hot fluid streams is known but that of the cold fluid streams is not known as a priori
Option D:	inlet temperatures of the fluid streams are known as a priori
4.	How can the temperature drop in a plane wall with uniformly distributed heat generated be decreased?
Option A:	By reducing thermal conductivity of wall material
Option B:	By reducing wall thickness
Option C:	By reducing convection coefficient at the surface
Option D:	By reducing heat generation rate
5.	Upto the critical radius of insulation
Option A:	added insulation will increase heat loss
Option B:	added insulation will decrease heat loss
Option C:	convection heat loss will be less than conduction heat loss
Option D:	heat flux will decrease
6.	A furnace is made of a red brick wall of thickness 0.5 m and conductivity 0.7 W/mK. For the same heat loss and temperature drop, this can be replaced by a layer of diatomite earth of conductivity 0.14 W/mK and thickness
Option A:	0.05 m

Option B:	0.1 m
Option C:	0.2 m
Option D:	0.5 m
7.	A steam pipe is covered with two layers of insulating materials, with the better insulating material forming the outer part. If the two layers are interchanged, the heat conducted
Option A:	will decrease
Option B:	will increase
Option C:	will remain unaffected
Option D:	may increase or decrease depending upon the thickness of each layer
8.	Addition of fin to the surface increases the heat transfer if $(hA/kP)^{1/2}$ is
Option A:	equal to one
Option B:	greater than one
Option C:	less than one
Option D:	greater than one but less than two
9.	Consider the following statements pertaining to large heat transfer rate using fins: 1. Fins should be used on the side where the heat transfer coefficient is small. 2. Long and thick fins should be used. 3. Short and thin fins should be used. 4. Thermal conductivity of fin material should be large. Which of the above statements are correct?
Option A:	1, 2 and 3
Option B:	1, 2 and 4
Option C:	2, 3 and 4
Option D:	1, 3 and 4
10.	What does transient conduction mean?
Option A:	Heat transfer for a shot time
Option B:	Conduction when the temperature at a point varies with time
Option C:	Very little heat transfer
Option D:	Heat transfer with a very small temperature difference
11.	In which of the following cases most unsteady heat flow occurs?
Option A:	Through the walls of a furnace
Option B:	Through lagged pipes carrying steam
Option C:	Through the wall of a refrigerator
Option D:	During annealing of casting
12.	Forced convection in a liquid bath is caused by
Option A:	density difference brought about by temperature gradients
Option B:	molecular energy interaction
Option C:	Flow of electros in a random fashion
Option D:	intense stirring by an external agency
13.	In transient heat conduction, the two significant dimensionless parameters are………number and ……….. number.
Option A:	Fourier, Reynolds

Option B:	Reynolds, Prandtl
Option C:	Biot, Fourier
Option D:	Reynolds, Biot
14.	Choose the wrong statements with respect to Nusselt number and convective heat transfer coefficients:
Option A:	Nusselt number represents the ratio of the temperature gradient at the surface to an overall of reference temperature gradient
Option B:	Nusselt number represents the dimensionless slope of the temperature distribution curve at the surface
Option C:	The convective coefficients can be evaluated from a knowledge of fluid temperature distribution in the neighborhood of the surface
Option D:	For a given Nusselt number, the convective coefficient is inversely proportional to thermal conductivity of the fluid
15.	In case of laminar flow over a plate, the convective heat transfer coefficient
Option A:	decreases with increase in free stream velocity
Option B:	increases with distance
Option C:	increases if a higher viscosity fluid is used
Option D:	increases if a denser fluid is used
16.	Consider the following statements pertaining to heat transfer through fins: 1. Fins are equally effective irrespective of whether they are on the hot side or cold side of the fluid. 2. The temperature along the fin is variable and hence the rate of heat transfer varies along the element of the fin. 3. The fin may be made of materials that have a higher thermal conductivity than the material of the wall. 4. Fins must be arranged at right angles to the direction of flow of the working fluid. Of these statements:
Option A:	1 and 2 are correct
Option B:	2 and 4 are correct
Option C:	1 and 3 are correct
Option D:	2 and 3 are correct
17.	An automobile radiator is ………….. type of heat exchanger
Option A:	cross-flow
Option B:	regenerator
Option C:	counter-flow
Option D:	Recuperator
18.	Due to which of the following reasons cork is a good insulator?
Option A:	It is a porous material
Option B:	Its density is low
Option C:	It can be powdered
Option D:	It is a non-porous material
19.	Absorptivity of a body will be equal to its emissivity
Option A:	at critical temperature
Option B:	for a polished body

