Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

END SEM/~~RE-EXAM~~ EXAMINATION MAY / ~~JUNE~~ 2025

Program: Third Year B.Tech. Mechanical Engineering **Duration: 03 Hrs**

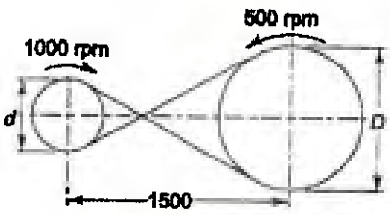
Course Code: PC–BTM612 **Maximum Points: 100**

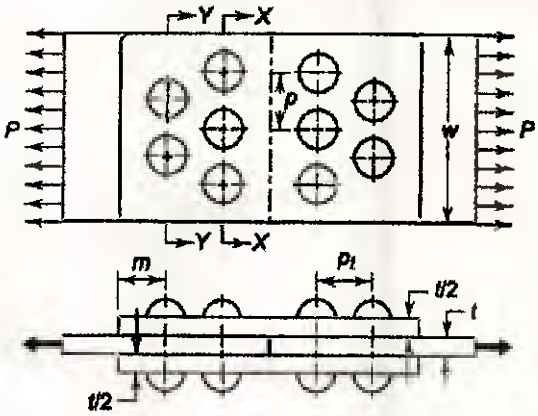
Course Name: Machine Design **Semester: VI**

13/5/25

Notes: 1. Solve any **FIVE** questions.
2. Each question carries equal marks.
3. Assume suitable data wherever necessary and justify the same.
4. Use of **Machine Design Data Book** by **V. B. Bhandari** is permitted.

Q.No.	Questions	Points	CO	BL	Module No.
1	a) Explain ergonomic considerations in product. b) Explain Sequential Design Process. c) Explain briefly the selection of factor of safety in engineering design. d) Define standardization. State the standards used in machine design.	05 05 05 05	3	2	1
2	a) Two rods, made of plain carbon steel 40C8 (S_{yt} = 380 N/mm^2), are to be connected by means of a cotter joint. The diameter of each rod is 50 mm and the cotter is made from a steel plate of 15 mm thickness. Calculate the dimensions of the socket end making the following assumptions: (i) the yield strength in compression is twice of the tensile yield strength; and (ii) the yield strength in shear is 50% of the tensile yield strength. The factor of safety is 6. b) Derive the expression for torque requirement for lifting the load.	12 08	1	5	2
3	a) A 40 mm diameter shaft is made of steel 50C4 (S_{ut} = 660 N/mm^2) 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 the endurance limit of the shaft. b) Explain Soderberg and Goodman design criteria.	10 10	1	3	3
4	a) A transmission shaft is supported between two bearings, which are 750 mm apart. Power is supplied to the shaft through a coupling, which is located to the left of the left-hand bearing. Power is transmitted from the shaft by means of a belt pulley, 450 mm in diameter, which is located at a distance of 200 mm	15	2	4	4

	to the right of the left-hand bearing. The weight of the pulley is 300 N and the ratio of the belt tension of tight and slack sides is 2:1. The belt tensions act in vertically downward direction. The shaft is made of steel FeE 300 (S_{yt} = 300 N/mm^2) and the factor of safety is 3. Determine the shaft diameter, if it transmits 12.5 kW power at 300 rpm from the coupling to the pulley. Assume ($S_{sy} = 0.5S_{yt}$). b) A shaft, 40 mm in diameter, is transmitting 35 kW power at 300 rpm by means of Kennedy keys of 10 X 10 mm cross-section. The keys are made of steel 45C8 ($S_{yt} = S_{yc}$ = 380 N/mm^2) and the factor of safety is 3. Determine the required length of the keys.	05			
	a) A helical compression spring is used to absorb the shock. The initial compression of the spring is 30 mm and it is further compressed by 50 mm while absorbing the shock. The spring is to absorb 250 J of energy during the process. The spring index can be taken as 6. The spring is made of patented and cold-drawn steel wire with an ultimate tensile strength of 1500 N/mm^2 and modulus of rigidity of 81 370 N/mm^2. The permissible shear stress for the spring wire should be taken as 30% of the ultimate tensile strength. Design the spring and calculate: (i) wire diameter; (ii) mean coil diameter; (iii) number of active turns; (iv) free length; and (v) pitch of the turns.	12			
5	b) Explain and derive the expression for nipping phenomenon in leaf spring.	08	2	4	5
	a) The layout of a crossed leather belt drive is shown in Fig.. The belt, 6 mm thick, transmits 7.5 kW and operates at a velocity of 13 m/s approximately. The coefficient of friction is 0.3 and the permissible tensile stress for the belt material is 1.75 N/mm^2. The density of leather is 0.95 g/cc. Calculate (i) the diameters of pulleys; (ii) the length and width of the belt and (iii) belt tensions on the tight and loose sides.  	12			
6	b) Explain polygon effect in chains.	08	2	5	6

	a) Derive the expression for primary and secondary shear forces subjected to shear for eccentrically loaded bolted joints. b) Two flat plates subjected to a tensile force P are connected together by means of double-strap butt joint as shown in Fig.. The force P is 250 kN and the width of the plate w is 200 mm. The rivets and plates are made of the same steel and the permissible stresses in tension, compression and shear are 70, 100 and 60 N/mm^2 respectively. Calculate: (i) the diameter of the rivets; (ii) the thickness of the plates; (iii) the dimensions of the seam, viz., p, pt and m; and (iv) the efficiency of the joint.  	10			
7		10	2	4	7

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Munshi Nagar, Andheri (W) Mumbai – 400058

~~END-SEM~~/RE-EXAM EXAMINATION ~~MAY~~ / JUNE 2025

Program: Third Year B.Tech. Mechanical Engineering Sem VI

Duration: 03 Hrs

Course Code: PC–BTM612

Maximum Points: 100

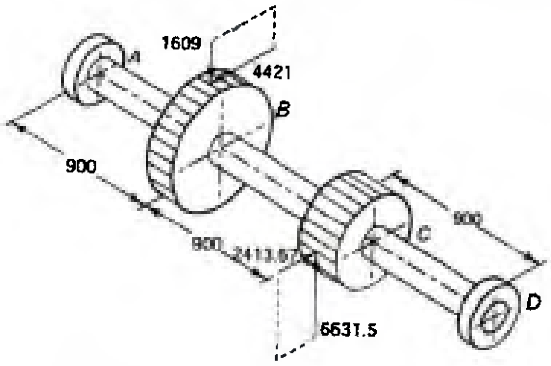
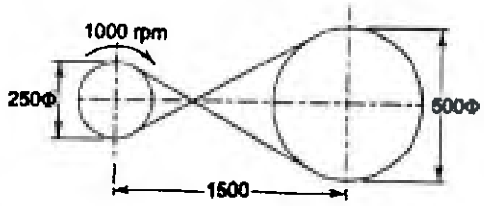
Course Name: Machine Design

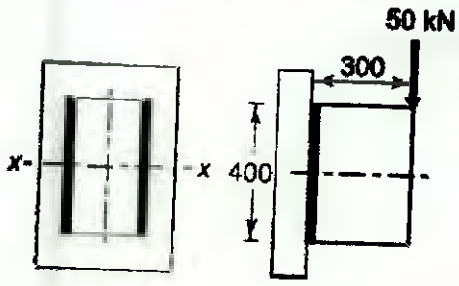
Semester: VI

26/6/25

Notes: 1. Solve any **FIVE** questions.
2. Each question carries equal marks.
3. Assume suitable data wherever necessary and justify the same.
4. Use of **Machine Design Data Book** by **V. B. Bhandari** is permitted.

Q.No.	Questions	Points	CO	BL	Module No.
1	a) Explain Morgan's theory for asthetic considerations in product. b) Explain Simultaneous Design Process. c) What are the modes of failure of a component? d) Draw stress strain diagram for ductile materials.	05 05 05 05	3	2	1
2	a) Two rods are connected by means of a cotter joint. The inside diameter of the socket and outside diameter of the socket collar are 50 and 100 mm respectively. The rods are subjected to a tensile force of 50 kN. The cotter is made of steel 30C8 (Syt = 400 N/mm^2) and the factor of safety is 4. The width of the cotter is five times of thickness. Calculate: (i) width and thickness of the cotter on the basis of shear failure; and (ii) width and thickness of the cotter on the basis of bending failure b) Derive the expression for torque requirement for lifting the load.	12 08	1	5	2
3	a) A 25 mm diameter shaft is made of forged steel 30C8 (Sut = 600 N/mm2). There is a step in the shaft and the theoretical stress concentration factor at the step is 2.1. The notch sensitivity factor is 0.84. Determine the endurance limit of the shaft if it is subjected to a reversed bending moment. b) Explain Soderberg and Goodman design criteria.	10 10	1	3	3
4	a) The layout of an intermediate shaft of a gear box supporting two spur gears B and C is shown in Fig.. The shaft is mounted on two bearings A and D. The pitch circle diameters of gears B and C are 900 and 600 mm respectively. The material of the shaft is steel FeE 580 (Sut = 770 and Syt = 580 N/mm^2). The	15	2	4	4

	factors kb and kt of ASME code are 1.5 and 2.0 respectively. Determine the shaft diameter using the ASME code. Assume that the gears are connected to the shaft by means of keys.  				
	b) The standard cross-section for a flat key, which is fitted on a 50 mm diameter shaft. is 16 X 10 mm. The key is transmitting 475 N-m torque from the shaft to the hub. The key is made of commercial steel (S_{yt} = S_{yc} = 230 N/mm^2). Determine the length of the key, if the factor of safety is 3.	05			
	a) A direct reading tension spring balance consists of a helical tension spring, which is attached to a rigid support at one end and carries masses at the other free end. The pointer attached to the free end moves on a scale and indicates the mass. The length of the scale is 100 mm, which is divided into 50 equal divisions. Each division on the scale indicates 0.5 kg. The maximum capacity of the spring balance is 25 kg. The spring index is 6. The spring is made of an oil-hardened and tempered steel wire of Grade-SW (G = 81370 N/mm^2). The permissible shear stress in the spring wire is recommended as 50% of the ultimate tensile strength. Design the spring and give its specifi cations.	12			
5	b) Explain and derive the expression for nipping phenomenon in leaf spring.	08	2	4	5
	a) The layout of a crossed leather belt drive transmitting 7.5 kW is shown in Fig.. The mass of the belt is 0.55 kg per metre length and the coefficient of friction is 0.30. Calculate  	12			
6		08	2	5	6

	(i) the belt tensions on the tight and loose sides, and (ii) the length of the belt. b) Explain Simplex and Duplex type roller chain with designations.				
7	a) Derive the expression for eccentric load perpendicular to axis of bolt. b) A bracket is welded to the vertical plate by means of two fillet welds as shown in Fig.. Determine the size of the welds, if the permissible shear stress is limited to 70 N/mm^2. 	10 10	2	4	7

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END SEM/~~RE-EXAM~~ EXAMINATION MAY / ~~JUNE~~ 2025

