University of Mumbai

Examination 2020 under cluster 9 (FAMT)

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

Program: **Mechanical Engineering**

Curriculum Scheme: Rev2012

Examination: BE Semester VII

Course Code: MEC701 and Course Name: Machine Design II

Time: 2 hour Max. Marks: 80

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Note: 1. Use of PSG Data Book, preferably in Hard Copy format, is allowed by the students.
2. Clearly mention the page number, table number, etc. for the data used from the Data Book in your answer sheet (for Question No 2 and 3).
3. Clearly write the assumptions, if made any, in your answer sheet.

Q.1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	A spur gear with pitch circle diameter D has T number of teeth. The module is given as _____.
Option A:	m= D/T
Option B:	m= T/D
Option C:	m= D/(2T)
Option D:	m = (2T)/D
2.	The Lewis equation for beam strength gives the maximum value of the _____.
Option A:	Compressive force that the tooth can transmit power without failure
Option B:	Tensile force that the tooth can transmit power without buckling failure
Option C:	Tangential force that the tooth can transmit power without bending failure
Option D:	Shear force that the tooth can transmit power without failure
3.	Calculate the pitch circle diameter of helical gear, if normal module is 4 mm, the number of teeth is 20 and helix angle 18^{o}.
Option A:	89.7835 mm
Option B:	80 mm
Option C:	96.7619 mm
Option D:	84.1169 mm
4.	The helix angle on worm gear is equal to _____.
Option A:	Shaft angle - Lead angle
Option B:	Lead angle
Option C:	Shaft angle + Lead angle
Option D:	Helix angle on the worm
5.	If a velocity ratio of 60:1 is to be achieved in a single stage, which of the following gear boxes is most suitable?
Option A:	worm and worm wheel gear box
Option B:	spur gear box
Option C:	helical gear box
Option D:	bevel gear box

6.	For a shaft with diameter of 80 mm, which of the following bearings can be selected?
Option A:	SKF 6018
Option B:	SKF 6020
Option C:	SKF 6016
Option D:	SKF 6022
7.	What is life of bearing in millionrevolutions (mr), if the shaft is rotating at 1400 rpm and life in hours is 10000hours?
Option A:	8400
Option B:	840
Option C:	84
Option D:	8040
8.	If the hole size is 120^{+63}_{+00} and the shaft size is 120^{-85}_{-148} then minimum clearance is _____.
Option A:	0.148 mm
Option B:	0.211 mm
Option C:	0.085 mm
Option D:	0.189 mm
9.	In case of a sliding contact bearing if L/D < 1 such a bearing is called as _____.
Option A:	Long bearing
Option B:	Short bearing
Option C:	Square bearing
Option D:	Pivot bearing
10.	If L/D ratio is one, diameter of shaft is 120 mm, radial load is 20 kN then bearing pressure generated is _____.
Option A:	1.5 N/mm^2
Option B:	1.8833 N/mm^2
Option C:	1.3888 N/mm^2
Option D:	2.5676 N/mm^2
11.	In case of a cam and follower mechanism if base circle diameter is 80 mm and prime circle diameter is 100 mm then diameter of roller of follower is _____.
Option A:	10 mm
Option B:	20 mm
Option C:	30 mm
Option D:	40 mm
12.	The total force acting on the cam surface is the summation of _____.
Option A:	Force due to self-weight of follower and external force
Option B:	Force due to self-weight of follower and inertia force
Option C:	Force due to self-weight of follower and external force and inertia force
Option D:	Force due to self-weight of follower and external force and inertia force and spring force by strainer

13.	In a belt drive, tension on the tight side is maintained at 4500 N whereas on the slack side it is 3200 N. If the power transmission capacity is 2080 W then tangential velocity of drive is _____.
Option A:	1.6 m/sec
Option B:	2 m/sec
Option C:	1.8 m/sec
Option D:	2.2 m/sec
14.	Which of the following items is not the part of chain drive?
Option A:	Roller
Option B:	Bush
Option C:	pin
Option D:	Bolt
15.	In case of chain, with the increase in number of teeth, the chordal speed variation _____.
Option A:	Increased
Option B:	Remains same
Option C:	Decreased
Option D:	Becomes zero
16.	Let T_1 and T_2 be the tensions in tight and slack side of belt drive, V is the peripheral velocity and ω_1 and ω_2 be the angular velocities of the pullies then power transmission capacity is equal to _____.
Option A:	$(T1-T2)\omega_1$
Option B:	$(T1-T2)\omega_2$
Option C:	(T1-T2)V
Option D:	(T1-T2)/V
17.	The chain drive is called as _____.
Option A:	Positive drive
Option B:	Negative drive
Option C:	Friction drive
Option D:	Zero Friction drive
18.	Which of the following shafts is used in clutches?
Option A:	Regular shaft with key
Option B:	Splined shaft
Option C:	hollow shaft
Option D:	shaft with taper end
19.	Which one of the following sentences is FALSE in case of a single plate clutches?
Option A:	They are bigger in size and shape
Option B:	They create less heat while in operation
Option C:	They are used in larger vehicles like trucks
Option D:	They are always provided with oil filled lubrication

20.	If there are 7 clutch plates in a multi-plate clutch, what is the number of pair of contact surfaces?
Option A:	5
Option B:	4
Option C:	6
Option D:	8

Q.2.	**Solve any Four. [5 marks each]**
A	Explain various types of gear tooth failures.
B	Explain significance of the following factors in the design of a sliding contact bearing: i. Sommerfeld number, ii. Flow variable and iii. coefficient of friction
C	7.5 kW power is transmitted by multiplate clutch at 960 rpm. The plates run in oil and coefficient of friction is 0.07 and axial intensity of pressure is not to exceed 0.15 N/mm^2. Due to space limitations external radius is limited to 140 mm. Determine the number of plates required.
D	With neat sketch, explain the terminology of Cam and follower mechanism.
E	Write a short note on materials used for sliding contact bearings.
F	Explain concept of chordal action of chain with neat sketch.