Option C:	at all temperatures
Option D:	when the system is under thermal equilibrium
20.	In a counter flow heat exchanger, the product of specific heat and mass flow rate is same for the hot and cold fluids. If NTU is equal to 0.5, then the effectiveness of the heat exchanger is
Option A:	1.0
Option B:	0.5
Option C:	0.33
Option D:	0.2

Q2.	**Solve any Four out of Six. (5 marks each)**
A	State Basic laws of Conduction, Convection and Radiation. Write mathematical equation of these laws.
B	Show that the temperature distribution in a slab or plane wall is a linear function of its thickness.
C	A longitudinal fin of rectangular profile is exposed to surroundings with a temperature of 65 °C and a heat transfer coefficient of 44 W/m²k. The temperature of the fin base is 100 °C. The fin is made up of steel with thermal conductivity 30 W/mK and is 10 cm long, 1 cm thick and 1 m wide. Using insulated end determine the fin efficiency.
D	Show by dimensional analysis for free convection, Nu=ϕ(Pr×Gr).
E	Define shape factor. Explain its properties.
F	Derive an expression for LMTD in case of counter flow heat exchanger.

Q3.	**Solve any Two Questions out of Three. (10 marks each)**
A	A counter-flow tubular oil cooler is to be designed to cool 1500 kg/h of oil from temperature 90 °C to 30°C by means of water entering the cooler at 20°C and leaving the cooler at 50 °C. Calculate the amount of water flow rate required and the heat transfer area. Take specific heat of oil as 3 kJ/kgK and overall heat transfer coefficient equal to 1200 W/m²K.
B	A body having area 1000 cm² has an effective temperature of 900 K. Find (i) the total rate of energy emission, (ii) the intensity of normal radiation, (iii) intensity of radiation along a direction at 60 °C to the normal and (iv) the wavelength of maximum monochromatic emissive power.
C	Find the heat transfer from 60 W incandescent bulb at 100°C to ambient air at 20°C. Assume the bulb as a sphere of 50 mm diameter. Also find the percentage of power lost by convection. The correlation is given by: Nu = 0.6 (Gr×Pr)$^{1/4}$ Take the following properties of the fluid: k = 0.002964 W/mK; υ = 20.02 × 10^{-6} m²/s &Pr = 0.694

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

Program: Mechanical Engineering
Curriculum Scheme: Rev 2016
Examination: TE Semester V
Course Code: MEC504 and Course Name: Dynamics 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 TWO marks EACH.
1.	In a vibrating system, at _____, the potential energy is maximum.
Option A:	Extreme position
Option B:	Mean position
Option C:	All positions
Option D:	Not any position
2.	In the case of simple harmonic motion, the phase difference between displacement and velocity is _____.
Option A:	0 degree
Option B:	90 degree
Option C:	180 degree
Option D:	360 degree
3.	The square of the natural frequency of oscillation of a simple pendulum with string length L is _____.
Option A:	g/L
Option B:	$2g/L$
Option C:	$g/2L$
Option D:	$2L/g$
4.	In the case of underdamped response, the roots of the characteristic equation are _____.
Option A:	Real and distinct
Option B:	Equal
Option C:	Imaginary
Option D:	Zero
5.	In the case of overdamped response, the roots of the characteristic equation are _____.
Option A:	Real and distinct
Option B:	Equal
Option C:	Imaginary
Option D:	Zero
6.	A system with _____ will undergo transient vibrations.