Program: BTECH (MECHANICAL ENGG.) T.Y. B.Tech Sem VI

Duration: 3hrs

Course Code: PC-BTM606

Maximum Points: 100

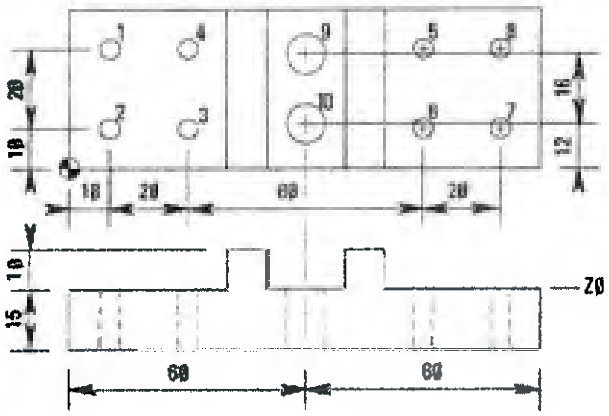
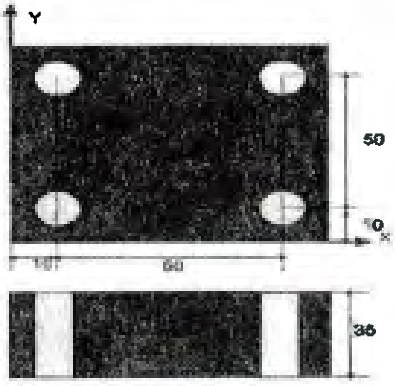
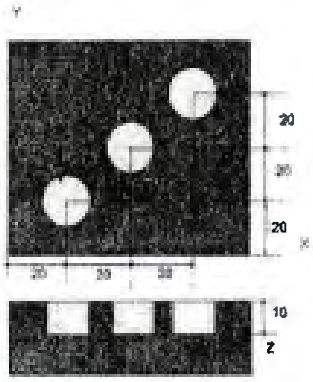
Course Name: CAD/CAM/CIM

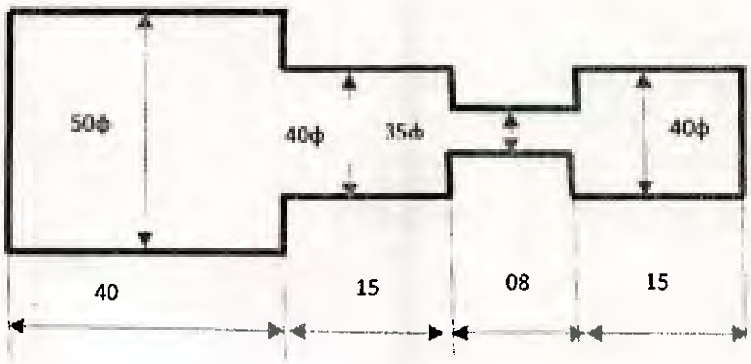
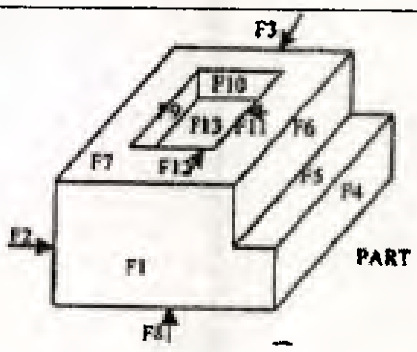
Semester: VI

Important Notes:

- Solve any five questions out of seven
- Figures to the right indicates full marks
- Assume suitable data wherever necessary

Q.No.	Questions	Points	CO	BL	PI
Q.1 (a)	1. Triangle ABC has vertices at A(1,3),B(5,5),C(3,7). It is desired to reflect through the line y= − x + 4y. Calculate the new vertices of the triangle and show the results graphically. 2. Triangle XYZ has vertices at X(0,0),Y(2,3),Z(4,1). Reflect the triangle through the line y = x+1. Find the coordinates of the reflected triangle and show the result graphically.	[10]	1	1	3.2.1
(b)	Explain concurrent engineering with neat figure?	[04]	2,4	3	5.2.1
(c)	Explain z-buffer Algorithm with figure.	[06]	3	3	5.2.1
Q.2 (a)	A triangle is defined by 3 vertices A (0,1,2), B (1,3,2), C (2,2,1). Find the final coordinates after it is rotated by 90 degrees around a line joining the points (2,0,1) and (2,2,3).	[10]	2	3	3.2.1
(b)	Construct a B-spline curve for open uniform vectors with n=4 and K= 3 with polygon vertices: $P_0(0, 0)$, $P_1(1, 2)$, $P_2(3, 5)$, $P_3(5, 4)$, $P_4(6, 1)$	[10]	1	1	3.2.1
Q.3 (a)	What is Adaptive Control (AC)? Explain the sources of variability for AC in machining conditions along with neat sketches? Also explain Adaptive Control Optimization (ACO) & Adaptive Control Constraint (ACC) with neat block diagrams?	[10]	3	3	5.2.1
(b)	Explain Generative CAPP & CAQC with neat sketches?	[10]	2,3,4	1	3.2.1

Q.4 (a)	 **Fig.a** Formulate a CNC program for the given fig.a using G81 Canned Cycle (For holes 1 to 8) & G83 Canned Cycle (For holes 9 to 10). Also use G98 and G99 code along with G81 & G83 canned cycles.	[05]	4	3	5.2.1
(b)	 Fig.d • What is G83 cycle used for? Write & explain the G83 cycle format? Formulate a CNC program for the given fig.d using G83 Canned Cycle	[05]	1	2	5.2.1
(c)	 **Fig.C**	[10]	3	3	5.2.1

	Formulate a CNC program for the given fig. C using G82 Counter boring cycle.				
(d)	 **Fig.B** Formulate a CNC program for the Grooving operation at 8 mm slot given in fig.b using G75 Grooving Cycle.				
Q.5 (a)	Explain the complete Design for Assembly (DFA) guidelines along with neat figures?	[10]	3	3	5.2.1
(c)	 **Fig.E** For the object shown above in Fig.E use the graph based feature recognition approach to achieve the following • Develop the AAG of the given object • Give the matrix representation of the AAG • Recognize the features in this object	[10]	3	3	5.2.1
Q.6	Write a C++ program for line with following 2D transformations using class & object • Translation • Scaling • Rotation • Reflection	[20]	2,4	3	5.2.1

	• Shearing Insert comments wherever necessary.				
Q.7	Write Short Notes on (Any Three) • Graphics Standards • Computer Integrated Manufacturing (CIM) • Augmented Reality • Virtual Manufacturing • Structured Query Language (SQL)	[20]	3,4	2	5.2.1, 3.2.1

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~~END SEM~~ T.Y /RE-EXAM EXAMINATION ~~MAY~~ / JUNE 2023

Program: BTECH (MECHANICAL ENGG.)

Course Code: PC-BTM606

Course Name: CAD/CAM/CIM

Duration: 3hrs

Maximum Points: 100

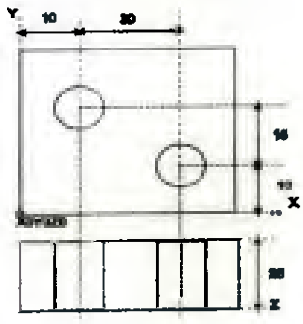
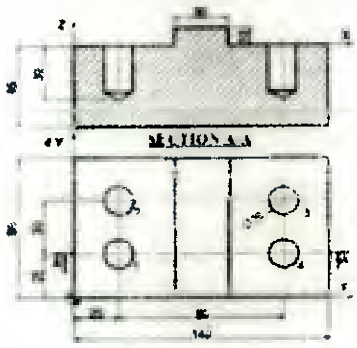
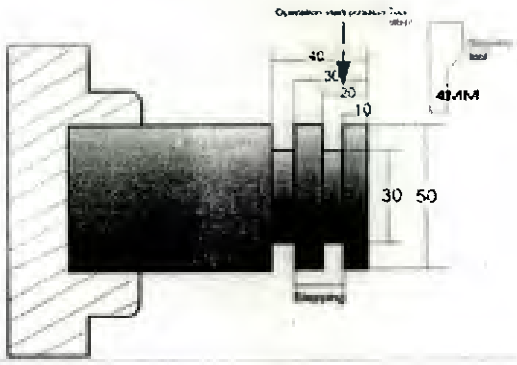
Semester: VI

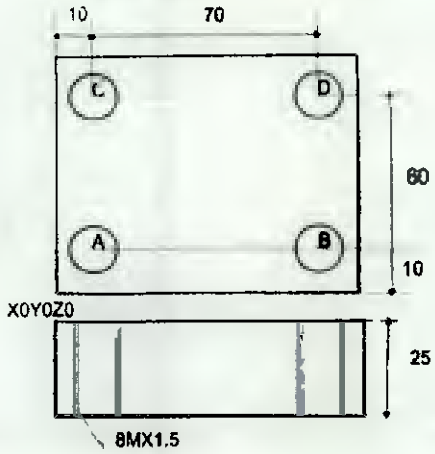
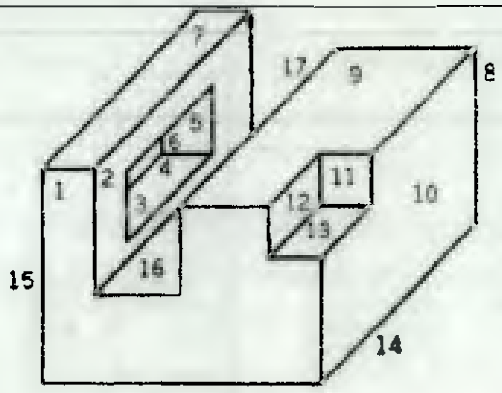
24/6/23

Important Notes:

- Solve any five questions out of seven
- Figures to the right indicates full marks
- Assume suitable data/dimensions wherever necessary

Q.No.	Questions	Points	CO	BL	PI
Q.1 (a)	1. An equilateral triangle ABC with length of side 10 units each is to be transformed into an isosceles triangle A'B'C with altitude 2.5 times the altitude of equilateral triangle. Coordinates of point A is (10, 5). Find the resultant transformation 2. Triangle LMN has vertices at L(−2,4), M(0,6), N(2,4). It is reflected through the line y=2x+1.Calculate the coordinates of the reflected triangle and represent it graphically.	[10]	1	1	3.2.
(b)	Explain concurrent engineering with neat figure?	[04]	2,4	3	5.2.
(c)	Explain Cohen Sutherland Algorithm with figure.	[06]	3	3	5.2
Q.2 (a)	A triangle is defined by 3 vertices A (2, -1, 3), B (4, 0, 2), C (3, 1, 4). Find the final coordinates after it is rotated by 30 degrees around a line joining the points (1,1,0) and (2,2,1).	[10]	2	3	3.2
(b)	Construct a B-spline curve for open uniform vectors with n=5 and K=4 with polygon vertices: $Q_0(0,1)$, $Q_1(2,3)$, $Q_2(4,6)$, $Q_3(6,5)$, $Q_4(7,2)$, $Q_5(8,0)$	[10]	1	1	3.2
Q.3 (a)	What is Adaptive Control (AC)? Explain the sources of variability for AC in machining conditions along with neat sketches? Also explain Adaptive Control Optimization (ACO) & Adaptive Control Constraint (ACC) with neat block diagrams?	[10]	3	3	5.

