

Roll No.

3312

B. Tech. 6th Semester (ME)

Examination – May - 2026

MANUFACTURING TECHNOLOGY - II

Paper : PCC-ME-302-G

Time : Three hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all. Question no. 1 is **compulsory**. Attempt *one* question from each Unit.
All questions carry equal marks.

1. Answer the following : $2.5 \times 6 = 15$

- (i) What is the meaning of cutting speed of a tool ?
- (ii) Define absolute and incremental coordinate system.
- (iii) Differentiate between Jigs and Fixtures.
- (iv) Define an NC system.

3312-1950-(P-3)(Q-9)(26)

P. T. O.

(v) What is component classification and coding ?

(vi) Explain the locating devices.

UNIT - I

2. Explain the mechanism of chip formation and classify the various types of chips along with condition of their formation. Show temperature distribution at tool chip interface. 15

3. Explain the mechanics of orthogonal and oblique cutting. Give a comparative evaluation of the various cutting tool materials. Also discuss the desirable characteristics of a cutting tool material. 15

UNIT - II

4. With the help of a neat diagram, explain the working of LBM. What are the critical parameters and limitations of LBM ? 15

5. How to determine that the jigs and fixtures for a particular application will be economical ? What are the advantages of jigs and fixtures ? 15

UNIT - III

6. Explain the following in detail : $5 \times 3 = 15$

(a) Classification of NC system

(b) Explain Part Programming

(c) Compare CNC and DNC

7. Explain the two axes part programming for milling operation with a suitable example. 15

UNIT - IV

8. How classification and coding of parts is done in Group Technology layouts. Also give some benefits of using Group Technology principles in production plant. 15

9. Explain the following : $7.5 \times 2 = 15$

(a) Definition, concept, and working of Group Technology.

(b) Stages of adopting of Group Technology.

Roll No.

3313

**B. Tech. 6th Semester (ME)
Examination – May, 2026**

DESIGN OF MACHINE ELEMENT - I

Paper : PCC-ME-304-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks. Design Data hand Book by Mahadevan and PSG college of Coimbatore is permitted.

1. (i) Surface roughness. $2.5 \times 6 = 15$
(ii) Define toughness and resilience of material.
(iii) Draw knuckle joint.
(iv) Max power condition in V-Belts.

3313-2500(P-4)(Q-9)(26)

P. T. O.

(v) Explain various keys.

(vi) Self-energizing and locking screws.

UNIT – I

2. (i) What is meant by 'hole basis system' and 'shaft basis system'? Which one is preferred and why ?
(ii) Describe economic, societal and technical feasibility. $6 + 9 = 15$
3. With the reference to stress- strain diagram explain mechanical properties of mild steel and also discuss factor of safety. 15

UNIT – II

4. Design the longitudinal joint for a 1.25 m diameter steam boiler to carry a steam pressure of 2.5 N/mm². The ultimate strength of the boiler plate may be assumed as 420 MPa, crushing strength as 650 MPa and shear strength as 300 MPa. Take the joint efficiency as 80%. Sketch the joint with all the dimensions. Adopt the suitable factor of safety. 15

5. Design and draw a screw jack for lifting a safe load of 150 kN through a maximum lift of 350 mm. The elastic strength of the material of the screw may be taken as 240 MPa in compression and 160 MPa in shear. The nut is to be made of phosphor bronze for which the elastic strengths in tension, compression and shear are respectively 130, 115 and 100 MPa. Bearing pressure between the threads of the screw and the nut may be taken as 18 N/mm². Safe crushing stress for the material of the body is 100 MPa. Coefficient of friction for the screw as well as collar may be taken as 0.15. 15