Q3.	**Solve any Two. [Three 10 marks each]**
A	A pair of helical gear is used to transmit 10 kWpower from an electric motor rated at 960 rpm. It is coupled to pinion shaft which is rotated at 250 rpm. Take helix angle as 17^o. i) Select suitable material and determine module. ii) Check gear pair for Lewis dynamic load.
B	Select Deep Groove Ball Bearing for the shaft diameter of 60 mm which rotates at 1440 rpm with radial load of 2500 N and axial load of 1200 N. Expected life of bearing is 25000 Hours. Assume service factor as 1.2.
C	Design V belt drive for following specifications: Power to be transmitted is 6.5 kW, Input speed is 750 rpm, Approximate output speed is 250 rpm, Application - air blower with continuous working, Required life is 2500 Hours.

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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: BE | Semester VII
Course Code: MEC701 | Course Name: MACHINE DESIGN-II
Time: 2 hour | Max. Marks: 80

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Q1.	**Choose the correct option for following questions.** **All the Questions are compulsory and carry equal marks**
1.	Difference between the size diameter of ball bearing designated as 305 and 405 is _____
Option A:	5 mm
Option B:	10 mm
Option C:	100 mm
Option D:	Zero mm
2.	Bearing characteristics number is _____ where Z= absolute viscosity of the lubricant, in kg-/m-s, N=speed of the journal in r.p.m., p= Bearing pressure in N/mm^2
Option A:	ZN/p
Option B:	Zp/N
Option C:	ZN/p^2
Option D:	Zp/N^2
3.	A pair of straight bevel gears consists of 16 pinion teeth and 42 gear teeth. What are the pitch cone angles of pinion and gear?
Option A:	67.60 degree & 22.39 degree
Option B:	52.14 degree & 37.86 degree
Option C:	20.85 degree & 69.14 degree
Option D:	35.12 degree & 54.88 degree
4.	The size of a cam depends upon _____
Option A:	base circle
Option B:	pitch circle
Option C:	prime circle
Option D:	pitch curve
5.	Brake efficiency is a term which denotes
Option A:	Efficiency of the braking system as a whole
Option B:	Efficiency of the braking linings
Option C:	The deceleration as percentage of gravity
Option D:	Efficiency of the operating linkage
6.	The ball bearings are usually made from _____
Option A:	low carbon steel
Option B:	medium carbon steel
Option C:	high carbon steel

Option D:	high speed steel
7.	The cam follower generally used in automobile engines is _____
Option A:	knife edge follower
Option B:	flat faced follower
Option C:	spherical faced follower
Option D:	roller follower
8.	In hydrostatic bearings _____
Option A:	The oil film pressure is generated only by the rotation of the journal
Option B:	The oil film is maintained by supplying oil under pressure
Option C:	Do not require external supply of lubricant
Option D:	Grease is used for lubrication
9.	The optimum value of the width of the block (W)in the block brake is given by _____
Option A:	W < 0.1 Drum diameter
Option B:	0.1 Drum diameter <0.25 Drum diameter
Option C:	0.25 Drum diameter < W < 0.5 Drum diameter
Option D:	0. 5 Drum diameter < W < 0.75 Drum diameter
10.	The condition to avoid the undercutting in the cam and roller follower is _____
Option A:	The roller radius should be more than the minimum radius of the curvature of the pitch curve.
Option B:	The minimum radius of the curvature of the cam profile should be more than roller radius.
Option C:	The roller radius should be more than the minimum radius of the curvature of the cam profile.
Option D:	The minimum radius of the curvature of the pitch curve should be more than roller radius.
11.	In case of a multiple disc clutch, if n1 are the number of discs on the driving shaft and n2 are the number of the discs on the driven shaft, then the number of pairs of contact surfaces will be _____
Option A:	n1 + n2
Option B:	n1 + n2 – 1
Option C:	n1 + n2 + 1
Option D:	n1 - n2
12.	A pair of spur gears with module 5mm and a centre distance of 450mm is used for a speed reduction of 5:1. The number of teeth on pinion is _____
Option A:	20
Option B:	30
Option C:	45
Option D:	50
13.	Crowning of a flat belt pulley is done _____.
Option A:	To Prevent the slipping of a belt
Option B:	To increase the tension of a belt
Option C:	To increase the angle of contact