(b)	Explain Generative CAPP & CAQC with neat sketches?	[10]	2,3,4	1	3.2.1
Q.4 (a)	 **Fig.a** Formulate a CNC program for the given fig.a using G81 & G85 Canned Cycle for drilling & reaming operation.	[05]	4	3	5.2.1
(b)	 **FIG.D** • Formulate a CNC program for the given fig.d using G83 Canned Cycle?	[05]	1	2	5.2.1
(c)	 **Fig.C** Write a CNC program for Groove cutting cycle for fig.c	[05]	3	3	5.2.1

(d)	 **FIG-E** Write a CNC program for the figure E using G84 cycle?	[05]	3	3	5.2.1
Q.5 (a)	Explain the complete procedure for Design for Assembly (DFA) step by step along with neat figures?	[10]	3	3	5.2.1
(b)	 **Fig.E** For the object shown above in Fig.E use the graph based feature recognition approach to achieve the following • Develop the AAG of the given object • Give the matrix representation of the AAG • Recognize the features in this object	[10]	3	3	5.2.1
Q.6	Write a C++ program for line with following 2D transformations using class & object • Translation • Scaling • Rotation	[20]	2,4	3	5.2.1

	• Reflection • Shearing Insert comments wherever necessary.				
Q.7	Write Short Notes on (Any Three) • Graphics Standards • Computer Integrated Manufacturing (CIM) • Augmented Reality • Virtual Manufacturing • Structured Query Language (SQL)	[20]	3,4	2	5.2.1, 3.2.1

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SARDAR PATEL COLLEGE OF ENGINEERING

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PREVIOUS SEMESTER EXAMINATION JUNE 2025 – R18

Program: BTECH (MECHANICAL ENGG.) T.Y. Sem VI

Course Code: PC-BTM606

Course Name: CAD/CAM/CIM

Duration: 3hrs

Maximum Points: 100

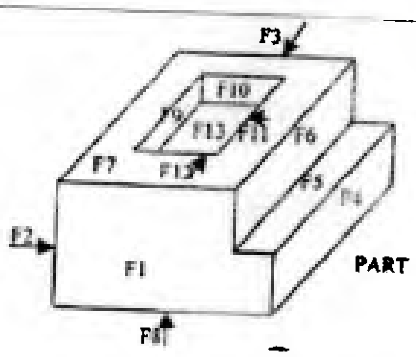
Semester: VI

Important Notes:

24/6/25

- Solve any five questions out of seven
- Provide figures wherever necessary
- Figures to the right indicates full marks
- Assume suitable data/dimensions wherever necessary

Q.No.	Questions	Points	CO	BL	PI
Q.1 (a)	1. A triangle having vertices A(2,3) B(6,3) & C(4,8) is reflected about a line Y = 3x + 4. Find the final position of the triangle. 2. Triangle LMN has vertices at L(−2,4), M(0,6), N(2,4). It is reflected through the line y=2x+1.Calculate the coordinates of the reflected triangle and represent it graphically.	[10]	1	1	3.2.1
(b)	Explain how PLM enables concurrent engineering with neat figure?	[04]	2,4	3	5.2.1
(c)	Explain Circle Algorithm with neat figure.	[06]	3	3	5.2.1
Q.2 (a)	A triangle is defined by 3 vertices A (0,2,1) B (2,3,0) C (1,2,1). Find the final coordinates after it is rotated by 45 degree around a line joining the points (2,2,2) and (1,1,1)	[10]	2	3	3.2.1
(b)	Explain the following properties of Bezier curve with neat sketches • Partition of unity • Variation Diminishing Property • Invariant under Affine Transformations • C^0 & C^1 Continuity • Convex Hull	[10]	1	1	3.2.1
Q.3 (a)	What is Adaptive Control (AC)? Explain the sources of variability for AC in machining conditions along with neat sketches? Also explain Adaptive Control	[10]	3	3	5.2.1

	Optimization (ACO) & Adaptive Control Constraint (ACC) with neat block diagrams?				
(b)	Explain the working principle of velocity & position feedback in CNC machines with neat sketches?	[10]	2,3,4	1	3.2.1
Q.4 (a)	Explain Servomechanism in CNC machines with neat sketch?	[05]	4	3	5.2.1
(b)	Explain Group Technology with neat sketches?	[05]	1	2	5.2.1
(c)	Explain groove cutting cycle with its format and example?	[05]	3	3	[illegible]2.1
(d)	Explain back boring cycle with its format and example?	[05]	3	3	5.2.1
Q.5 (a)	Explain the complete procedure for Design for Assembly (DFA) step by step along with neat figures?	[10]	3	3	5.2.1
(b)	 **Fig.E** For the object shown above in Fig.E use the graph based feature recognition approach to achieve the following • Develop the AAG of the given object • Give the matrix representation of the AAG • Recognize the features in this object	[10]	3	3	5.[illegible].1
Q.6	Write a C++ program for line with following 2D transformations using class & object • Translation • Scaling • Rotation • Reflection	[20]	2,4	3	5.2.1

	• Shearing Insert comments wherever necessary.				
Q.7	Write Short Notes on (Any Three) • Graphics Standards • Computer Integrated Manufacturing (CIM) • Augmented Reality • Virtual Manufacturing • Structured Query Language (SQL)	[20]	3,4	2	5.2.1 3.2.1

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Munshi Nagar, Andheri (W) Mumbai – 400058

End Semester Examination May-2025

T.Y. Sem VI

Program: B. Tech Mechanical **Duration: 3 Hours**

Course Code: PC-BTME611 **Maximum Points: 100**

Course Name: Refrigeration and Air-Conditioning. **Semester: VI**

Instructions:

1) **Question number ONE is compulsory and solve any FOUR questions out of remaining SIX**
2) **Use of refrigerant properties table and psychrometric chart is permitted.**
3) **Use of steam table is permitted.**
4) **Assume suitable data, mention it and justify the same.**

19/5/25

Q.No.	Questions	Points	CO	BL	Module Number
1(a)	Discuss the effect of evaporator pressure and condenser pressure on the performance of the vapour compression cycle.	05	1	1	1
1(b)	Draw neat schematic diagram and T-s diagram for Boot-strap air refrigeration cycle.	05	1	1	1
1(c)	Define Effective temperature. Enlist the factors governing effective temperature.	05	3	1	7
1(d)	Define the COP of the Vapour Absorption Refrigeration System. Derive an equation for the maximum COP of a heat-heat-operated machine.	05	3	1	3
2(a)	A commercial refrigerator using R-134a operates on the simple saturation cycle with saturated suction and discharge temperatures of -24°C and 54°C, respectively. **(Solve only by using properties table for R-134a)** (i) Calculate the COP and power required to run the compressor per ton of refrigeration. (ii) If the liquid is subcooled by 10°C in the condenser, calculate the COP and the power required per ton of refrigeration (iii) If the liquid is subcooled in a regenerative heat exchanger with superheating of vapour by 30°C, what is the increase in COE and decrease in power required?	12	2	3,4	1
2(b)	What are ozone depletion potential (ODP) and global warming potential (GWP)? How refrigerants are linked to ODP and GWP. How does the ozone layer get depleted by the use of CFCS? Explain in detail.	08	1	1,2	2

3(a)	Describe the desirable properties of ideal refrigerants.	10	3	1	2
3(b)	Draw a neat sketch of a reduced ambient air refrigeration system and explain its working of it. Also write an equation for COP of the system including ram compression work.	10	1	1	1
4(a)	Explain practical single-effect water-lithium bromide absorption chiller	10	1	1,2	3
4(b)	The DBT and WBT of the sample of air 40°C and 30°C respectively and the barometer reads 1.00125 bar. Calculate the following without using the psychrometric chart. (i) Specific humidity (ii) Relative humidity (iii) DPT (iv) Density (iv) Enthalpy of atmospheric air.	10	4	3,4	4
5	Given for a conditioned space: Room sensible heat gain = 20 kW Room latent heat gain = 5 kW Inside design conditions = 25°C DBT, 50% RH Bypass factor of the cooling coil = 0.1 The return air from the space is mixed with the outside air before entering the cooling coil in the ratio of 4:1 by weight. Estimate the followings: (i) Apparatus dew point (ii) Condition of air leaving the cooling coil (iii) Dehumidified air quantity. (iv) Ventilation air mass and volume flow rates (v) Total refrigeration load on the air conditioning plant.	20	4	3,4	5
6(a)	Explain ASHRAE's thermal sensation scale for human comfort. Also, draw a neat sketch of the comfort chart.	10	3	1	7
6(b)	Explain various methods of duct design for air distribution in a centralised air conditioning plant.	10	3	1	8
7(a)	Explain the mechanism of body heat loss and the mathematical model of heat exchange between man and the environment.	10	3	1	[illegible]
7(b)	Investigate the effect of humidity on the density of moist air by computing the vapour density for an air-water vapour mixture at 26°C and relative humidities of 0, 50 and 100 per cent. Also, for each case, compare the values of the degree of saturation to the values of relative humidity.	10	3	3,4	4

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Munshi Nagar, Andheri (W) Mumbai – 400058

~~End-Semester~~ Examination ~~May~~-2025

T. Y. Re- June

Program: B. Tech Mechanical Sem VI

Course Code: PC-BTM611

Course Name: Refrigeration and Air-Conditioning.