UNIT – III

6. Design a cast iron driven pulley to transmit 20 kW at 300 r.p.m. The diameter of the pulley is 500 mm and the angle of lap is 180°. The pulley has four arms of elliptical cross-section with major axis twice the minor axis. The coefficient of friction between the belt and the pulley surface is 0.3. The allowable tension per metre width of the belt is 2.5 N. The following allowable stresses may be taken : ' Shear stress for the shaft material = 50 MPa, and Bending stress for the pulley arms = 15 MPa. 15

7. Design and draw a cast iron flange coupling for a mild steel shaft transmitting 90 kW at 250 r.p.m. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1° in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30 MPa. 15

UNIT - IV

8. Why a positive clutch is used ? Describe, with the help of a neat sketch, the working of a jaw or claw clutch. Describe with the help of neat sketches the working principles of two different types of friction clutches and the materials used for lining of friction surfaces ? 15
9. Derive an expression for the braking torque of band and block brakes. 15

Roll No.

3314

B. Tech. 6th Semester (ME)
Examination – May, 2026

HEAT TRANSFER

Paper : PCC-ME-306-G

Time : Three hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) Differences between Thermodynamics and heat transfer. $2.5 \times 6 = 15$
- (b) What is Fourier's law of conduction ?
- (c) What is Fin Effectiveness ?
- (d) Define semi-infinite body.
- (e) Explain the number of transfer units (NTU) in the heat exchanger.
- (f) Define Lambert's law of radiation.

3314-1900-(P-4)(Q-9)(26)

P. T. O.

UNIT - I

2. Describe the modes of heat flow--conduction, convection and radiation- and elucidate the fundamental principles governing each mode. Compare and contrast the mechanisms, characteristics and applications of these modes in heat transfer processes. Discuss how these modes interact in combined heat transfer systems and analyze their roles in achieving thermal equilibrium. 15
3. The interior of a refrigerator having inside dimensions of $0.5 \text{ m} \times 0.5 \text{ m}$ base area and 1 m height, is to be maintained at 6°C . The walls of the refrigerator are constructed of two mild steel sheets 3 mm thick ($k = 46.5 \text{ W/m}^\circ\text{C}$) with 50 mm of glass wool insulation ($k = 0.046 \text{ W/m}^\circ\text{C}$) between them. If the average heat transfer coefficients at the outer and inner surfaces are $11.6 \text{ W/m}^2^\circ\text{C}$ and $14.5 \text{ W/m}^2^\circ\text{C}$ respectively, Calculate : 15
 - (i) The rate at which heat must be removed from the interior to maintain the specified temperature in the kitchen at 25°C , and
 - (ii) The temperature on the outer surface of the metal sheet.

UNIT - II

4. A steel rod ($k = 30 \text{ W/m}^\circ\text{C}$), 10 mm in diameter and 50 mm long, with an insulated end, is to be used as a spine. It is exposed to surroundings with a temperature of 65°C and a heat coefficient of $50 \text{ W/m}^2^\circ\text{C}$. The temperature at the base of the fin is 98°C . Determine : 15

3314-1900-(P-4)(Q-9)(26) (2)

- (i) The fin efficiency,
- (ii) The temperature at the edge of the spine, and
- (iii) The heat dissipation.

5. A long cylindrical bar ($k = 17.5 \text{ W/m}^\circ\text{C}$, $\alpha = 0.0185 \text{ m}^2/\text{h}$) of radius 75 mm comes out of oven at 815°C throughout and is cooled by quenching it in a large bath of 38°C coolant. The surface coefficient of heat transfer between the bar surface and the coolant is $175 \text{ W/m}^2^\circ\text{C}$.

Determine :

- (i) The time taken by the shaft centre to reach 116°C ;
- (ii) The surface temperature of the shaft when its centre temperature is 116°C . Also calculate the temperature gradient at the outside surface at the same instant of time. 15

UNIT - III

6. Explain the concept of fluid friction and heat transfer using the Colburn analogy. Discuss how this analogy relates the friction factor to the heat transfer coefficient in convective heat transfer. 15

3314- (P-4)(Q-9)(26) (3)

P. T. O.

7. Derive expressions for the following cases, using definitions of irradiation and radiosity : 15
- (i) Radiation heat exchange between two black surfaces.
 - (ii) Radiation heat exchange for three gray surfaces.
 - (iii) Radiation heat exchange for two gray surfaces connected by single refractory surface.
 - (iv) Radiation heat exchange for four gray surfaces.