Option D:	To decrease the slip
14.	Find Length & Diameter of a full hydrodynamic bearing if it is subjected to a load of 20 KN & speed 1500 rpm, application is machine tool. Assume L/D=0.5
Option A:	(69,138)mm
Option B:	(138,69)mm
Option C:	(50,100)mm
Option D:	(96,192)mm
15.	Antifriction Bearing are _____
Option A:	Oil lubricated bearings
Option B:	Bush bearings
Option C:	Ball and roller bearings
Option D:	Boundary lubricated bearings
16.	If 'b' denotes face width and R denotes cone distance, the bevel factor is written as _____
Option A:	1- b/R
Option B:	1-2bR
Option C:	b/(2R)
Option D:	b/R
17.	The difference in the maximum and minimum speeds of the flywheel during a cycle is called as_____.
Option A:	Fluctuation of speed
Option B:	Maximum fluctuation of speed
Option C:	Coefficient of fluctuation of speed
Option D:	Fluctuation of energy
18.	In case of V belt the ratio of tension in tight side to the tension in slack side is given by_____.
Option A:	$e^{(\mu\theta/\beta)}$
Option B:	$e^{(\mu\theta/sin\beta)}$
Option C:	$e^{(\mu\theta/cos\beta)}$
Option D:	$e^{(\mu\beta/\theta)}$
19.	The virtual no. of teeth on the helical gear with 20 teeth and 20 degree pressure angle is _____
Option A:	21.28
Option B:	22.64
Option C:	24.10
Option D:	170.97
20.	The heat generated in brake depends upon _____
Option A:	pv
Option B:	p/v
Option C:	pv^2
Option D:	$pv^2/2$

Q2. (20 Marks)	**Solve any Two questions out of three questions** **10 marks each** **i) Assume suitable data if necessary,** **ii) Use of Design Data book is permitted**
A	A pair of bevel gear is required to transmit 15 kW power from a pinion shaft rotating at 800 rpm with reduction ratio of approximately 3.2. The shaft angle is 85 degree and the drive is subjected to moderate shocks and rotates for 12 hours/day. i) Determine pitch cone angle of the pinion and gear. ii) Selecting suitable material and design stresses, determine module and face width to satisfy strength and wear criteria.
B	Chain drive is used to transmit 5 kW power from an electric motor running at 1000 rpm to a machine at 500 rpm. The service conditions involve light shocks. Select a standard roller chain.
C	A pair of helical gear is used to transmit power from an electric motor rated at 30 KW, 960 rpm. The motor is coupled to the pinion shaft and reduction ratio is approximately 4.2. The helix angle is 17^0. The gears are with 20^0 pressure angle full depth involute profile. i) Select suitable material and design stresses. ii) Determine module and face width to satisfy strength and wear criteria.

Q3. (20 Marks)	**Solve any Two questions out of three questions** **10 marks each** **i) Assume suitable data if necessary,** **ii) Use of Design Data book is permitted**
A	Determine the maximum velocity and acceleration from the motion analysis of the rotary disc cam with central translatery roller follower. Forward stroke 25 mm in 70 degree of cam rotation with SHM, dwell of 50 degree of cam rotation and return stroke of 25 mm in 100 degree of cam rotation in SHM and remaining dwell. Mass of follower is 1 Kg. Cam speed is 500 rpm. Maximum pressure angle during forward stroke and return stroke is 25 degree. The external force during forward stroke is 300N and during return stroke is 50N.
B	A deep groove ball bearing is subjected to a radial load of 5 kN and an axial load of 2.5 kN when operate at 500 rpm. Select suitable standard bearing if it is required to have a life of 20000 hrs with a probability of survival 93%.
C	An electric motor is coupled to a machine through multiple clutch operation under dry condition. The clutch is required to transmit 8 kW at 740 rpm. The frequency of operation is 32 in 8 hours. Due to space constraint overall size of clutch is limited to 250 mm in radial direction. Design the following components. i) Input shaft ii) Output shaft iii) Friction plates

University of Mumbai

Examination 2021 under cluster 9 (Lead College: FAMT)