Duration: 3 Hours

Maximum Points: 100

Semester: VI

25/6/25

Instructions:

1) **Question number ONE is compulsory and solve any FOUR questions out of remaining SIX**
2) **Use of refrigerant properties table and psychrometric chart is permitted.**
3) **Use of steam table is permitted.**
4) **Assume suitable data, mention it and justify the same.**

Q.No.	Questions	Points	CO	BL	Module Number
1(a)	Discuss the effect of superheating the vapour in the evaporator and sub-cooling the liquid in the condenser on the performance of the vapour compression cycle.	05	1	1	1
1(b)	Explain mechanism of depletion of ozone layer.	05	3	1	2
1(c)	Explain wet bulb temperature and thermodynamic wet bulb temperature.	05	3	1,2	4
1(d)	Moist air enters a chamber at 7°C DBT and 2.5°C thermodynamic WBT at a rate of 100 cmm. The barometric pressure is 1.01325 bar. While passing through the chamber, the air absorbs sensible heat at the rate of 100 kW and pics up 50 kg/h of saturated steam at 150°C. Determine the dry and wet bulb temperature of leaving air.	05	4	2	4
2(a)	Draw a neat sketch of a three-fluid refrigeration system and explain its working in detail.	08	1	1,2	3
2(b)	A commercial refrigerator using R-134a operates on the simple saturation cycle with saturated suction and discharge temperatures of -24°C and 54°C, respectively. **(Solve only by using properties table for R-134a)** (i) Calculate the COP and power required to run the compressor per ton of refrigeration. (ii) If the liquid is subcooled by 10°C in the condenser, calculate the COP and the power required per ton of refrigeration (iii) If the liquid is subcooled in a regenerative heat exchanger with superheating of vapour by 30°C, what is the increase in COE and decrease in power required?	12	2	3,4	1

3(a)	Write the complete designation system of refrigerants by giving an example of each category of refrigerant.	10	3	1	2
3(b)	Draw a neat sketch of a regenerative air refrigeration system and explain its working of it. Also write an equation for COP of the system including ram compression work.	10	1	1	1
4(a)	Explain practical double-effect water-lithium bromide absorption chiller	10	1	1,2	3
4(b)	The DBT and WBT of the sample of air 35°C and 23°C respectively and the barometer reads 1.00125 bar. Calculate the following without using the psychrometric chart. (i) Specific humidity (ii) Relative humidity (iii) DPT (iv) Density (iv) Enthalpy of atmospheric air.	10	4	3,4	4
5	In an industrial application for winter air conditioning an air washer is used with heated water spray followed by a reheater. The room sensible heat factor may be taken as unity. The design conditions are: Outside: 0°C DBT and dry Inside :22°C DBT and 50% RH Room heat loss: 703 kW The following quantities are known from the summer design. Ventilation air: 1600 cmm Supply air: 2800 cmm Spray water quantity: 500 kg/min The air washer saturation efficiency is 90 percent. The make-up water is available at 20°C. Calculate (i) The supply air condition to space (ii) The entering and leaving air conditions at the spray chamber. (iii) The entering and leaving spray water temperatures. (iv) The heat added to the spray water. (v) The reheat, if necessary.	20	4	3,4	
6(a)	Explain ASHRAE's thermal sensation scale for human comfort. Also, draw a neat sketch of the comfort chart.	10	3	1	7
6(b)	Investigate the effect of humidity on the density of moist air by computing the vapour density for an air-water vapour mixture at 26°C and relative humidities of 0, 50 and 100 per cent. Also, for each case, compare the values of the degree of saturation to the values of relative humidity.	10	3	3,4	4
7(a)	Explain various methods of duct design for air distribution in a centralised air conditioning plant.	10	3	1	6
7(b)	Explain the mechanism of body heat loss and the mathematical model of heat exchange between man and the environment.	10	3	1	7

- Find Earliest Start time, Earliest Finish Time of each activity.
- Find Latest Start and Latest Finish time of each activity.
- Find the Float of each activity.
- Find Probability of completion of project in 4 days lesser than project duration.

Activity	Time (days)		
	Optimistic	Most Likely	Pessimistic
1-2	2	6	9
2-3	8	12	22
2-4	4	8	15
2-5	4	10	21
3-4 dummy	-	-	-
3-7	3	6	15
4-6	7	11	13
5-6	3	8	18
6-7	2	4	12
7-8	2	5	7

Q5B Refer the following project data

- Draw the Project Network.
- Find Expected time of each activity.
- Find Variance of Each activity
- Find and show Critical Path
- Find Project duration
- Find Earliest Occurrence and Latest Occurrence of each Event.
- Find Earliest Start time, Earliest Finish Time of each activity.
- Find Latest Start and Latest Finish time of each activity.
- Find the Float of each activity.
- Find Probability of completion of project in 2 days lesser than project duration.

Job (i-j)	Duration (days)		
	Optimistic (t_o)	Most likely (t_m)	Pessimistic (t_p)
1-2	3	6	15
1-6	2	5	14
2-3	6	12	30
2-4	2	5	8
3-5	5	11	17
4-5	3	6	15
6-7	3	9	27

10 CO3 5 5

	A	B	C	D	E
1	10	5	9	18	11
2	13	9	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10

Q7B The top management of a company is considering the problem of marketing a new product. The investment of fixed cost for NPD is Rs 15000. NPD programme has following three uncertain factors Sale price, variable cost, sale volume. Product has a life of only one year. Management has collected a data following data.

Unit Sale Price Rs	Probability	Unit Variable cost Rs.	Probability	Sales Volume	Probability
14	0.35	2	0.3	3000	0.25
15	0.50	3	0.5	4000	0.40
16	0.15	4	0.20	5000	0.35

Find the average profit and percentage rate of return from the above investment on the basis of 10 trials of Monte Carlo Simulation. Use following random numbers.

A. 39,59,26,18,78,06,90,61,20,47
B. 91,75,43,89,46,83,06,77,20,61
C. 85,46,95,58,21,35,49,12,71,05

10 CO2 5 7

	A	B	C	D	E
1	10	5	9	18	11
2	13	9	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10

Q7B The top management of a company is considering the problem of marketing a new product. The investment of fixed cost for NPD is Rs 15000. NPD programme has following three uncertain factors Sale price, variable cost, sale volume. Product has a life of only one year. Management has collected a data following data.

Unit Sale Price Rs	Probability	Unit Variable cost Rs.	Probability	Sales Volume	Probability
14	0.35	2	0.3	3000	0.25
15	0.50	3	0.5	4000	0.40
16	0.15	4	0.20	5000	0.35

Find the average profit and percentage rate of return from the above investment on the basis of 10 trials of Monte Carlo Simulation. Use following random numbers.

A. 39,59,26,18,78,06,90,61,20,47
B. 91,75,43,89,46,83,06,77,20,61
C. 85,46,95,58,21,35,49,12,71,05

10 | CO2 | 5 | 7

Pg 5/5

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Munshi Nagar, Andheri (W) Mumbai – 400058

T.Y. **~~END SEM~~ / RE EXAMINATION - ~~MAY 2025~~** / June 2025

Program: BTech Mechanical Sem VI

Duration: 3hr

Course Code: PC-BTM605

Maximum Points:100

Course Name: Manufacturing Planning and Control

Semester: VI

23/6/25

Note:

Que I is compulsory Solve any 4 questions out of remaining

ND Tables are permitted.

Q No	Question	Points	CO	BL	Module
Q1	• State the benefits of MPC to customers, employers and employees. • Prepare the list of Lean tools and explain them. • State the Methods of Forecasting and explain anyone method. • Prepare a short note on MRP • Illustrate the Design for Manufacturing concept	20	CO1, CO2, CO3, CO4	4	1,2,4,
Q2A	Numerical on Sales Forecasting using Regression equation. The annual sales of company is given below. Year — Sales in Rs 2020 — 50000 2021 — 65000 2022 — 75000 2023 — 52000 2024 — 72000 By the method of least square find the tread value of for each of the five years. Also estimate the sales annual sales for year 2025. State the objectives of Short term forecasting and Limitations of forecasting .	10	CO1, CO2	5	1
Q2B	What are the factors affecting under capacity planning and over capacity planning? Refer the table of total material requirements as follows. Week: 1, 2, 3, 4, 5, 6, 7, 8 Requirements: 200, 400, 900, 500, 200, 200, 200, 1400	10	CO2, CO4	5	2,3

END SEM / RE EXAMINATION - MAY 2025

	The annual demand for this end item is estimated to be 25,000 units over a 50 week per year schedule, or an average of 500 units per week. It costs Rs. 800 to change over the machines in the final assembly department to this end item when a production lot is begun. It costs Rs. 1.10 per unit when one unit of this product must be carried in inventory from one week to another; therefore, when one unit of this product is in ending inventory, it must be carried over as beginning inventory in the next week and incurs the Rs. 1.10 per unit carrying cost. Determine which of these lots sizing methods results in the least carrying and changeover (or order) costs for the eight week schedule : (a) Lot for Lot (LFL), (b) Economic Order Quantity (EOQ)				
Q3A	State and Explain Seven wastes according to JIT. Draw the cost curves of Inventory Management. Derive an Expression for Economic Order Quantity under Basic Inventory Model. Draw the Model and State the assumptions.	10	CO2, CO4	5	3,4
Q3B	A manufacturer needs 2000 units/annum. Ordering cost Rs 10 per order and carrying cost Rs0.16 per year per unit of average inventory. Purchase price is Rs1 per unit. Find EOQ and Total inventory cost. Discount of 5 percentage for purchase of 1000 units and Discount of 7 percentage for purchase of 2000 units are available. Give your recommendation. State the reasons of keeping the inventory.	10	CO2, CO4	5	3
Q4A	Use the graphical method and find the minimum total elapsed time, Idle time of each job for the given data. Prepare the Gantt chart to showcase the loading of the machine on common time scale. Show which job will be loaded first on each machine.	10	CO1, CO3	5	4

Job 1	Machines					
	Sequence	A	B	C	D	E
	Time in hrs	2	3	4	6	2
Job2	Sequence	C	A	D	E	B
	Time in hrs	4	5	3	2	6

Q4B	Find the optimal sequence to complete the following jobs on three machines. Find the Total elapsed time to complete all jobs. Find the idle time of each machine.	10	CO2	5	5

Machines	Jobs				
	J11	J2	J3	J4	J5
M1	6	8	7	10	6
M2	3	2	5	6	4

	M3	4	8	6	7	8				

Q5A

Refer the following project data.

- Draw the Project Network.
- Find Expected time of each activity.
- Find Variance of Each activity
- Find and show Critical Path
- Find Project duration
- Find Earliest Occurrence and Latest Occurrence of each Event.
- Find Earliest Start time, Earliest Finish Time of each activity.
- Find Latest Start and Latest Finish time of each activity.
- Find the Float of each activity.
- Find Probability of completion of project in 4 days lesser than project duration.

Activity	Time (days)		
	Optimistic	Most Likely	Pessimistic
1-2	2	5	8
2-3	8	11	20
2-4	4	7	16
2-5	4	9	20
3-4 dummy	-	-	-
3-7	3	5	13
4-6	7	10	13
5-6	3	7	17
6-7	2	3	10
7-8	2	4	6

Q5A		10	CO3		3,4, 6
Q5B	Draw the Break Even Analysis chart based on following points. Show Fixed Cost line Show Variable Cost line Show Total Cost Line Sales Revenue Line Show Break Even Point State the ways to lower the Break Even point. Refer the following Production scenario. Production Manager of a unit wants to know from what quantity he can use automatic machines as against the semiautomatic machines.	10	1,2	5	1,2

Data	Automatic	Semi-Automatic
Time for the Job	3 minutes	7 minutes

	Set up time	2 hours	1.5 hours				
	Cost per hour	Rs. 30	Rs. 12				

State the governing equation based on Break even analysis Technique.
State the quantities at which above machines can be useful.
Draw the graph and showcase the concept to be used for above decision making

Q6A A manufacturer of biscuits is considering four types of gift packs containing three types of biscuits. Orange cream OC , Chocolate cream CC, Wafors W, market research study conducted recently to assess the preferences of consumers shows the followings types of assortments to be in good demand. — 10 — CO2 — 5 — 6

Assort-ments	Contents	Selling Price per kg [Rs]
A	Not less than 40% of OC Not More Than 20% of OC Any Quantity of W	20
B	Not less than 20% of OC Not More Than 40% of OC Any quantity of W	25
C	Not less than 50% of OC Not more than 10% of CC Any quality of W	22
D	No Restrictions	12

For biscuits The manufacturing capacity and costs are given below.