Option A:	Mass and spring
Option B:	Mass, spring, and damper
Option C:	Mass and damper
Option D:	Spring and damper
7.	In a Hartnell governor, if a spring of greater stiffness is used, then the governor will be_____ governor.
Option A:	Less sensitive
Option B:	More sensitive
Option C:	Unaffected of sensitivity
Option D:	Isochronous
8.	When the speed of the engine fluctuates continuously above and below the mean speed, the governor is said to be_____ governor.
Option A:	Stable
Option B:	Unstable
Option C:	Isochronous
Option D:	Hunting
9.	For isochronous spring controlled governor, the controlling force_____ with increase in radius of rotation.
Option A:	Increases
Option B:	Decreases
Option C:	Remains constant
Option D:	Behaves in unpredictable way
10.	A Hartnell governor has its controlling force F= b + a r , where r is radius of rotation and a and b are constants, the governor become isochronous when
Option A:	b=0 and a is positive
Option B:	b is positive and a=0
Option C:	b is positive and a is positive
Option D:	b is negative and a is positive
11.	A pair of action and reaction forces acting on a body are known as
Option A:	Applied force
Option B:	Constraint force
Option C:	Accelerating force
Option D:	Inertia forces
12.	In static equilibrium, the vector sum of all the forces acting on the body and all the moments about _____ point is zero
Option A:	A fixed
Option B:	A particular
Option C:	Any arbitrary
Option D:	A permanent
13.	Calculate the thrust in connecting rod, if piston effort is 200 kN and crank makes an angle of 45° from TDC. Assume obliquity ratio = 3.5
Option A:	900.80 kN
Option B:	204.20 kN
Option C:	195.87 kN

Option D:	970.02 kN
14.	A connecting rod has periodic time of 1.5 sec/cycle for one oscillation. Calculate radius of gyration, when centre of gravity is at a distance of 500 mm from the small end.
Option A:	0.1325 m
Option B:	0.1719 m
Option C:	0.0295 m
Option D:	0.555 m
15.	Formula for calculating the Steady State Amplitude of the mass in case of reciprocating mass approximates to that for the case of rotating unbalanced mass, when the following condition between the crank length (r) and the connecting rod length (l) is assumed:
Option A:	$r = l$
Option B:	$r \gg l$
Option C:	$r \ll l$
Option D:	$r + l = 1$
16.	In case of forced vibrations, the closed form of rotating vector polygon of forces indicates that the system is in:
Option A:	Static equilibrium
Option B:	Dynamic equilibrium
Option C:	Static disequilibrium
Option D:	Dynamic disequilibrium
17.	Presence of Resultant Vector in Force Polygon indicates that the system is____.
Option A:	Statically balanced
Option B:	Statically unbalanced
Option C:	Dynamically balanced
Option D:	Dynamically unbalanced
18.	The unbalanced force due to revolving masses
Option A:	Varies in magnitude but constant in direction
Option B:	Varies in direction but constant in magnitude
Option C:	Varies in magnitude and direction both
Option D:	Constant in magnitude and direction both
19.	Let the disturbing mass be 50 kg, with radius of rotation = 0.1 m. If one of the balancing masses is 30 kg at a radius of rotation 0.1 m, then find the other balancing mass situated at a radial distance of 0.2 m.
Option A:	80 kg
Option B:	40 kg
Option C:	20 kg
Option D:	10 kg
20.	In the balancing of single-cylinder engine, the rotating unbalance is
Option A:	Completely made zero and so also the reciprocating unbalance
Option B:	Completely made zero and the reciprocating unbalance is partially reduced
Option C:	Partially reduced and the reciprocating unbalance is completely made zero
Option D:	Partially reduced and so also the reciprocating unbalance