Examinations Commencing from 15th June 2021 to 28th June 2021

Program: Mechanical Engineering

Curriculum Scheme: Rev 2012

Examination: BE Semester VII

Course Code: MEC702and Course Name: CAD/CAM/CAE

Time: 2 hour Max. Marks: 80

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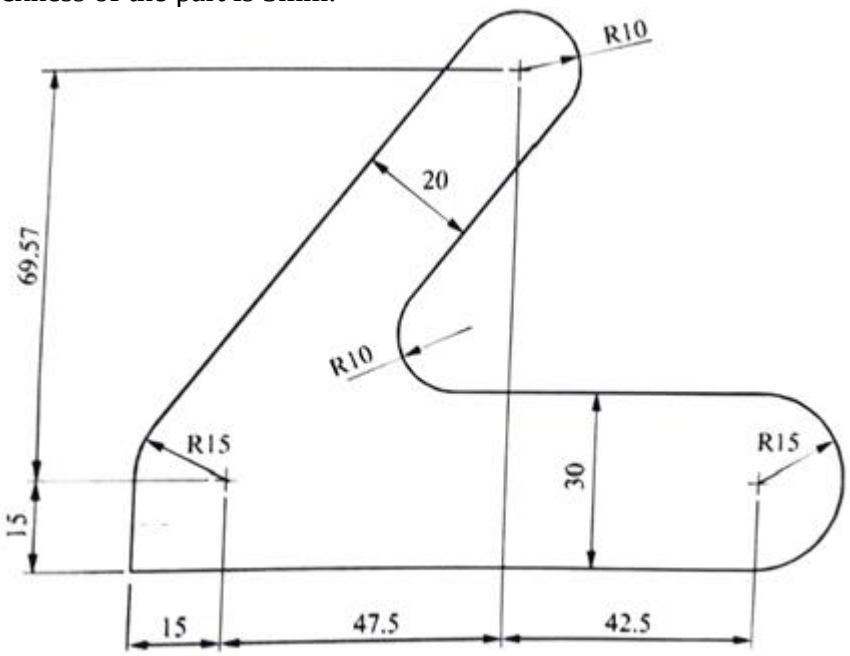
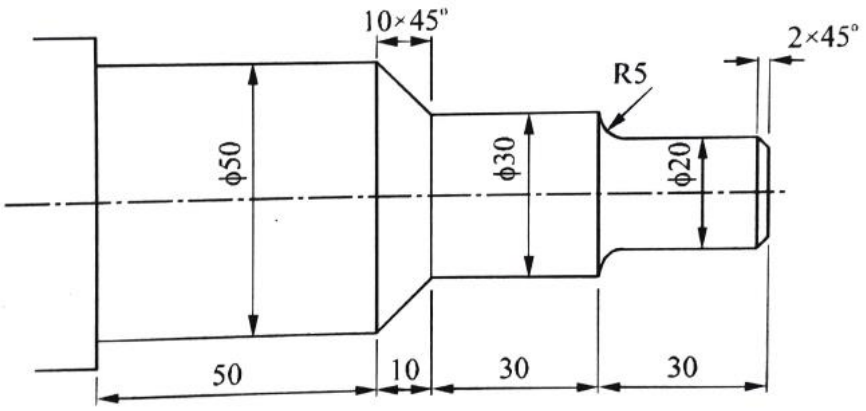
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The model which is created by using basic entities of two dimensioning is called
Option A:	Surface model
Option B:	Wireframe model
Option C:	Solid model
Option D:	Isometric model
2.	When the curve passes through all the data points, then the curve is known as
Option A:	Approximate Curve
Option B:	Pitch curve
Option C:	Data Curve
Option D:	Interpolation Curve
3.	The degree of the curve is independent of the number of control points in_____
Option A:	Hermite Curve
Option B:	Bezier curve
Option C:	B-Spline curve
Option D:	Hyperbola
4.	B-rep and C-rep are methods of_____
Option A:	Solid Modeling
Option B:	Surface Modeling
Option C:	Wireframe Modeling
Option D:	2D Modeling
5.	For reducing the size of an object, we set both scale factors as
Option A:	Less than 0
Option B:	Greater than 1
Option C:	Equals to 1
Option D:	In between 0 and 1
6.	After applying 2D shearing transformation in X-direction, unit square becomes
Option A:	Parallelogram
Option B:	Parabola
Option C:	Rectangle
Option D:	Hyperbola
7.	Translation equation $X_1=X+T_x$ $Y_1=Y+T_y$ What is another name for the

	translation pair (T_x,T_y)?
Option A:	Shift scaling
Option B:	Shift coordinates
Option C:	Translation points
Option D:	Rotate points
8.	The software that is used to provide the users with various functions to perform geometric modeling and construction is known as
Option A:	Operating software
Option B:	Graphics software
Option C:	Application software
Option D:	Programming software
9.	G95 represents,
Option A:	Incremental positioning
Option B:	Absolute positioning
Option C:	Per minute feed rate
Option D:	Per revolution feed rate
10.	A machine tool is called as a fixed zero type if,
Option A:	the origin is always predefined.
Option B:	the origin can be set by operator
Option C:	The part programming is done in absolute positioning
Option D:	The part programming is done in incremental positioning
11.	One of the following is the letter is used for representing speed, in G-M code part programming
Option A:	T
Option B:	S
Option C:	F
Option D:	M
12.	One of the following is not a type of statements in APT
Option A:	Geometry
Option B:	Motion
Option C:	Friction
Option D:	Auxiliary
13.	One of the following is not a CAE tool
Option A:	2D sketching in AUTOCAD
Option B:	Hypermesh
Option C:	Ansys
Option D:	Ansys Fluent
14.	CIM fulfill the goal of :
Option A:	Delivering high variety of products at low cost and short production cycles
Option B:	Manufacturing customized products at high cost and short production cycles
Option C:	Manufacturing customized products at low cost and short production cycles
Option D:	Delivering high quality of product irrespective of cost and production cycle time

15.	Just In Time technology attempts to:
Option A:	Avoid all costs that do not add any value to product
Option B:	Manufacture highest quality product
Option C:	Manufacture products at lowest cost
Option D:	Manufacture low quality product
16.	For any factory using CIM technology, which of the following is the center of control?
Option A:	Computer
Option B:	Robot
Option C:	AGV
Option D:	Automated assembly lines
17.	Rapid prototyping is used in
Option A:	Mass production
Option B:	Batch production
Option C:	Continuous production
Option D:	Customized and intricate products
18.	Stereo-lithography is based on
Option A:	Friction
Option B:	Fusion
Option C:	Photo-polymerization
Option D:	Extrusion
19.	Layers of adhesive coated materials is used in
Option A:	Shaping
Option B:	Milling
Option C:	MSL
Option D:	LOM
20.	Fused Deposition Modeling is
Option A:	Indirect tooling RP technique
Option B:	Solid based RP technique
Option C:	Liquid based RP technique
Option D:	Powder based RP technique

Q2	**Solve any Four out of Six. (5 marks each.)**
A	Illustrate the steps in FEA
B	Explain the challenges in CIM implementation.
C	Explain the characteristics of Bezier Curve.
D	Discuss additive manufacturing's applications in various fields.
E	Explain advantages, limitations and functions of CNC technology.
F	Explain the steps for 2D Mirror transformation.