Biscuits variety	Plant Capacity kg/day	Manufacturing cost Rs/Kg
OC	200	8
CC	150	9
W	150	7

Formulate a linear programming problem to find the production schedule which maximize the profits assuming no market restrictions.

Q6B A firm assembles and sells two different types of outboards motors, A and B , using four resources. The production details can be as follows. — 10 — CO2 — 5 — 6

Sr.No.	Resources	Capacity per month

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~~End-Semester~~ Examination ~~May~~-2025

T.Y. Re- June

Program: B. Tech Mechanical Sem VI

Duration: 3 Hours

Course Code: PC-BTM611

Maximum Points: 100

Course Name: Refrigeration and Air-Conditioning.

Semester: VI

25/6/25

Instructions:

1) **Question number ONE is compulsory and solve any FOUR questions out of remaining SIX**
2) **Use of refrigerant properties table and psychrometric chart is permitted.**
3) **Use of steam table is permitted.**
4) **Assume suitable data, mention it and justify the same.**

Q.No.	Questions	Points	CO	BL	Module Number
1(a)	Discuss the effect of superheating the vapour in the evaporator and sub-cooling the liquid in the condenser on the performance of the vapour compression cycle.	05	1	1	1
1(b)	Explain mechanism of depletion of ozone layer.	05	3	1	2
1(c)	Explain wet bulb temperature and thermodynamic wet bulb temperature.	05	3	1,2	4
1(d)	Moist air enters a chamber at 7°C DBT and 2.5°C thermodynamic WBT at a rate of 100 cmm. The barometric pressure is 1.01325 bar. While passing through the chamber, the air absorbs sensible heat at the rate of 100 kW and pics up 50 kg/h of saturated steam at 150°C. Determine the dry and wet bulb temperature of leaving air.	05	4	2	4
2(a)	Draw a neat sketch of a three-fluid refrigeration system and explain its working in detail.	08	1	1,2	3
2(b)	A commercial refrigerator using R-134a operates on the simple saturation cycle with saturated suction and discharge temperatures of -24°C and 54°C, respectively. **(Solve only by using properties table for R-134a)** (i) Calculate the COP and power required to run the compressor per ton of refrigeration. (ii) If the liquid is subcooled by 10°C in the condenser, calculate the COP and the power required per ton of refrigeration (iii) If the liquid is subcooled in a regenerative heat exchanger with superheating of vapour by 30°C, what is the increase in COE and decrease in power required?	12	2	3,4	1

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~~End Semester~~ **Examination ~~May~~ -2025**

June

3(a)	Write the complete designation system of refrigerants by giving an example of each category of refrigerant.	10	3	1	2
3(b)	Draw a neat sketch of a regenerative air refrigeration system and explain its working of it. Also write an equation for COP of the system including ram compression work.	10	1	1	1
4(a)	Explain practical double-effect water-lithium bromide absorption chiller	10	1	1,2	3
4(b)	The DBT and WBT of the sample of air 35°C and 23°C respectively and the barometer reads 1.00125 bar. Calculate the following without using the psychrometric chart. (i) Specific humidity (ii) Relative humidity (iii) DPT (iv) Density (iv) Enthalpy of atmospheric air.	10	4	3,4	4
5	In an industrial application for winter air conditioning an air washer is used with heated water spray followed by a reheater. The room sensible heat factor may be taken as unity. The design conditions are: Outside: 0°C DBT and dry Inside :22°C DBT and 50% RH Room heat loss: 703 kW The following quantities are known from the summer design. Ventilation air: 1600 cmm Supply air: 2800 cmm Spray water quantity: 500 kg/min The air washer saturation efficiency is 90 percent. The make-up water is available at 20°C. Calculate (i) The supply air condition to space (ii) The entering and leaving air conditions at the spray chamber. (iii) The entering and leaving spray water temperatures. (iv) The heat added to the spray water. (v) The reheat, if necessary.	20	4	3,4	
6(a)	Explain ASHRAE's thermal sensation scale for human comfort. Also, draw a neat sketch of the comfort chart.	10	3	1	7
6(b)	Investigate the effect of humidity on the density of moist air by computing the vapour density for an air-water vapour mixture at 26°C and relative humidities of 0, 50 and 100 per cent. Also, for each case, compare the values of the degree of saturation to the values of relative humidity.	10	3	3,4	4
7(a)	Explain various methods of duct design for air distribution in a centralised air conditioning plant.	10	3	1	6
7(b)	Explain the mechanism of body heat loss and the mathematical model of heat exchange between man and the environment.	10	3	1	7

END SEM / ~~RE-EXAMINATIO~~N - MAY 2025

	If Safety Stock , Fixed Lot size, Beginning inventory are 50, 70, 90 respectively, Prepare Master Production Schedule and comment on the same. Prepare the Diagram showing Basic Structure of Master Production Schedule and explain it.				
Q3A	Explain the various terms used in lean manufacturing with necessary diagrams. Derive an Expression for Economic Batch Quantity under Basic Inventory Model (EOQ Model With Uniform Replenishment). State the assumptions.	10	CO2, CO4	5	3,4
Q3B	The annual demand for the product is 64000 units. The buying cost per order is Rs10 and estimated cost of carrying one unit in stock for year is 20 percent. Price of product is Rs10 per unit. Discount of 2 percentage on purchase of 1000 units and Discount of 5 percentage on purchase of 5000 units are available. Give your recommendation. Explain ABC analysis with appropriate diagram.	10	CO2, CO4	5	3
Q4A	Use the graphical method and find the minimum total elapsed time, Idle time of each job for the given data. Prepare the Gantt chart to showcase the loading of the machine on common time scale. Show which job will be loaded first on each machine.	10	CO1, CO3	5	4

Job		Machines				
	Sequence	A	B	C	D	E
	Time in hrs	7	9	5	13	5
Job2	Sequence	B	C	A	D	E
	Time in hrs	11	9	7	5	13

Q4B	Find the optimal sequence to complete the following Tasks on three machines. Find the Total elapsed time to complete all Tasks. Find the idle time of each machine.	10	CO2	5	5

Machines	Tasks						
	A	B	C	D	E	F	G
M1	3	8	7	4	9	8	7
M2	4	3	2	5	1	4	3
M3	6	7	5	11	5	6	2

Q5A	Refer the following project data. • Draw the Project Network. • Find Expected time of each activity. • Find Variance of Each activity • Find and show Critical Path • Find Project duration • Find Earliest Occurrence and Latest Occurrence of each Event.	10	CO3	5	2,3, 6

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END SEM / ~~RE-EXAMINATION~~ - MAY 2025

T. Y.

Program: BTech Mechanical Sem VI

Duration: 3hr

Course Code: PC-BTM605

Maximum Points:100

Course Name: Manufacturing Planning and Control

Semester: VI

Note:

Que 1 is compulsory Solve any 4 questions out of remaining

ND Tables are permitted

21/5/25

Q.No.	Question	Points	CO	BL	Module
Q1	• State the functions of MPC and state their purposes. • Explain the MPS with suitable example • Prepare the list of approaches to cut down the cost per piece of product. • Differentiate between CPM and PERT. • Prepare the note on Simulation Technique	20	CO1, CO2, CO3, CO4	4	1,2,4,5
Q2A	Numerical on Sales Forecasting Find the trend of following data using the Least Square Method. Estimate the demand for Y8. Year / Demand in (1000) units Y1 / 85 Y2 / 75 Y3 / 80 Y4 / 72 Y5 / 65 Y6 / 60 Y7 / 55 State the objectives of Long term forecasting and Limitations of forecasting	10	CO1, CO2	5	1
Q2B	A manufacturing unit produces product M on a produce to stock basis. The estimated demand for the product M over the next six week are shown in the following Tables	10	CO2, CO4	5	2,3

Source of Demand	Weekly Demand of Product					
	1	2	3	4	5	6
Company			-	30	20	20
Warehouse			30	-	-	-
R&D			20	20	-	-
Customers	30	30	30	30	30	30

21/5

- Find Earliest Start time, Earliest Finish Time of each activity.
- Find Latest Start and Latest Finish time of each activity.
- Find the Float of each activity.
- Find Probability of completion of project in 4 days lesser than project duration.

Activity	Time (days)		
	Optimistic	Most Likely	Pessimistic
1-2	2	6	9
2-3	8	12	22
2-4	4	8	15
2-5	4	10	21
3-4 dummy	-	-	-
3-7	3	6	15
4-6	7	11	13
5-6	3	8	18
6-7	2	4	12
7-8	2	5	7

Q5B Refer the following project data

- Draw the Project Network.
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Job (i-j)	Duration (days)		
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1-2	3	6	15
1-6	2	5	14
2-3	6	12	30
2-4	2	5	8
3-5	5	11	17
4-5	3	6	15
6-7	3	9	27

10 CO3 5 5

	A	B	C	D	E
1	10	5	9	18	11
2	13	9	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10

Q7B The top management of a company is considering the problem of marketing a new product. The investment of fixed cost for NPD is Rs 15000. NPD programme has following three uncertain factors Sale price, variable cost, sale volume. Product has a life of only one year. Management has collected a data following data.

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15	0.50	3	0.5	4000	0.40
16	0.15	4	0.20	5000	0.35

Find the average profit and percentage rate of return from the above investment on the basis of 10 trials of Monte Carlo Simulation. Use following random numbers.

A. 39,59,26,18,78,06,90,61,20,47
B. 91,75,43,89,46,83,06,77,20,61
C. 85,46,95,58,21,35,49,12,71,05

10 CO2 5 7

Pg 5/5

	A	B	C	D	E
1	10	5	9	18	11
2	13	9	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10

Q7B The top management of a company is considering the problem of marketing a new product. The investment of fixed cost for NPD is Rs 15000. NPD programme has following three uncertain factors Sale price, variable cost, sale volume. Product has a life of only one year. Management has collected a data following data.

Unit Sale Price Rs	Probability	Unit Variable cost Rs.	Probability	Sales Volume	Probability
14	0.35	2	0.3	3000	0.25
15	0.50	3	0.5	4000	0.40
16	0.15	4	0.20	5000	0.35

Find the average profit and percentage rate of return from the above investment on the basis of 10 trials of Monte Carlo Simulation. Use following random numbers.

A. 39,59,26,18,78,06,90,61,20,47
B. 91,75,43,89,46,83,06,77,20,61
C. 85,46,95,58,21,35,49,12,71,05

10	CO2	5	7

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(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

T.Y. **~~END SEM~~ / RE EXAMINATION - ~~MAY 2025~~** / June 2025

Program: BTech Mechanical Sem VI

Duration: 3hr

Course Code: PC-BTM605

Maximum Points:100

Course Name: Manufacturing Planning and Control

Semester: VI

Note:

23/6/3

Que 1 is compulsory Solve any 4 questions out of remaining

ND Tables are permitted.