Q2	**Solve any Two Questions out of Three.** (10 marks each)
A	A Porter governor has equal arms 200 mm long pivoted on the axis of rotation. The mass of each ball is 3 kg and the mass on the sleeve is 15 kg. The ball path is 120 mm when the governor begins to lift and 160 mm at the maximum speed. Determine the range of speed. If the friction at the sleeve is equivalent to a force of 10 N, find the coefficient of insensitiveness.
B	A horizontal steam engine running at 120 r.p.m. has a bore of 250 mm and a stroke of 400 mm. The connecting rod is 0.6 m and mass of the reciprocating parts is 60 kg. When the crank has turned through an angle of 45° from the inner dead centre, the steam pressure on the cover end side is 550 kN/sq.m and that on the crank end side is 70 kN/sq.m. Considering the diameter of the piston rod equal to 50 mm, determine: **1.** turning moment on the crank shaft, **2.** thrust on the bearings, and **3.** acceleration of the flywheel, if the power of the engine is 20 kW, mass of the flywheel 60 kg and radius of gyration 0.6 m.
C	A cylinder of mass "m" and radius "r" rolls without slipping on a concave cylindrical surface of radius "R". Find natural frequency of vibration.

Q3	**Solve any Two Questions out of Three.** 10 marks each
A	The time of free vibration of a mass hung from the end of a helical spring is 0.8 seconds. When the mass is stationary, the upper end is made to move upwards with the displacement y in centimeters is given by, *y= 1.8 sin 2πt,* where *t* is the time in seconds measured from the beginning of the motion. Neglecting the mass of the spring and any damping effect, determine the vertical distance through which the mass is moved in first 0.3 seconds.
B	A commercial type vibration pick-up has a natural frequency of 5.75 Hz, and a damping factor of 0.65. What is lowest frequency beyond which the amplitude can be measured within (i) one percent error, (ii) two percent error.
C	A four-cylinder vertical engine has cranks 150 mm long. The planes of rotation of the first, second, and fourth cranks are 400 mm, 200 mm, and 200 mm respectively from the third crank and their reciprocating masses are 50 kg, 60 kg, and 50 kg respectively. Find the mass of the reciprocating parts for the third cylinder and the relative angular positions of the cranks in order that the engine may be in complete primary balance.

University of Mumbai
Examination 2021 under cluster 9 (FAMT, Ratnagiri)
Examinations Commencing from 15th June 2021 to 26th June 2021
Program: BE Mechanical Engineering
Curriculum Scheme: Rev2016
Examination: TE Semester V
Course Code: MEDLO5011 and Course Name: Press Tool Design

Time: 2 hour   Max. Marks: 80

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Q1.(40 Marks)	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	In Cutting operations, the workpiece is stressed beyond its -------------
Option A:	Tensile Pressure
Option B:	Viscosity
Option C:	Ultimate Strength
Option D:	Young's Modulus
2.	The workpiece obtained after one or more press operations is called a ---------
Option A:	Metal Wrapping
Option B:	Metal Stamping
Option C:	Metal Shaving
Option D:	Metal Lancing
3.	------------- guiding components ensures the accurate alignment of the upper shoe with the die shoe in operations
Option A:	Guide Posts and Punch Holder
Option B:	Punch Holder and Die holder
Option C:	Bushings and Die-Blocks
Option D:	Guide posts and Bushings
4.	In blanking operation, clearance is applied on ------------- to form the desired blank.
Option A:	Punch
Option B:	Die-Opening
Option C:	Guide Post
Option D:	Die-Block
5.	The tonnage of mechanical press is determined by -----------
Option A:	Piston area * oil pressure in the cylinder
Option B:	Die-Opening * Punch holder
Option C:	Ultimate pressure * Ultimate stress
Option D:	Shear strength of the crankshaft material * the area of the crankshaft bearings
6.	The maximum force F(max) required to cut a material is given by,
Option A:	F(max) = Punch travel
Option B:	F(max) = Sheared area * Shearing strength