Q3	**Solve any Two Questions out of Three. (10 marks each)**
A	Write a computer assisted part program using APT, to machine an outline of the part as shown in figure below. Assume appropriate data, if required. Thickness of the part is 5mm. 
B	A triangle PQR has its vertices at P(0,0) Q(4,0) and R(2,3). It is to be translated by 4 units in X direction and 2 units in Y direction, then it is to be rotated in anticlockwise direction about the new position of point R through 90 degree. Find the new position of the triangle P"Q"R".
C	Write a manual part program using G-M codes, to create the part, as shown in figure below. Work piece material is mild steel. Calculatespeed and feed. Assume any other appropriate data, if required and mention the same. Raw Material Size ϕ50mm by 125mm. 

University of Mumbai

Examination 2020 under cluster 9 (FAMT)

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

Program: **Mechanical Engineering**

Curriculum Scheme: **2016**

Examination: BE Semester VII

Course Code: **MEC702** and Course Name: **CAD/CAM/CAE**

Time: 2-hour Max. Marks: 80

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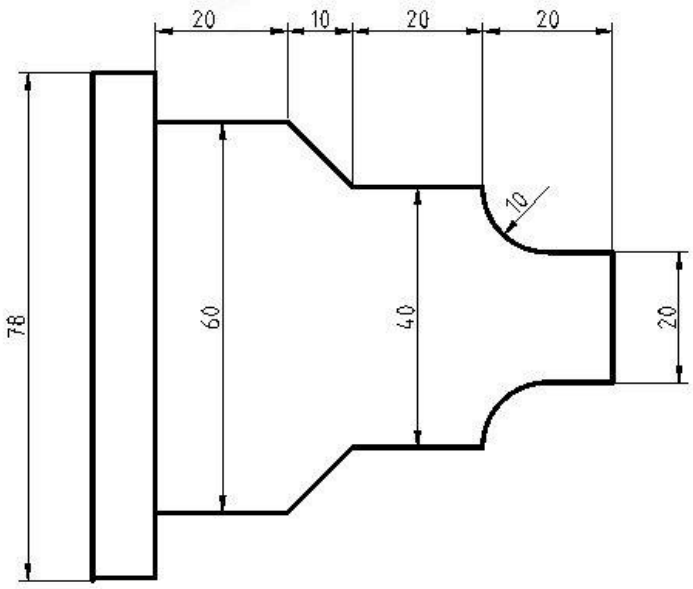
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	G codes are
Option A:	Sequence numbers
Option B:	Preparatory Codes
Option C:	Miscellaneous Codes
Option D:	Given Codes
2.	Plane stress analysis is
Option A:	1D analysis
Option B:	2D analysis
Option C:	3D analysis
Option D:	2D or 3D analysis
3.	By default, the controller interprets the code in
Option A:	Metric and absolute mode
Option B:	Metric and incremental mode
Option C:	Inch and absolute mode
Option D:	Inch and incremental mode
4.	Which of the following code is NOT a canned cycle for Milling
Option A:	G71
Option B:	G81
Option C:	G82
Option D:	G84
5.	_____ systems are complex rule-based systems that help in solving problems that are solved by experts.
Option A:	Drafting based
Option B:	Coordinate based
Option C:	Knowledge based
Option D:	Projection based
6.	The _____ transformation distorts an object by scaling one coordinate using the other.
Option A:	mirror
Option B:	translation
Option C:	shear
Option D:	rotation

7.	A scaling constant > 1, represents
Option A:	expansion
Option B:	compression
Option C:	unchanged values
Option D:	reflection
8.	The model which is created by using basic entities of two dimensioning is called
Option A:	Solid model
Option B:	Surface model
Option C:	Isometric model
Option D:	Wire frame model
9.	Which of the following is an analytical entity?
Option A:	Hyperbola
Option B:	Bezier curve
Option C:	B-spline curve
Option D:	Cubic spline curve
10.	One of the benefits of CIM is:
Option A:	Increase in machine utilization
Option B:	Increase in inventory
Option C:	Increase in cost
Option D:	No customer satisfaction
11.	Which of the following is the correct data structure for solid models?
Option A:	solid part → faces → edges → vertices
Option B:	solid part → edges → faces → vertices
Option C:	vertices → edges → faces → solid parts
Option D:	vertices → faces → edges → solid parts
12.	Choose the correct sequence to generate prototype.
Option A:	3D CAD data - CAD solid model - STL file - RP prototype
Option B:	CAD solid model - 3D CAD data - RP prototype - STL file
Option C:	STL file - 3D CAD data - CAD solid model - RP prototype
Option D:	3D CAD data - STL file - CAD solid model - RP prototype
13.	Which one of the following is purely technological aspects of CIM?
Option A:	Government policy
Option B:	Increase in productivity
Option C:	Increase in profit
Option D:	Trade union resistance
14.	STL file format is represented by interaction of _____.
Option A:	lines and hexagons
Option B:	lines and rectangles
Option C:	lines and triangles
Option D:	lines and circles
15.	CIM is most useful where a high level_____ is used in the company or facility,