Q.N.	Question	Points	CO	BL	Module
Q1	• State the benefits of MPC to customers, employers and employees. • Prepare the list of Lean tools and explain them. • State the Methods of Forecasting and explain anyone method. • Prepare a short note on MRP • Illustrate the Design for Manufacturing concept	20	CO1, CO2, CO3, CO4	4	1,2,4.
Q2A	Numerical on Sales Forecasting using Regression equation. The annual sales of company is given below. Year — Sales in Rs 2020 — 50000 2021 — 65000 2022 — 75000 2023 — 52000 2024 — 72000 By the method of least square find the tread value of for each of the five years. Also estimate the sales annual sales for year 2025. State the objectives of Short term forecasting and Limitations of forecasting .	10	CO1, CO2	5	1
Q2B	What are the factors affecting under capacity planning and over capacity planning? Refer the table of total material requirements as follows. Week — 1, 2, 3, 4, 5, 6, 7, 8 Requirements — 200, 400, 900, 500, 200, 200, 200, 1400	10	CO2, CO4	5	2,3

END SEM / RE EXAMINATION - MAY 2025

	The annual demand for this end item is estimated to be 25,000 units over a 50 week per year schedule, or an average of 500 units per week. It costs Rs. 800 to change over the machines in the final assembly department to this end item when a production lot is begun. It costs Rs. 1.10 per unit when one unit of this product must be carried in inventory from one week to another; therefore, when one unit of this product is in ending inventory, it must be carried over as beginning inventory in the next week and incurs the Rs. 1.10 per unit carrying cost. Determine which of these lots sizing methods results in the least carrying and changeover (or order) costs for the eight week schedule : (a) Lot for Lot (LFL), (b) Economic Order Quantity (EOQ)				
Q3A	State and Explain Seven wastes according to JIT Draw the cost curves of Inventory Management. Derive an Expression for Economic Order Quantity under Basic Inventory Model. Draw the Model and State the assumptions.	10	CO2, CO4	5	3,4
Q3B	A manufacturer needs 2000 units/annum. Ordering cost Rs 10 per order and carrying cost Rs0.16 per year per unit of average inventory. Purchase price is Rs1 per unit. Find EOQ and Total inventory cost. Discount of 5 percentage for purchase of 1000 units and Discount of 7 percentage for purchase of 2000 units are available. Give your recommendation. State the reasons of keeping the inventory.	10	CO2, CO4	5	3
Q4A	Use the graphical method and find the minimum total elapsed time, Idle time of each job for the given data. Prepare the Gantt chart to showcase the loading of the machine on common time scale. Show which job will be loaded first on each machine.	10	CO1, CO3	5	4

Job		Machines				
Job 1	Sequence	A	B	C	D	E
	Time in hrs	2	3	4	6	2
Job2	Sequence	C	A	D	E	B
	Time in hrs	4	5	3	2	6

Q4B	Find the optimal sequence to complete the following jobs on three machines. Find the Total elapsed time to complete all jobs. Find the idle time of each machine.	10	CO2	5	5

Machines	Jobs				
	J11	J2	J3	J4	J5
M1	6	8	7	10	6
M2	3	2	5	6	4

	M3	4	8	6	7	8				

Refer the following project data.

- Draw the Project Network.
- Find Expected time of each activity.
- Find Variance of Each activity
- Find and show Critical Path
- Find Project duration
- Find Earliest Occurrence and Latest Occurrence of each Event.
- Find Earliest Start time, Earliest Finish Time of each activity.
- Find Latest Start and Latest Finish time of each activity.
- Find the Float of each activity.
- Find Probability of completion of project in 4 days lesser than project duration.

Activity	Time (days)		
	Optimistic	Most Likely	Pessimistic
1-2	2	5	8
2-3	8	11	20
2-4	4	7	16
2-5	4	9	20
3-4 dummy	-	-	-
3-7	3	5	13
4-6	7	10	13
5-6	3	7	17
6-7	2	3	10
7-8	2	4	6

Q5A		10	CO3		3,4, 6
Q5B	Draw the Break Even Analysis chart based on following points. Show Fixed Cost line Show Variable Cost line Show Total Cost Line Sales Revenue Line Show Break Even Point State the ways to lower the Break Even point. Refer the following Production scenario. Production Manager of a unit wants to know from what quantity he can use automatic machines as against the semiautomatic machines.	10	1,2	5	1,2

Data	Automatic	Semi-Automatic
Time for the Job	3 minutes	7 minutes

	Set up time: 2 hours; 1.5 hours Cost per hour: Rs. 30; Rs. 12 State the governing equation based on Break even analysis Technique. State the quantities at which above machines can be useful. Draw the graph and showcase the concept to be used for above decision making					
Q6A	A manufacturer of biscuits is considering four types of gift packs containing three types of biscuits. Orange cream OC , Chocolate cream CC, Wafors W, market research study conducted recently to assess the preferences of consumers shows the followings types of assortments to be in good demand.	10	CO2	5	6	

Assort-ments	Contents	Selling Price per kg [Rs]
A	Not less than 40% of OC Not More Than 20% of OC Any Quantity of W	20
B	Not less than 20% of OC Not More Than 40% of OC Any quantity of W	25
C	Not less than 50% of OC Not more than 10% of CC Any quality of W	22
D	No Restrictions	12

For biscuits The manufacturing capacity and costs are given below.

Biscuits variety	Plant Capacity kg/day	Manufacturing cost Rs/Kg
OC	200	8
CC	150	9
W	150	7

Formulate a linear programming problem to find the production schedule which maximize the profits assuming no market restrictions.

Q6B	A firm assembles and sells two different types of outboards motors, A and B , using four resources. The production details can be as follows.	10	CO2	5	6

Sr.No.	Resources	Capacity per month

	1.	Motor unit shop resource	400 Type A Units or 250 type B units or any linear combination of the two				
	2.	Type A gear and Drive Shop Resource	175 Type A units				
	3.	Type B gear and Drive shop Resource	225 Type B units				
	4.	Final Assembly resource	200 Type A units or 350 Type B units or any linear combination of the two.				

Type A units bring in a profit of Rs. 90 each and type B units, Rs.60 each. What should be the optimum product mix? Important note: Attach the graph wherever you solve the question.

Q7A Solve the following assignment problem where Wi , Ji are workers and jobs respectively. The cell values shows the cost of doing the job. State the name of method used. State the application examples of assignment problems. — 10 — CO1, CO2, CO3 — 5 — 6

	W1	W2	W3	W4	W5
J1	11	17	8	16	20
J2	9	7	12	6	15
J3	13	16	15	12	16
J4	21	24	17	28	26
J5	14	10	12	11	13

Q7B The output of production line is checked by an inspector for one or more types of defects called Defects A, B, C . IF defect A occurs item is scrapped. If Defect B or C occurs item is reworked. Time required to to rework Defect B is 15 min and Time required to — 10 — CO2 — 5 — 7

rework defect C is 30 min. The probabilities of A, B, C defects are 0.15, 0.20 and 0.10 respectively.

For ten items coming off assembly line find number items without the defects, number scrapped and Total rework time. Use the following random number-RN .

RN for Defect A	48	55	91	40	93	01	83	63	47	52
RN for Defect B	47	36	57	04	79	55	10	13	57	09
RN for Defect C	82	95	18	96	20	84	56	11	52	03

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SARDAR PATEL COLLEGE OF ENGINEERING, MUMBAI

DEPARTMENT OF MECHANICAL ENGINEERING

END-SEMESTER EXAMINATION/[redacted], MAY-[redacted]2025

PROGRAM: Third Year B.Tech. (C/M/E), Semester-VI
COURSE: OE-BTM611- Computational Methods

Total Points: 100
Duration: 3 HOURS

23/5/25

Note:

- Answer any 5 question. **Question 1 is mandatory.**
- Answer should be very specific and to the point,
- Make suitable assumptions if needed,
- ~~Answer of all sub-questions must be grouped together in answer book.~~
- Data in the last column represents course outcome and Blooms Taxonomy of respective question.

				CO/BL
Q1.		Answer **ANY FIVE** (5) of the following questions:	20	1,2/4
		(a) Compare fixed-point iteration and secant method for solving nonlinear equations. Discuss convergence behaviour. (b) List five practical applications of numerical differentiation in engineering and briefly describe their importance. (c) Explain the significance of diagonal dominance in iterative solvers like Gauss-Seidel. How does it influence convergence? (d) Name five engineering applications of numerical interpolation. (e) Differentiate between interpolation and regression analysis with examples. (f) Describe Euler, Runge-Kutta, and Predictor-Corrector methods for solving IVPs in ODEs. Illustrate with simple examples.		
Q2.	A	Differentiate between linear and non-linear regression with examples. Describe the least squares method and its importance in regression. How do you evaluate the goodness-of-fit of a regression model?	10	2/4
	B	A chip of size A (face) is mounted on a substrate through an adhesive of thickness 1mm. The top surface is exposed to coolant flow at T_f and other side surfaces are insulated. The substrate is at constant temperature Ts. The thermal conductivity of adhesive, $k(T) = k_0 + 0.2T^2$. Develop a mathematical model to determine the time variation of chip temperature and its steady state temperature. Clearly state all assumptions and define appropriate initial and boundary conditions.	10	3/4,5
Q3.	A	Explain the difference between interpolation and extrapolation with examples. How does spline interpolation differ from other techniques? Discuss the limitations of polynomial interpolation for large datasets.	10	1/1,2
	B	Write a pseudo-code to use Bi-section method. Obtain a root, correct to three decimal places, for the following equations, $xe^x = 1$. Use Bi-section and Regula Falsi method. Compute the root up to six decimal places. Analyse the convergence by plotting the approximate error vs. iteration number.	10	3,4/4
Q4.	A	(a) Compare direct and iterative methods for solving linear systems with examples. (b) Define condition number of a set of linear algebraic number and explain	10	1,2/2,3

its significance and methods to calculate it.

(c) How do round-off errors affect the accuracy of numerical solutions in linear systems?

B The following values of the function $f(x) = \sin x + \cos x$, are given 10 3/4,5

x	10°	20°	30°
f(x)	1.1585	1.2817	1.3660

Construct the quadratic Lagrange interpolating polynomial that fits the data. Hence, find f(π/12).

Q5. A State and derive the trapezoidal rule for numerical integration. What is its geometric interpretation? Compare the trapezoidal rule with Simpson's 1/3 rule in terms of accuracy and error order. 10 1,2/2,3

B Solve the following system of linear equations using the TDMA 10 3/4

$$\begin{bmatrix} 4 & -1 & 0 & 0 & 0 \\ -1 & 4 & -1 & 0 & 0 \\ 0 & -1 & 4 & -1 & 0 \\ 0 & 0 & -1 & 4 & -1 \\ 0 & 0 & 0 & -1 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{bmatrix} = \begin{bmatrix} 5 \\ 5 \\ 5 \\ 5 \\ 5 \end{bmatrix}$$

Q6. A. Compare the forward, backward, and central difference formulas for the first derivative. Which of these is generally more accurate and why? Additionally, explain the concept of truncation error in numerical differentiation and discuss how the choice of step size h influences the accuracy of the approximation. 10 2/2,3

B. A reservoir discharging through sluices at a depth h below the water surface has a surface area A. For various value of h, the surface area A is tabulated below. 10 3/4,5

h (feet)	3	4	5	6	7
A (sq. feet)	120	150	200	250	300

If t denotes time in minutes, the rate of fall of the surface is given by

$$\frac{dh}{dt} = \frac{24}{A} h^{1.5}$$

Estimate the time taken for the water level to fall from 5 ft to 8 ft above the sluices.

