

ME-1841
Examination –May-June.- 2022
B.Tech. IV Sem :Mechanical Engineering
Manufacturing Process - I

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) Distinguish between green sand moulding and dry sand moulding. 02
 (b) State the process of sand preparation. 02
 (c) What considerations are necessary while designing a pattern? 03
 (d) Explain the common allowances provided on pattern and why? 07

OR

How does a cold chamber die casting machine differ from a hot chamber machine? 07
 State the main advantages and limitations of die-casting also.

- Q.2 (a) Define forging. State the operations that are normally employed in forging. 02
 (b) Differentiate between coining and embossing. 02
 (c) Explain how forging improves the mechanical properties of components. 03
 (d) What is metal Spinning? What type of components are generally manufactured by this process. 07

OR

Draw a sketch of a punch and a die set used for punching operation. Indicate its various parts. 07

- Q.3 (a) How is an arc obtained in electric welding? 02
 (b) Why is it normally necessary to use filler material in welding with tungsten arc? Give reason. 02
 (c) State the types of flames obtained in an oxy-acetylene gas welding process giving the applications. 03
 (d) Explain the principle underlying the resistance welding process. 07

OR

Define thermit welding. How can shape of the joint be effectively controlled in thermit welding? 07

- Q.4 (a) State the characteristics of the ideal cutting tool materials. 02
(b) State the various forms of wear found in cutting tools. 02
(c) Define machinability. State the factors on which machinability depend. 03
(d) Considering the various forces acting on the chip, draw merchant force diagram. State the assumption made. 07

OR

Differentiate between orthogonal and oblique cutting. What is the utility of orthogonal cutting? 07

- Q.5 (a) What is comparator? State the types of comparators used. 02
(b) Write short note on slip gauges. 02
(c) Define the terms tolerance, limits and fit with reference to the dimensional measurement. 03
(d) Explain the Vernier principle as used in linear measurements. 07

OR

Explain the principle of Sine bar for measuring angles. 07

ME-1842
Examination – May-June - 2022
B.Tech. IV Sem : Mechanical Engineering
Applied Thermodynamics

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

Note:- Steam tables are permitted in the examination hall.

Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) What is heat balance sheet of a boiler and what is its use? 02
- (b) What is Boiler Draught? 02
- (c) What are super critical boilers? Give their advantages. 03
- (d) A boiler produces 10 kg of steam per kg of fuel from feed water at 30⁰ C at 9 bar absolute pressure. What is equivalent evaporation from and at 100⁰ C per kg of fuel and factor of evaporation, if the steam produced is 0.9 dry? 07

OR

Discuss the construction and working of Benson Boiler with neat sketch. 07

- Q.2 (a) What is ideal Carnot cycle? 02
- (b) What is reheating? What are the advantage of reheat Rankine cycle? 02
- (c) What do you understand by steam rate and heat rate? 03
- (d) What is the effect of superheat on the efficiency of Rankine cycle? 07

OR

Steam at pressure of 100 bar and 500⁰ C is supplied to turbine. It comes out at 0.075 bar and 80% dryness. One stage of reheating is used. The net power output from the turbine is 1800 KJ/kg . Calculate the thermal efficiency of the plant. 07

- Q.3 (a) Define Mach Cone and Mach angle. 02
- (b) Why the steam nozzles are made convergent –divergent? 02
- (c) What is mach number? What is the significance of Mach number in compressible fluid flow? 03
- (d) What is stagnation state? What do you mean by stagnation properties? 07

OR

An aeroplane is flying at a speed of 1400 km/hr at an altitude where the ambient temperature is -21°C . Find the Mach number of the flight. 07

- Q.4 (a) Define isothermal efficiency and adiabatic efficiency. 02
(b) What are the advantages of multi-stage compression over single-stage compression? 02
(c) What are rotary compressors? How are rotary compressor classified? 03
(d) Prove that for perfect inter-cooling of a two-stage reciprocating air compressor work input would be minimum when intermediate pressure: $P_2 = \sqrt{P_1 P_3}$. 07