	such as CAD/CAM system.
Option A:	Computer coding
Option B:	Information and Communication Technology
Option C:	Prediction
Option D:	Analysis
16.	Which of the following is a process of redesigning an existing product to improve its functions, add quality to increase the useful life?
Option A:	Reverse engineering
Option B:	Value engineering
Option C:	Rapid prototyping
Option D:	Computer aided design
17.	In CIM, the entire range of product development and manufacturing activities with all the functions are carried out with the help of dedicated Software packages in which the data required for various functions are;
Option A:	Used to transfer imprecisely to various software
Option B:	Passed from one application software to another in a warped manner
Option C:	Passed from one application software to another in a seamless manner
Option D:	Used to transfer cracked details of the various software
18.	Rapid Tooling is a _____ process
Option A:	Better, Slower and cost effective
Option B:	Faster, better and less expensive
Option C:	Faster, better and costly
Option D:	Better and complex
19.	Which of the following is used as base material in SLA process?
Option A:	Thermoplastics, Metal powders
Option B:	Titanium alloy
Option C:	Photopolymer
Option D:	Ceramic
20.	Both 3D Printer (3DP) and Selective Laser Sintering (SLS) method uses powder as the starting material. However, what is the difference between these two methods.
Option A:	3DP uses a binding agent; SLS uses a laser
Option B:	3DP uses a laser; SLS uses a binding agent.
Option C:	3DP uses a filament extruder; SLS uses a binding agent
Option D:	3DP uses a filament extruder; SLS uses a laser

Q2	**Answer any Four out of Six (5 marks each)**
A	Explain Cutter radius Compensation with example.
B	Explain Parametric Optimization.
C	Explain Procedure of creating scripts for API.
D	Explain Feature based modeling technique used for 3D modeling.
E	Explain the applications of RP in Medical field
F	Illustrate the role of CAD/CAM in CIM

Q3	**Solve any Two Questions out of Three (10 marks each)**
A	Write a manual part program in G and M codes to generate a part as shown in figure 1. Size of raw material is 85 mm in diameter and 100mm in length. Assume suitable data.  *Figure 1.*
B	Explain Cohen-Sutherland Clipping Algorithm with example.
C	Find the Transformation matrix aligns a given vector V = aI+bJ+cK in three-dimensional space with positive Z-axis.

University of Mumbai

Examination 2020 under cluster 9 (FAMT)

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

Program: **MECHANICAL ENGINEERING**

Curriculum Scheme: Rev2012

Examination: BE Semester VII

Course Code: MEC703 and Course Name: MECHANICAL UILITY SYSTEMS

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.	Which of the following is application of reciprocating air compressor?
Option A:	Gas turbine
Option B:	Supercharging of I C Engines
Option C:	Pneumatic Tools
Option D:	Oil Refineries
2.	If work input to the compressor to be minimum, the compression process should be…..
Option A:	Isentropic
Option B:	Isothermal
Option C:	Polytropic
Option D:	Isochoric
3.	Estimate the intermediate pressure of compressor to compress 1 kg of air from 1 bar and 27 C to 16 bar in 2 stages.
Option A:	16 bar
Option B:	4 bar
Option C:	8 bar
Option D:	2 bar
4.	The ratio of actual whirl velocity to the ideal whirl velocity in the centrifugal compressor is called as _____.
Option A:	velocity factor
Option B:	work factor
Option C:	shape factor
Option D:	slip factor
5.	In case of centrifugal compressors the phenomenon of unsteady, periodic and reversed flow is known as……
Option A:	Surging
Option B:	Stalling
Option C:	Choking
Option D:	Regeneration
6.	Reciprocating pump is a _____
Option A:	Negative displacement pump
Option B:	Positive displacement pump

Option C:	Diaphragm pump
Option D:	Emulsion pump
7.	The discharge of double acting reciprocating pump is defined as the (L= length of stroke A= cross-section area of piston N= speed of crank in rpm
Option A:	L.A.N
Option B:	2L.A.N
Option C:	3L.A.N
Option D:	4 L.A.N
8.	For small discharge at high pressure, following pump is preferred
Option A:	Centrifugal
Option B:	Axial flow
Option C:	Mixed flow
Option D:	Reciprocating
9.	Air vessel used in reciprocating pump to obtain
Option A:	reduction of suction head
Option B:	rise in delivery head
Option C:	continuous supply of water at uniform rate
Option D:	increase in supply of water
10.	By fitting an air vessel to the reciprocating pump, there is always a saving in work done and subsequently saving of power. This saving in case of a double acting reciprocating pump is
Option A:	39.20%
Option B:	48.80%
Option C:	84.80%
Option D:	88.40%
11.	In a centrifugal pump, the liquid enters the pump
Option A:	at the top
Option B:	at the bottom
Option C:	at the center
Option D:	from sides
12.	In the case of a centrifugal pump, cavitation will occur if
Option A:	It operates above the minimum net positive suction head
Option B:	It operates below the minimum net positive suction head
Option C:	The pressure at the inlet of the pump is above the atmospheric pressure
Option D:	The pressure at the inlet of the pump is equal the atmospheric pressure
13.	The specific speed of a hydraulic pump is the speed of geometrically similar pump working against a unit head and
Option A:	Delivering unit quantity of water
Option B:	Having unit blade velocity
Option C:	Having unit velocity of flow
Option D:	Having unit radial velocity
14.	The process of filling the liquid into the suction pipe and pump casing upto the