Q7. A Differentiate between Initial Value Problems (IVPs) and Boundary Value Problems (BVPs) in the context of ODEs, providing examples. How does the predictor-corrector method enhance accuracy compared to Euler's method? 10 1,2/3,4

B. Solve the following initial value problem with y (0) = 1.5, where t varies from 0 to 2.5. Use any scheme as long as you achieve 3-digit accuracy. 10 3/4

$$\frac{dy}{dt} = 3(1 - y^4)$$

Show the results in the tabular form.

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~~EE~~/RE Exam – ~~May~~/June 2025 Examinations

T.Y. B.Tech (AI) Sem VI

Program: Electrical

Course Code: OE-BTE604

Course Name: Computer Architecture

Duration: 3 hours

Maximum Points: 100

Semester: VI

27/6/25

- Attempt **any 5** questions from the given 7 questions.
- Make suitable assumptions wherever necessary.

Q.No.	Questions	Points	CO	BL
1a.	Discuss about the Hardware and software abstraction.	10	1	2
1b.	Consider a 4 stage pipeline processor. The number of cycles needed by the four instructions I1, I2, I3 and I4 in the stages S1, S2, S3 and S4 is shown below: | | S1 | S2 | S3 | S4 | | I1 | 1 | 3 | 2 | 1 | | I2 | 2 | 2 | 3 | 1 | | I3 | 1 | 1 | 1 | 1 | | I4 | 2 | 1 | 1 | 2 | What is the number of cycles needed to execute the following loop? for(i=1 to 2) {I1.I2.I3.I4}	10	1	4
2a.	Multiply $(-4)_{10} \times (3)_{10}$ using Booth's Algorithm	10	2	3
2b.	Differentiate between Harvard architecture and Von Neumann architecture	06	4	2
2c.	Calculate the pointer address for LDT descriptor for the 32 bit processor from the following data: a. GDTR = 100000000000h b. LDTR Selector = F002h	04	1	3
3a.	Explain the paging model of 80386 and how virtual memory of 64TB is supported.	05	4	2

3b.	A computer has 64KB cache, 1MB main memory, and a block size of 64 bytes. • Number of address lines required. • Implement using 2- way set associative and 4-way set associative mapping.	10	1	3
3c.	For a Magnetic Disk: No. of tracks per surface = 250 Disk rotation speed = 3000 rpm Track storage capacity = 62,500 bits Average latency of device = P ms Data transfer rate = Q bits/sec Find P and Q.	05	1	3
4a.	What is Direct Memory Access (DMA)? Compare programmed I/O, interrupt-driven I/O, and DMA in terms of efficiency and CPU involvement.	10	3	2
4b.	Differentiate between hardwired and microprogrammed control units. State advantages and disadvantages of each.	10	3	3
5a.	Compare and contrast the IEEE 754 single-precision format and double precision format and hence Convert the decimal number 123.25 to IEEE 754 single-precision (32-bit) format.	10	2	3
5b.	Discuss the register model of 80386 in the Real mode.	10	4	2
6a.	Explain the working of magnetic hard disk w.r.t Various Components like Sector, Track, Cylinder, Read write head assembly, etc.	10	1	2
6b.	What are the different types of hazards encountered while implementing pipelining? Discuss the static methods implemented to overcome the branch hazards	10	1	2
7.	Discuss the following architectures i. SoC ii. DSP Processor	20	4	2

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PREVIOUS SEMESTER EXAMINATION (PSE), JUNE-2025 (R 18)

Program: B.Tech. Mechanical T.Y. Sunny

Course Code: PCC-BTM 614

Course Name: Internal Combustion Engines

Duration: 3 Hour

Maximum Points: 100

Semester: VI

30/6/25

Notes:

1) **Solve: Any FIVE Questions.**
2) Answers must be **SPECIFIC** and in **legible** handwriting.
3) **Draw neat, labelled system and process diagrams** wherever asked or necessary.
4) **Illustrate your answers with suitable examples** wherever asked or necessary.
5) **Assume suitable data wherever necessary and state the same.**

Q. No.	Question	Points	CO	BL	Module
1.	**a) Explain:** Construction of a typical four stroke SI Engine with function and features of at least **FOUR** of its important parts **Draw:** Neat and well labelled sketch of the engine showing its construction.	**10**	1	II, III	1
	b) Explain: i) Indicated thermal efficiency ii) brake specific fuel consumption. A six-cylinder, four-stroke petrol engine has a compression ratio of 7, bore of 90 mm and stroke of 100 mm. The relative efficiency based on indicated power is 55 % the indicated specific fuel consumption of 300 gm/kW.h, indicated mean effective pressure of 8.5 bar and engine speed is 2500 rpm **Evaluate:** i) indicated power ii) calorific value of fuel ii) fuel consumption in kg/h.	**10**	1	II, VI	1,4
2.	**Explain:** Phenomenon of combustion in SI engines with terms involved. **Draw:** neat p-θ diagram.	**08**	2	I, II,	2,3
	b) In a S.I. engine working on the ideal Otto cycle, the compression ratio is 5.5. The pressure and temperature at the beginning of compression are 1 bar and 27 ∘C respectively. The peak pressure is 30 bar. **Evaluate:** i) the pressure and temperatures at the nodal points and ii) the air-standard efficiency. Assume: For air γ =1.4, cv = 0.718 kJ/kg.K. **Draw:** p-V and T-s diagrams of the cycle.	**12**	2	I, VI	1,3

3.	**a) State:** Types of diesel injection systems. **Describe:** Working, advantages and limitations of **any ONE** injection system. **Draw:** Neat schematic diagram.	**10**	2	I, II	3
	b) Explain: Procedure and significance of i) Morse test and ii) Heat balance test of an I C Engine.	**10**	3	II,	4
4.	**a) State:** Various types of dynamometers and **Describe:** Features and working of any One of them. **Draw:** Neat schematic diagram of the system	**08**	2	I, II	4
	b) During the trial of a single cylinder, four-stroke diesel engine, the following test results are obtained Assume 1 kg of fuel used.	**12**	3	VI	4

Parameter	Value	Parmeter	Value
Cylinder diameter	20 cm	Cooling water flow rate	4.5 kg/min
Piston stroke	40 cm	Air used per kg of fuel	30 kg
Imep	6 bar	Rise in cooling water temp.	45° C
Torque	407 m.N	Temp of exhaust gases	420° C
Speed	250 rpm	Ambient temperature	20° C
Fuel consumption	4 kg/h	Mean specific heat of exhaust gases	1 kJ/kg. K
Calorific value of fuel	43 MJ/kg	Specific heat of water	4.18 kJ/kg K

Evaluate: i) Indicated power, ii) Brake power **Construct:** Heat balance Sheet of the engine on kJ/min basis

5.	a) Describe Properties of fuels for S.I. Engine and C.I. Engine **Draw:** Typical distillation curves for each of them.	**10**	3	II, III	5
	b) Explain: Necessity of engine cooling. **State:** Various liquid (water) cooling systems for I.C. Engines. **Compare:** Advantages and limitations of air and water-cooling systems.	**10**	2	I, II, IV	6
6.	**a) State:** Various types of engine lubrication system. **Explain** Features, working and advantages of **Any ONE** of the wet sump lubrication systems. **Draw:** Neat schematic diagram of the system.	**10**	2	I, II, III	6

	b) State: Various alternative liquid and gaseous fuels for I.C. Engines. **Discuss:** Use, properties, advantages and limitations of i) Biodiesel and ii) CNG.	**10**	4	I, II	7
7.	**Explain: Any THREE** of the following. **Draw:** Neat system/ schematic/ process diagrams wherever necessary.	**20**		II, III	
	a) Knocking in S.I. and C.I. Engines		2		2
	b) Classification and applications of I.C. Engines		1		1
	c) Ignition lag, ignition delay and ignition limits		2		2
	d) Anti-knock ratings of fuels		3		5
	e) Hydrogen: Fuel for future		4		7

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ENDSEM /[redacted] EXAMINATION MAY/[redacted] 2025

T. Y.

Sem VI

Program: B.Tech. in Civil/Mechanical/Electrical Engineering **Duration: 3 hrs.**

Course Code: OE-BTM613 **Maximum Points: 100**

Course Name: Entrepreneurship Development and Start-Up **Semester: VI**

23/5/25

Note:

1. Question 1 is Compulsory.
2. Attempt any four out of remaining six questions.

Q. No.			Points	CO	BL	MO
Q.1		Attempt **any four**:	**20**			
	a.	List different barriers of Entrepreneurship.	5	01	01	01
	b.	Distinguish between Innovation and Invention.	5	02	02	02
	c.	What are the limitations of Market research?	5	02	01	03
	d.	Classify Intellectual Property Rights?	5	04	02	05
	e.	Give the contents of feasibility report?	5	04	01	06
	f.	List the full names of Commercial Banks which are specifically providing Financial Support to Industrial Development.	5	04	01	07
Q.2	a.	You wish to innovate sun-glasses with latest trends. Generate 10 ideas with SCAMPER technique. (atleast one idea from each letter of SCAPMER).	10	02	06	02
	b.	Evaluate the ideas using SWOT Analysis Technique and rate top 3 ideas from above generated ideas for sun-glasses.	10	02	05	02
Q.3	a.	Make *atleast 2* different sketches of sun-glasses frames which includes latest trends and features and label it. *(Use Plain Paper to answer this question).*	10	03	06	04
	b.	List atleast three names for your company producing sun-glasses. Select the best name and Create one logo for it. *(Use Plain Paper to answer this question).*	10	03	06	04

Q.4	a.	Describe role of PCT in Intellectual Property rights? Show its application process with help of flow chart.	10	04	02	05
	b.	List different considerations for feasibility report. Describe the Technical Considerations for a feasibility report.	10	04	02	06
Q.5	a.	Describe Patent with following points: i. Definition ii. Term/Duration iii. Act that governs patents iv. What are the different criteria of patentability in India.	10	04	02	05
	b.	What is Observational Method of Market Research? State its advantages, and disadvantages.	10	02	02	03
Q.6	a.	List different Leadership Styles and Explain atleast 4 styles.	10	01	02	01
	b.	Describe what is the role of Start-up Incubators?	10	04	02	07
Q.7	a.	What is NSIC? State its functions?	10	04	02	07
	b.	Write in short about the following financial terms: a. Total Fixed Costs b. Depreciation c. PBDIT d. Net-worth	10	04	01	06

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End-Sem Examinations May 2025_V1