OR

Estimate the minimum work required to compress 1 kg of air from 1 bar and 27°C to 16 bar in two stages, if the law of compression is $PV^{1.25} = C$ and the inter-cooling is perfect. Take $R=287 \text{ J/kgK}$. 07

- Q.5 (a) Define vacuum efficiency and condenser efficiency. 02
(b) Differentiate between jet and surface condensers. 02
(c) Write short note on cooling towers. 03
(d) Discuss the back pressure of steam condensers and its effect on power plant performance. 07

OR

The following observations were recorded during a test of steam condenser. 07

Barometer reading = 760 mm of Hg,

Vacuum at steam inlet to condenser = 690 mm of Hg,

Hot well temperature = 32°C ,

Calculate the vacuum efficiency of the condenser.

ME-1843
Examination – May-June - 2022
B.Tech. IV Sem: Mechanical Engineering
Theory of Machine - I

Time : 3 Hrs

Max. Marks : 70
 Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

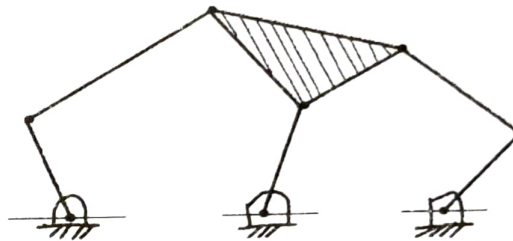
Word limit be observed as follows:

Part a – Max 50 words, Part b – Max 50 words,

Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) Define link and its types. 02
 (b) What are different types of kinematic pairs? 02
 (c) Find degree of freedom of a mechanism shown in fig. 03

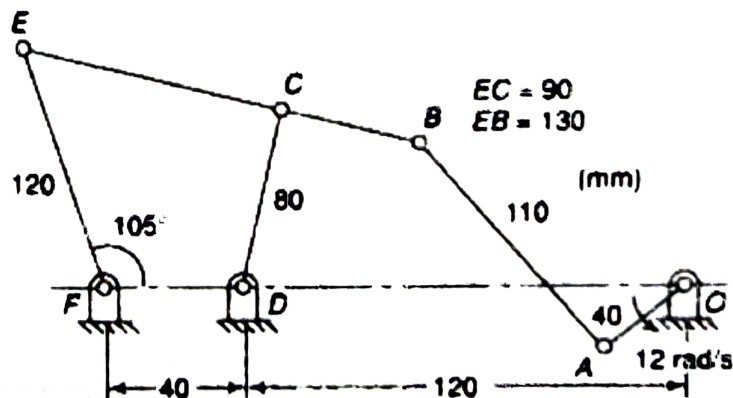


- (d) Explain with the help of neat sketch a quick return mechanism. 07

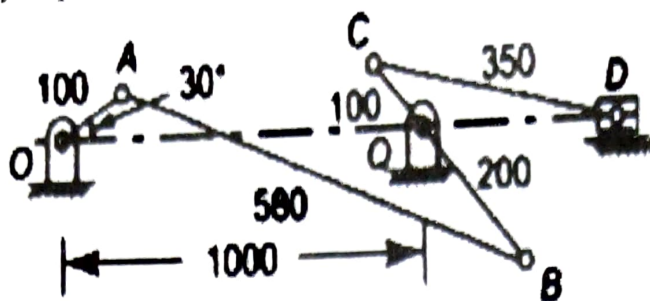
OR

Explain Oldham's coupling mechanism with neat sketch. 07

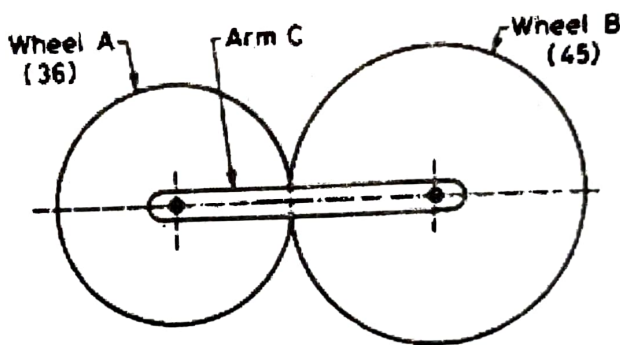
- Q.2 (a) Define instantaneous centre of rotation and its types. 02
 (b) Write statement of Kennedy's theorem. 02
 (c) Draw four bar mechanism and locate all I-Centers 03
 (d) Find angular velocity of link AB 07