	level of delivery valve is called as
Option A:	Filling
Option B:	Pumping
Option C:	Priming
Option D:	Leveling
15.	Energy conservation in the pumping system can be achieved by
Option A:	Adequate NPSH
Option B:	less use of pumping system
Option C:	Optimizing the water volume
Option D:	specific speed
16.	Efficient operation is achieved in case of over designed pumps by
Option A:	not using the pump
Option B:	using variable speed drive
Option C:	increasing the requirements to match with the design
Option D:	providing high head
17.	For how much time, for detecting outward leakage point, pressure be stored in the system
Option A:	36
Option B:	24
Option C:	18
Option D:	6
18.	Which of the following pumps is used for pumping viscous fluids
Option A:	Centrifugal pump
Option B:	Screw pump
Option C:	Reciprocating pump
Option D:	Jet pump
19.	Aeroplanes uses following type of compressor.....
Option A:	Radial flow
Option B:	Reciprocating
Option C:	Centrifugal
Option D:	Axial flow
20.	Reciprocating pumps are classified according to _____
Option A:	Number of cylinders
Option B:	Drag force
Option C:	Shock waves
Option D:	Flow speed

Q2(20 Marks)		
A	**Solve any Two.**	**5 marks each**
i.	Enumerate the various use of air compressor.	
ii.	Explain the working of axial flow compressor.	
iii.	Explain the working of vane pump.	
B	**Solve any One .**	**10 marks each**
i.	Define NPSH, Thoma's cavitation factor and suction specific speed of pump. Explain NPSHA and NPSHR w.r.t. cavitation in pumps using neat sketch.	
ii.	Write down energy conservation opportunities in pumping system.	

Q3 (20 Marks)		
A	**Solve any Two .**	**5 marks each**
i.	Write a note on leak detection in compressed air network.	
ii.	Difference between centrifugal and axial flow compressor.	
iii.	Define coefficient of discharge, volumetric efficiency and slip in reciprocating pump. Describe negative slip with proper description.	
B	**Solve any One .**	**10 marks each**
i.	Drive an expression for work done by impeller of a Centrifugal pump on liquid per second per unit weight of water.	
ii.	Explain construction and working of axial compressor with neat diagram.	

University of Mumbai

Examination 2020 under cluster 9 (FAMT, Ratnagiri)

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

Program: Mechanical Engineering

Curriculum Scheme: Rev2016

Examination: BE Semester VII

Course Code: MEC703 and Course Name: Production Planning and Control

Time: 2 hours Max. Marks: 80

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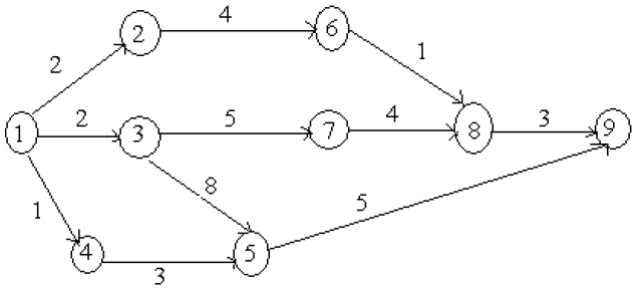
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Critical path of a project consists of 4 activities having variances 4, 16, 4, 1. What is the standard deviation of the project?
Option A:	25
Option B:	1
Option C:	4
Option D:	5
2.	What is a Gantt chart type of?
Option A:	Work schedule design
Option B:	Work flow design
Option C:	Work rate design
Option D:	Work output design
3.	For sequencing n jobs in 3 machines as per Johnson's algorithm which condition(s) must be satisfied 1. Min. time for the 1st machine ≥ Max time on 2nd machine 2. Min time for the 3rd machine ≥ Max time on 2nd machine 3. Sum of minimum time of the 1st and 3rd machine ≤ Max time on 2nd machine
Option A:	Only 1
Option B:	Only 2
Option C:	Either 1 or 2
Option D:	Either 1 or 2 or 3
4.	The implementation of ERP should be planned well and executed perfectly by
Option A:	Vendors
Option B:	Top Management
Option C:	Organization
Option D:	System developers
5.	ERP system is built on a _____ utilizing a common computing platform
Option A:	Centralized database
Option B:	Individual databases
Option C:	Modular databases
Option D:	Centralized layout
6.	Level production involve production at a constant rate using …… to absorb

	fluctuations in demand
Option A:	Hiring
Option B:	Layoff
Option C:	Inventory
Option D:	Machines
7.	The main cost involved in chase strategy in aggregate planning is
Option A:	Inventory
Option B:	Subcontracting
Option C:	Hiring and lay off workers
Option D:	Backorders
8.	The system that has a fixed ordering interval but the size of the order quantity may vary with changes in demand is
Option A:	Q system
Option B:	R system
Option C:	L system
Option D:	P system
9.	Inventory control is related to management of
Option A:	Labour
Option B:	Material
Option C:	Machines
Option D:	Expenditure
10.	Two bin system is an example of
Option A:	Q system
Option B:	R system
Option C:	T system
Option D:	S system
11.	A manufacturer has to supply his customers 5000 units of his product per year. Inventory carrying cost is Rs. 5 per annum and the set up cost per run is Rs. 50. What is the EOQ in units?
Option A:	427
Option B:	317
Option C:	527
Option D:	617
12.	In an assembly line, when the workstation times are unequal, the overall production rate of an assembly line is determined by the:
Option A:	Fastest station time
Option B:	Slowest station time
Option C:	Average of all station times
Option D:	Average of slowest and fastest station times
13.	If a process consists of 4 tasks having task time 4 min, 5 min, 6 min and 10 min. What is the output rate of the process per hour?
Option A:	6
Option B:	15