Option C:	F(max) = Punch travel * Clearance
Option D:	F(max) = Shearing strength * Shearing stress
7.	Find the force required to shear a 50 mm diameter hole in a 4 mm thick M.S. sheet.(Ultimate Shear strength = 400 N/mm²)
Option A:	251.327 kN
Option B:	151.423 kN
Option C:	352.534 kN
Option D:	101.555 kN
8.	To find out the back scrap in a strip layout which formula is used?
Option A:	a = h + 0.015t
Option B:	a = t - 0.015h
Option C:	a = t + 0.015h
Option D:	a = 0.015h - t
9.	_____ is used for the purpose of correcting the feed error immediately before carrying the cutting.
Option A:	Stripper
Option B:	Stock stop
Option C:	Knockout
Option D:	Pilot
10.	Guiding components such as guide post and bushes are made up of ----------
Option A:	Tin
Option B:	Aluminum
Option C:	Cast iron
Option D:	Mild Steel
11.	The 'spring back' effect in press working is
Option A:	partial recovery of the sheet metal
Option B:	release of stored energy in the sheet metal
Option C:	Elastic recovery of the sheet metal after removal of the load.
Option D:	regaining the original shape of the sheet metal
12.	Which formula is used to calculate blank size in the drawing process, where thin gauge stock is used and the shell has a sharp inside corner? (Condition : d/r ≥ 20, r is radius of bottom corner) D = Flat Blank Diameter d = Finished Shell diameter h = Height of the finished shell
Option A:	D = √(d*2 + 4dh)
Option B:	D = √(d*2 + 4h)
Option C:	d = √(D*2 + 4Dh)
Option D:	h = √(D*2 + 4d*D)
13.	Select the correct formula for calculating Bend allowance. B = Bend allowance along neutral axis, cm α = Bend angle in degree

	r = Inside radius of bend, cm
	k = Distance of neutral axis from inside surface of the bend
Option A:	B = (α/360) * (π (2r + k))
Option B:	B = (α/360) * (2π (r + k))
Option C:	B = (α/360) * (π (r + k))
Option D:	B = (α/360) * (2π (r + 2k))
14.	During the bending operation, the outer surface of the material is in _____ and the inside surface is in _____
Option A:	compression and tension
Option B:	tension and compression
Option C:	frictional and squeezing
Option D:	squeezing and frictional
15.	The process of making cup-shaped parts from a flat sheet metal blank is known as
Option A:	Angle Drawing
Option B:	Length Drawing
Option C:	Wire Drawing
Option D:	Deep Drawing
16.	In a compound die
Option A:	Two or more operations are performed simultaneously at the single stroke of the punch
Option B:	Two or more cutting operations are performed at one station of the press in every stroke of the punch
Option C:	Both cutting and non-cutting operations are performed at one station of the press in every stroke of the punch
Option D:	Only one operation is performed at each stroke of the punch
17.	In which type of die both cutting and non-cutting operations are performed at one station of the press in every stroke of the punch
Option A:	Compound die
Option B:	Embossing die
Option C:	Combination die
Option D:	Coining die
18.	---------------- die produces a raised readable mark on the flat workpiece.
Option A:	Embossing
Option B:	Compound
Option C:	Combination
Option D:	Progressive
19.	Hydraulic press is most suitable for
Option A:	Deep-drawing
Option B:	Blanking
Option C:	Piercing
Option D:	Trimming
20.	The greatest source of accidents in automation press shop is
Option A:	Hand driven machine

Option B:	Tool with flat edge
Option C:	Power driven machine
Option D:	Tool with sharp edge

Q2. (20 Marks)	**Attempt any Four out of Six Questions.** **(5 marks each)**
A	Classify press working operations and explain notching operation with a neat diagram
B	Differentiate between blanking operation and piercing operation .
C	What is spring back in bending operation and explain anyone method to compensate the spring back.
D	Explain working and construction of embossing die.
E	Differentiate between compound die and combination die
F	Write safety precautions taken in the press shop.

Q3. (20 Marks)	**Solve any Two out of Three Questions.** **(10 marks each)**
A	Find the total pressure, dimensions of tools to produce a washer of 5.5 cm outer diameter with 2.5 cm diameter hole, from a material of 4 mm thickness, having shear strength of 350 N/mm^2. (Assume Clearance 10% of stock thickness)
B	A symmetrical-cup workpiece with a height of 50 mm and a diameter of 50 mm, the inner corner radius is 1.6 mm. The workpiece material is cold-rolled steel of 0.8 mm thick. Make necessary calculations for designing the drawing die for this part.
C	Find the centre of pressure for the following blanks.