Find velocity of point D on slider



- Q.3 (a) What are important types of gears? 02
- (b) Define module of gear. 02
- (c) Find minimum number of teeth required in order to avoid interference on a pinion which is in mesh with gear to give a gear ratio of 3. 03
- (d) Fig. below shows an epicyclic gear train in which the arm C is rotating at 80 rpm anticlockwise. The arm carries two gears A and B having 32 and 40 teeth respectively. The gear A is fixed and the arm rotates about the center of gear A. Find the speed of gear B. what will be the speed of gear B if gear A instead of being fixed, makes 160 rpm clockwise. 07



OR

Two mating involute spur gears of 20° pressure angle have a gear ratio of 2. The number of teeth on the pinion is 20 and its speed is 250 rpm. The module of the teeth is 12 mm. If the addendum on each wheel is such that the path of approach and the path of recess on each side are half the maximum possible length each, find:

- (i) The addendum for pinion and gear wheel;
- (ii) The length of arc of contact;
- (iii) The maximum velocity of sliding during approach and recess.

Assume pinion to be driver.

- Q.4 (a) Define radial cam and offset in cam 02
- (b) Name different types of motion a follower can have 02
- (c) Differentiate between base circle and prime circle 03
- (d) Draw cam profile of a cam to give following motion to reciprocating follower with a knife edge follower: 07
- (i) Follower to move outward through a distance of 40 mm during 120° of cam rotation
 - (ii) Follower to dwell for 30° of cam rotation
 - (iii) Follower to return to its initial position during 120° of cam rotation
 - (iv) Follower to dwell for the remaining 90° of cam rotation.

The minimum radius of cam is 25 mm. The outward and return strokes are to take place with simple harmonic motion.

OR

Calculate the maximum velocity and acceleration of the follower during the ascent and descent periods with following data: Lift of follower 30 mm; Follower lifts for 120° cam rotation; A dwell period of 30° ; Follower lowers down during 150° cam rotation; The cam is rotating with 150 rpm. 07

- Q.5 (a) Define gyroscopic couple. 02
- (b) State the effect of gyroscopic effect on aircraft when it takes left turn. Aircraft engine is rotating clockwise when viewed from rear. 02
- (c) Explain gyroscopic effect naval ship in following during Pitching. 03
- (d) An aero plane engine flying at 240 km/hr turns towards left and completes a quarter circle of 60 m radius. The mass of the rotary engine and the propeller of the plane amounts to 450 kg with a radius of gyration of 320 mm. The engine speed is 2000 rpm clockwise when viewed from the rear. Determine the gyroscopic couple on the aircraft. 07

OR

Each wheel of a four-wheeled, rear engine automobile has a moment of inertia of 2.4 kg.m^2 and effective diameter of 660 mm. The rotating parts of the engine have a moment of inertia of 1.2 kg.m^2 . The engine axis is parallel to the rear axle and the crank shaft rotates in the same direction as the road wheels. The mass of the vehicle is 2200 kg and center of mass is 550 mm above the road level. The track width of the vehicle is 1.5 m. Determine the limiting speed of the vehicle around a curve with 80 m radius so that all the four wheels maintain contact with the road surface. 07

ME-1844
Examination –May-June - 2022
B.Tech. IV Sem: Mechanical Engineering
Machine Design - I

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

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Part c – Max 100 words and Part d – Max 400 words.

Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) What are the causes of the stress concentration? 02
- (b) Explain methods for reduction in stress concentration? 02
- (c) Draw S-N curve to explain endurance limit and fatigue life. Also describe low cycle and high cycle fatigue on the basis of S-N curve? 03
- (d) Write a comparative note on static failure versus fatigue failure. Draw a schematic diagram for fatigue crack growth and describe various stages of fatigue crack propagation? 07

OR

A 40 mm diameter shaft is made of steel 50C4 (Sut = 660 N/mm²) and has a machined surface. The expected reliability is 99%. The theoretical stress concentration factor for the shape of the shaft is 1.6 and the notch sensitivity factor is 0.9. Determine actual endurance limit of the shaft, if surface finish factor (Ka) is 0.76, size factor (Kb) is 0.85 and reliability factor (Kc) is 0.814. 07

- Q.2 (a) Explain the ASME code for the designing of shafts? 02
- (b) Explain the advantages of hollow shaft over solid shaft? 02
- (c) For a square key, derive the relationship between compressive strength and shear strength? 03
- (d) Explain the design procedure for a solid shaft and hollow shaft based on torsional rigidity? 07

OR

A Shaft made of mild steel is required to transmit 100 KW at 300 RPM. The supported length of the shaft is 3 meters. It carries two pulleys each weighing 1500N supported at a distance of 1 metre from the ends respectively. Assuming the safe value of stress, determine the diameter of the shaft. 07

- Q.3 (a) Describe the condition of surge in helical spring? 02
- (b) Explain the series and parallel connection of helical springs? 02
- (c) Design considerations in design of simple screw jack? 03

- (d) Derive the load-stress and load-deflection equations for design of helical spring. Also, briefly explain the trial and error method of design of helical spring? 07

OR

A coil spring is used for the front suspension of an automobile. The spring has a stiffness of 90 N/mm with squared and ground ends. The material used is oil tempered chrome steel for which the permissible shear stress may be taken as 500 MPa. The load on the spring is causing a total deflection of 8.5 mm. Find the spring wire diameter and total number of turns using a spring index of 6. 07

- Q.4 (a) Differentiate between single plate and multi-plate clutch? 02
(b) List the factors to be considered for designing of friction clutch? 02
(c) For a block brake with short shoe, explain the conditions of self-energizing, self-locking and grabbing of brake? 03
(d) For a worn-out clutch, derive the equation for torque transmitting capacity? 07

OR

A single plate clutch consists of one pair of contacting surfaces. The inner and outer diameters of the friction disk are 125 and 250 mm respectively. The coefficient of friction is 0.25 and the total axial force is 15 kN. Calculate the power transmitting capacity of the clutch at 500 rpm using: (i) uniform wear theory; and (ii) uniform pressure theory. 07

- Q.5 (a) Define wear and explain the function of lubricants along with their types? 02
(b) Explain the load-life relationship for rolling contact bearings? 02
(c) Define thick film and thin film lubrication and also explain the McKee's investigation for the journal bearing? 03
(d) Define the static load carrying capacity of rolling contact bearing and derive the Stribeck's Equation? 07

OR

A ball bearing is subjected to a radial force of 2500 N and an axial force of 1000 N. The dynamic loadcarrying capacity of the bearing is 7350 N. The values of X and Y factors are 0.56 and 1.6 respectively. The shaft is rotating at 720 rpm. Calculate the life of the bearing in hours of service, if the race-rotation factor (V) is unity. 03

1845/2045
Examination – May-June - 2022
B.Tech. IV Sem: ME, EE, EC, AI
Engineering Mathematics - III

Time: 03:00 Hrs

Max. Marks: 70
 Min. Marks: 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any. Word limit be observed as follows:

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Word limit NOT to be followed for diagram, numerical, derivation.