UNIT - IV

8. It is required to design a shell and tube heat exchanger for heating 2.5 Kg/s of water from 15°C to 85°C by hot engine oil ($C_p = 2.35 \text{ KJ/Kg}^\circ\text{C}$) flowing through the shell of the heat exchanger. The Oil makes a single pass entering at 150°C and leaving at 95°C with an average heat transfer coefficient of $400 \text{ W/m}^2^\circ\text{C}$. The water flows through 10 thin wall tubes of 25 mm diameter with each tube making 8 pass through the shell. The heat transfer coefficient of the waterside is $3000 \text{ W/m}^2^\circ\text{C}$. Calculate the length of the tube required for the heat exchanger to accomplish the required water heating. 15
9. A vertical plate 50 mm high and maintained at 30°C is exposed to saturated steam at atmospheric pressure. Calculate : 15
- (i) the rate of heat transfer and
 - (ii) the condensate rate per hour per meter for the plate with film condensation.
- The properties of water film at the mean temperature are :
- $\rho = 980.3 \text{ kg/m}^3$, $k = 66.4 \times 10^{-3} \text{ W/m}^\circ\text{C}$, $\mu = 434 \times 10^{-6} \text{ kg/ms}$ and $h_{fg} = 2256.9 \text{ KJ/Kg}$.

Roll No.

3315

**B. Tech. 6th Semester (ME)
Examination – May, 2026**

DYNAMICS OF MACHINES

Paper : PCC-ME-308-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Explain the following :

6 × 2.5 = 15

- (a) Applied forces and Constraint forces
- (b) Static balancing
- (c) Function of a governor
- (d) Hunting of governor

3315-1700(P-3)(Q-9)(26)

P. T. O.

- (e) Brakes and dynamometers
- (f) What do you mean by spin, precession and gyroscopic planes ?

SECTION - A

2. What are conditions for a body to be in equilibrium under the action of two forces, three forces and two forces and a torque ? 15
3. Explain the following :
 - (a) Indicator diagrams 8
 - (b) Engine shaking forces 7

SECTION - B

4. A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg and 4 kg respectively. Find the required mass A and the relative angular setting of the four masses so that the shaft shall be in complete balance. 15
5. Derive the following expressions, for an uncoupled two cylinder locomotive engine : 15
 - (a) Variation of tractive force
 - (b) Swaying couple
 - (c) Hammer Blow

SECTION - C

6. The arms of a Porter governor are each 250 mm long and pivoted on the governor axis. The mass of each ball is 5 kg and the mass of the central sleeve is 30 kg. The radius of rotation of the balls is 150 mm when the sleeve begins to rise and reaches a value of 200 mm for maximum speed. Determine the speed range of the governor. If the friction at the sleeve is equivalent of 20 N of load at the sleeve. Determine how the speed range is modified. 15
7. (a) What is the difference between absorption and transmission dynamometers ? Explain the torsion dynamometer. 8
- (b) Describe the construction and operation of a rope brake dynamometer. 7

SECTION - D

8. Explain the Gyroscopic Couple and also discuss the effect of the gyroscopic couple on an aeroplane. 15
9. Derive expression for stability of a four wheel drive moving in a curved path. 15

Roll No.

3316

**B. Tech. 6th Semester (ME) (Elective-I)
Examination – May, 2026**

INTERNAL COMBUSTION ENGINES & GAS TURBINES

Paper : PEC-ME-320-G

Time : Three hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All questions carry equal marks.