Option C:	25
Option D:	2.4
14.	In Computer Aided Process Planning, determination of process sequence for manufacture of any part design without predefined standard plans is known as
Option A:	variant type process planning
Option B:	retrieval type process planning
Option C:	generative type process planning
Option D:	group technology based process planning
15.	If an activity with free slack time of 2 weeks is delayed by 1 week,
Option A:	the project will be delayed by 1 week.
Option B:	the slack time of all activities that follow this activity is reduced by 1 week.
Option C:	no other activity in the project is affected.
Option D:	the probability of completing the project on time decreases.
16.	_____ is Characterized by complex sets of activities that must be performed in a particular order within the given period and within the estimated expenditure.
Option A:	Batch Production
Option B:	Project
Option C:	Mass production
Option D:	Continuous Production
17.	Mass production results in the output that is
Option A:	Highly standardized
Option B:	Highly customized
Option C:	Partially customized
Option D:	Partially standardized
18.	The outputs of a transformation process can include all of the following except
Option A:	Services
Option B:	Material
Option C:	Industrial products
Option D:	People
19.	_____is the process of verifying if the organization has sufficient capacity available to meet the requirements of the master production schedule across a specific period.
Option A:	Rough cut capacity planning
Option B:	Forecasting
Option C:	Scheduling
Option D:	Aggregate planning
20.	Which of the following aggregate planning strategies is likely to have the least impact on quality?
Option A:	Subcontracting
Option B:	Using part-time workers
Option C:	Varying production rates through overtime or idle time
Option D:	Changing inventory level

<table>
<tr><td>Q2
(20 marks)</td><td>Solve any Four out of Six (5 marks each)</td></tr>
<tr><td>A</td><td>Explain Kilbridge –Wester method of line balancing</td></tr>
<tr><td>B</td><td>The following data gives the sales of the company for various years. Fit the straight line and forecast the sales for the years 2020 and 2021. [Tabulate the calculations]
<table>
<tr><td>Year</td><td>2011</td><td>2012</td><td>2013</td><td>2014</td><td>2015</td><td>2016</td><td>2017</td><td>2018</td><td>2019</td></tr>
<tr><td>Sales (‘000)</td><td>13</td><td>20</td><td>20</td><td>28</td><td>30</td><td>32</td><td>33</td><td>38</td><td>43</td></tr>
</table></td></tr>
<tr><td>C</td><td>What are the reasons to keep the inventories?</td></tr>
<tr><td>D</td><td>Describe the pre-requisites of the Production planning and control unit.</td></tr>
<tr><td>E</td><td>Find the critical path, its duration and calculate the total slack time for each activity for the following project network. Time is in days.

</td></tr>
<tr><td>F</td><td>What are the limitations of MRP system?</td></tr>
</table>

<table>
<tr><td>Q3
(20 marks)</td><td>Solve any Four out of Six (5 marks each)</td></tr>
<tr><td>A</td><td>Define following terminologies: (i) Cycle time (ii) Takt time (iii) Total work content (iv) Precedence diagram (v) Balance delay</td></tr>
<tr><td>B</td><td>Explain Aggregate planning and its strategies.</td></tr>
<tr><td>C</td><td>A company produces a cable at the rate of 5000 m/hr. The cable is used at the rate of 2500 m/hr. The cost of the cable is Rs. 5/m. The inventory carrying cost is 25% and set up costs are Rs. 4050 per set up. Determine the optimal number of cycles required in a year for the manufacturing of this cable. Assume the company works for 365 days in a year in one shift of 8 hours per day.</td></tr>
<tr><td>D</td><td>Compare Job, Batch and Mass production for various characteristics.</td></tr>
<tr><td>E</td><td>There are seven jobs, each of which has to be processed on two machines A and B in the order A-B. Processing times are given in the following table.
Determine a sequence of these jobs for minimum total elapsed time. Also find total elapsed time and idle time of machines.
<table>
<tr><th>Job</th><th>Machine A</th><th>Machine B</th></tr>
<tr><td>1</td><td>3</td><td>8</td></tr>
<tr><td>2</td><td>12</td><td>10</td></tr>
<tr><td>3</td><td>15</td><td>10</td></tr>
<tr><td>4</td><td>6</td><td>6</td></tr>
<tr><td>5</td><td>10</td><td>12</td></tr>
<tr><td>6</td><td>11</td><td>1</td></tr>
<tr><td>7</td><td>9</td><td>3</td></tr>
</table></td></tr>
<tr><td>F</td><td>List the benefits and limitations of MRP – II system.</td></tr>
</table>