- Q.1 (a) Define Periodic Function and Fourier series. 02
 (b) Write the Euler’s Formula for a_0, a_n, b_n . 02
 (c) Find the Fourier series for the function $f(x) = x - x^2, -1 < x < 1$. 03
 (d) Obtain the Fourier series for the function $f(x) = x^2, -\pi \leq x \leq \pi$. Hence show that $1/1^2 + 1/2^2 + 1/3^2 + \dots = \pi^2/6$. 07

OR

If $f(x) = x, 0 < x < \pi/2$ 07
 $\pi - x, \pi/2 < x < \pi$
 Show that $f(x) = (4/\pi)[\sin x - \sin 3x/3^2 + \sin 5x/5^2 + \dots]$

- Q.2 (a) Write the Laplace Transform of following elementary functions 02
 (i) $L\{1\}$ (ii) $L\{e^{at}\}$ (iii) $L\{\sin at\}$ (iii) $L\{\cos at\}$.
 (b) Find the Laplace transform of $\sin at/t$. 02
 (c) Find the inverse Laplace Transform of $(p+8)/(p^2+4p+5)$. 03
 (d) State the convolution theorem and using the convolution theorem evaluate 07

$$\int_0^t \sin u \cos(t - u) du$$

OR

Solve the equation using Laplace Transform 07

$$\frac{d^3y}{dt^3} + 2 \frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0, \text{ where } y = 1, \frac{dy}{dy} = 2, \frac{d^2y}{dt^2} = 2 \text{ at } t = 0$$

- Q.3 (a) Prove that $e^x = \left(\frac{\Delta^2}{E}\right)e^x \cdot \frac{Ee^x}{\Delta^2 e^x}$ 02
 (b) Find the missing term in the table : 02

x	: 45	50	55	60	65
y	: 3	-	2	-	-2.4

 (c) From the table estimate the number of students who obtained marks between 40 and 45 03
- | | | | | | | |
|------------------|---|-------|-------|-------|-------|-------|
| Marks | : | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 |
| No. of Students: | | 31 | 42 | 51 | 35 | 31 |

- (d) Find by Gauss's backward formula the sales of a concern for the year 1936, given that 07

Year	:	1901	1911	1921	1931	1941	1951
Sales (in lacs)	:	12	15	20	27	39	52

OR

When do we apply Lagrange's interpolation formula? Find the cubic Lagrange's interpolating polynomial from the following data: 07

x	:	0	1	2	5
f(x)	:	2	3	12	147

- Q.4 (a) "It may be observed that any error in approximating a function are amplified while taking the derivative whereas they are smoothed out in integration"; 02
So what do you think that the numerical differentiation should be avoided if an alternate exists? Clarify it in your words (Max word limit 50).

- (b) The table given below reveals the velocity 'v' of a body during the time 't' specified. Find its acceleration at t = 1.1. 02

t	:	1.0	1.1	1.2	1.3	1.4
v	:	43.1	47.7	52.1	56.4	60.8

- (c) Write the Newton Cotes Quadrature formula. Taking the values n = 1, 2, 3 & 6 respectively which formulae will evolve, write those formulae along with their specific names. 03

- (d) Evaluate $\int_0^6 dx/(1+x^2)$ by using 07
(i) Trapezoidal Rule (ii) Simpson's three-eight rule.

OR

What do you mean by the Direct methods and iterative methods for solving Simultaneous Algebraic Equation? Solve the system of equations 07

$$\begin{aligned} 3x + y - z &= 3 \\ 2x - 8y + z &= -5 \\ x - 2y + 9z &= 8 \end{aligned}$$

Using Gauss-elimination method.

- Q.5 (a) What do you mean by Initial Value Problem and Boundary Value Problem? 02
(b) Obtain Picard's second approximate solution of the initial value problem 02

$$\frac{dy}{dx} = \frac{x^2}{y^2 + 1}, y(0) = 0$$

- (c) Using Euler's method, solve for y at x = 0.1 from $\frac{dy}{dx} = x + y + xy$, y(0) = 1 taking step size h = 0.025. 03
(d) Solve $\frac{dy}{dx} = y - \frac{2x}{y}$, y(0) = 1 in the range 0 ≤ x ≤ 0.2 using modified Euler's method. Take h = 0.1. 07

OR

Using Runge - Kutta method of fourth order solve for y(0.1), y(0.2), y(0.3) given that 07

$$\frac{dy}{dx} = xy + y^2, y(0) = 1.$$