1. (a) Wankel Engine. $2.5 \times 6 = 15$
- (b) Elementary carburetor.
- (c) Functions of lubricating system.
- (d) Differentiate SI and CI Engine.
- (e) Explain indicated and brake mean effective pressure.
- (f) Sketches of various rotary compressor.

3316-1350-(P-4)(Q-9)(26)

P. T. O.

UNIT - I

2. A gas engine 'operating on the ideal Otto cycle has a compression ratio of 6:1. The pressure and temperature at the commencement of compression are 1 bar and 27°C. The heat added during the constant volume combustion process is 1170 kJ/kg. Determine the peak pressure and temperature, work output per kg of air and air-standard efficiency. Assume $C_v = 0.717$ kJ/kg K and $C_p = 1.004$ kJ/kg K. 15

3. What are the functional requirement of an injection system and describe the various types of solid injection system with their neat sketch. Also Discuss D-MPFI and L-MPFI injection system. 15

UNIT - II

4. Briefly explain the stages of combustion in SI engine elaborating the flame front propagation and explain various factors that influence the flame speed. 15

5. Explain the following : 15
- (i) thermo-syphon cooling system
 - (ii) forced circulation cooling system
 - (iii) evaporative cooling system
 - (iv) pressure cooling system

3316- (P-4)(Q-9)(26) (2)

UNIT - III

6. In a test of an oil engine under full load condition the following results were obtained. 15

IP = 33 kW

Brake power = 27 kW

Fuel used = 8 kg/hour

Rate of flow of water through gas calorimeter = 12 kg/min

Cooling water flow rate = 7 kg/min

Calorific value of fuel = 43 MJ/kg

Inlet temperature of cooling water = 15°C

Outlet temperature of cooling water = 75°C

Inlet temperature of water to exhaust gas calorimeter = 15°C

Outlet temperature of water to exhaust gas calorimeter = 55°C

Final temperature of the exhaust gases = 80°C

Room temperature = 17°C

Air fuel ratio on mass basis = 20

Mean specific heat of exhaust gas = 1 kJ/kgK

Specific heat of water = 4.18 kJ/kgK

Draw heat balance sheet and estimate thermal efficiency and mechanical efficiency.

3316- (P-4)(Q-9)(26) (3)

P. T. O.

7. Describe catalytic converters. What are the alternative power plants considered as good from emission point of view ? 15

UNIT - IV

8. Discuss briefly the methods employed for improvement of thermal efficiency of open cycle gas turbine plant. Also describe multi-stage compression with inter-cooling. State also its merits and demerits. 15
9. Sketch various parts of centrifugal compressor. Using velocity diagram derive equation for work, power and isentropic efficiency of centrifugal compressor. 15

Roll No.

3079

**B. Tech. 4th Semester (Bio-Tech)
Examination – May, 2026**

ORGANIZATIONAL BEHAVIOUR

Paper : HSMC-02-G

Time : Three Hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Answer the following questions in short : $2.5 \times 6 = 15$

- (a) Explain the nature of Management.
- (b) Define organizational Behavior.
- (c) What is Communication ?
- (d) Define Leadership.
- (e) What is organizational structure ?
- (f) Define Planning.

3079-8950-(P-3)(Q-9)(26)

P. T. O.

UNIT - I

2. What do you understand by Management ? Explain in brief the main functions of Management. 15
3. What is planning ? State what advantages does planning confer to an organization ? 15

UNIT - II

4. Explain the concept of organizational Behaviour. Discuss its importance and relationship with other fields. 15
5. Define perception. Explain their determinants and applications in organizational Behaviour. 15

UNIT - III

6. Define group and Team. Explain the stages of group development and difference between team and group. 15
7. What is Leadership ? Discuss the concept, functions and qualities of an effective Leader. 15

UNIT - IV

8. Define Organizational structure. Explain the types of organizational structure and their impact on human behaviour. 15
9. What is Organizational Change ? Discuss the factors affecting organizational change and resistance to change. 15