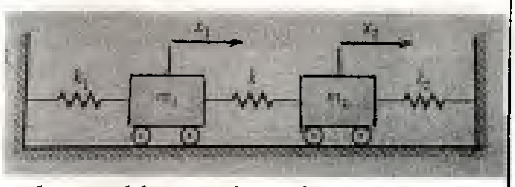
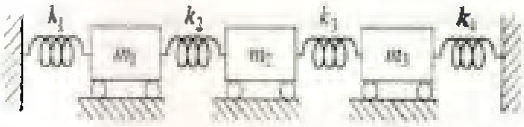
Program: T. Y. B Tech (Mechanical Engg.) Sem VI **Duration:** 3 hr

Course Code: PE-BTM518 **Maximum Points:** 100

Course Name: Mechanical Vibration **Semester:** VI

1. Q. no. 1 is compulsory, solve any four out of remaining.
2. Answers to each sub-questions must be grouped together
3. Use of scientific calculator is allowed
4. Begin answer to each question on new page.
5. Candidates should write the answers legibly

Q.No.	Questions	Pts	Co	BL	mod
1	Answer the following: a) How does a continuous system differ from a discrete system in vibration analysis? Discuss. b) In practice, the measurement of vibration has become necessary, Why? (write any five point). c) Discuss the frequency response curves. d) Concept of logarithmic decrement in free vibration system.	5x4	1,3, 4	3,4	1-6
2	a) A free un-damped vibration system has $m = 1$ kg and an equation of motion $x = 20\cos(8\pi t - \pi/4)$ mm. Determine: The spring constant k; The static deflection δst; The frequency in hertz; The velocity and acceleration at the instant $t = 0.20$ s; *The* spring force at $t = 0.20$ s. b) A vibrating system consists of mass of 50 kg, a spring with stiffness of 30 kN/m and a damper. The damping provided is only 20% of the critical value. Determine: damping factor (*zeeta*), critical damping coefficient, natural frequency of damped vibration, logarithmic decrement.	10 10	2,3	3,4	1
3	a) A vehicle of mass 980 kg and total spring constant of its suspension system is 60 kN /m . The profile of the road may be approximated to a line curve of amplitude 3.5 cm and wavelength of 3.5 meters. Determine: i) the critical speed of the vehicle ii) amplitude of the steady state motion of the mass when the vehicle is driven at critical speed and at speed of 57 kmph, take the damping factor is 0.35 . b) A machine of mass one ton is acted upon by an external force of 1500 N at a frequency of 560 rpm. To reduce the effect of vibration, isolator of rubber having a static deflection of 2mm under the machine load and an estimated damping $\zeta = 0.15$ are used. Determine : a) the force	10 10	2.3	3,4	2

	transmitted to the foundation b) the amplitude of vibration of machine c) phase lag.				
4	a) For the system shown in figure M_1= 2 kg, M_2= 1 kg. K_1 =2.5 kN/m , K_2 =2.5 kN/m, K =1 kN/m and an initial velocity of 20 m/s is imparted to mass M_1; Calculate the resulting motion of two masses. 	20	2,3	3,4	3
5	a) Draw flow-diagram of basic vibration measurement scheme. Discuss the function of each block. b) Discuss the Holzer method to evaluate natural frequency.	10 10	1,2 3	3,4	5,7
6	Write the flexibility and stiffness influence coefficient matrix, also write the equation of motion in matrix notation form. 	20	1,2 3	2,3	3
7	a) The strings of guitar are made of music wire with diameter 0.05 mm, weight density 76.5 kN/m^3, E= 207 GPa. If the length of two of the strings is 60 cm and 65 cm each, determine the fundamental natural frequencies of the strings. The tension in each string is 50 kN. b) Explain in detail the Vibration pick-ups	10 10	2,3	3,4	4,7

(A)

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END SEM/RE-EXAM EXAMINATION MAY / JUNE 2025

B.Y.B.Tech Sem VI

Program: Mechanical | **Duration: 3 Hrs**

Course Code: PE BTM 532 | **Maximum Points: 100**

Course Name: Composite Material Technology | **Semester: VI**

Notes: Solve ANY FIVE questions

26/5/25

Assume Suitable Data

Q No		Questions	Points	CO	BL	Module No.
1	a	Discuss the composite material and classify composite material in detail also explain different types of fibers and matrix.	10	1	IV	1
	b	Discuss any two interactive theories of failure of lamina with suitable example	10	3	V	7
2	a	Discuss the metal matrix composite and ceramic matrix composite with advantages and disadvantages with applications	10	2	VI	2
	b	Discuss independent theories of failure of lamina with suitable example.	10	1	V	6
3	a	Explain the strain tensor and stress tensor	10	3	IV	3
	b	Explain the procedure to develop pultruted Carbon/Epoxy composite rod	10	2	VI	5
4	a	Obtain the transversely isotropic material.	10	1	V	4
	b	Explain the manufacturing of Foams, Honeycombs and Adhesives		3	IV	3
	a	Discuss the Composite post processing operation in detail with suitable example	10	2	V	5
	b	Explain fully Anisotropic material and obtain engineering constant and elastic constant	10	2	VI	3
6	a	Discuss the manufacturing process of composite material and explain any two with neat diagram	10	1	IV	2
	b	A 60^0 GR/E lamina subject to $\sigma_x = 4P$, $\sigma_y = -6P$, $\tau_{xy} = 8P$. Using Tsai-Hill theory,determine max. value of $P > 0$. So that the lamina is safe. Given: $(\sigma_1^T)u = 1725$ MPa , $(\sigma_2^T)u = 40$ MPa,$(\sigma_1^c)u = 1350$ MPa,,$(\sigma_2^c)u = 275$ MPa, $(\tau_{12})u = 95$ MPa	10	2	VII	6
7	a	Explain Hygrothermal Behaviour of lamina with suitable example	10	3	V	7
	b	Explain the application of composite material in details. Draw and explain Ashby chart. Describe glass fiber manufacturing process.	10	3	IV	1

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T. Y. B.Tech

END SEMESTER EXAMINATION MAY 2025

26/3/25

Program: Mechanical Engineering — Duration: 3 hour

Course Code: **PE-BTM 537** — Maximum Points: 100

Course Name: **Tool Engineering** — Semester: VI

INSTRUCTIONS:

1. Attempt any five questions.
2. Draw neat schematic diagrams wherever necessary, **highlight** important points of answer.
3. Assume suitable data if necessary and mention it.

Q.No.	Questions	Pt	CO	BL	M
Q1 A)	Write short note on elongation, wrinkling and spring back along with sketch in case of sheet metal forming?	10	4	1	7
Q1 B)	Determine value of back and side rake angle of a turning tool, whose geometry is specified as per ORS system as, [5°, 5°, 10°, 10°, 25°, 25°, 0 (inch)]? Draw tool geometry in ASA system.	10	1	2	3
Q2 A)	Explain in brief measurement of cutting forces with the help of three basic principles? Explain working of strain gauge type 3-D Milling dynamometer in brief schematic sketch?	10	2	1	2
B)	During outer diameter (O.D.) turning of spring steel material having O.D. 60 mm on lathe machine. Refer the following input data- Rake angle of tool is 10°, Cutting velocity (V_c) is 10 m/min, feed is 0.2 mm/revolution of workpiece, length of continuous chip in one revolution is 101.44 mm, cutting force is 400 kgf, feed force is 160 kgf. Calculate- Shear plane angle, Coefficient of friction, velocity of chip along tool face and chip thickness?	10	1	2	1
Q3 A)	Give characteristic features of (a) a punched hole and (b) the punched slug. Give detailed point wise significance of each details using well labelled sketch?	10	3	2	5
B)	Explain following sheet metal shearing operation along with one combined sketch? A) Nibbling, b) Lancing, c) Notching operations	10	3	1	5

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END SEMESTER EXAMINATION MAY 2025

Q4 A)	Explain upsetting/flat die forging, uniform deformation and pancaking with the help of neat sketch? Draw neat sketch of close die forging die and label it. Give any 2 important point on it.	10	4	1	6
B)	How forming limit diagram (FLD) can be formed using set of specimens? Give significance of each regions FLD and draw labelled test set up?	10	3	2	7
Q5 A)	Explain continuous chip formation during machining of ductile material? Sketch and explain role of cutting velocity and feed on built up edge?	10	2	1	1
B)	Give advantages of thread rolling and ring rolling operation? Write short note on hot rolling process?	10	3	1	4
Q6 A)	Discuss about emulsion type cutting fluid characteristics? Explain cutting fluid selection criteria in detail based on process performance and effect on workpiece/machine tool system?	10	2	1	2
B)	Explain flat rolling process (mechanics) with the help of neat schematic sketch? Give significance of "Draft"?	10	4	1	4
Q7 A)	Write short note rotary swaging/radial forging operation with the help well labeled set up sketch? Draw neat sketch of impression die forging die and label it? Give any 2 important point on it.	10	3	2	6
B)	Using master line principle estimate value of maximum rake angle and inclination of master line? Draw necessary sketch of master line principle?	10	2	1	3

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END SEMSTER /~~RE-EXAMINATION~~, TERM-II, A.Y. 2024-25, MAY 2025

Program: B.Tech. Mechanical Sem VI

Duration: 3 Hours

Course Code: PEC-BTM538

Maximum Points: 100

Course Name: Industrial Management & Entrepreneurship

Semester: VI

26/5/25

Notes:

1) **Solve: Any FIVE Questions.**
2) Answers must be **SPECIFIC** and in **legible** handwriting.
3) **Illustrate your answers with suitable examples** wherever asked and/or necessary.
4) **Use Graph paper** for drawing the **Break-even chart in Q3 b).**

Q. No.	Question	Points	CO	BL	Module
1.	**a) Justify:** "*Management is the combination of science and art.*" **Discuss:** Scientific management, its evolution and pioneering contributions of any two management experts.	10	1	II, VI	1
	b) Explain: i) Functions of manager and ii) skills required by a manager to serve these functions. **Draw:** Neat sketch required.	10	1	II, III	1
2.	**a) Define:** Motivation. **Explain:** Types and techniques of motivation. **Illustrate:** Techniques of motivation practiced in any two industries.	10	2	I, II, IV	2
	b) List: Various functions of HR Management. **Explain:** HR Functions of i) Recruitment and selection and ii) Training and development.	10	2	II, IV	2
3.	**a) Distinguish:** Between cost control and cost reduction. **Describe:** i) Techniques of Cost control and ii) Program for cost reduction.	8	2	II, IV	3
	b) A company engaged in the production and sales of a single product has following data for 2023-24. Total fixed cost = Rs.12,00,000/-. Total variable cost = Rs. 35 per unit and selling price = Rs. 50/- per unit. Construct: Break-even chart. Determine: i) Break-even quantity for sales ii) Sales revenue at break-even point iii) Margin of safety for the profit of Rs. 3,00,000/- iv) Angle of incidence at BEP.	12	2	III, VI	3

B

4.	**a) List:** Various sources of finance for an industrial organization. **Describe**: Any two of them.	**8**	2	II	4
	b) Define: Depreciation and **Discuss:** Causes of depreciation. A particular product has initial value of Rs. 5000/- and the salvage value of Rs. 1000/- at the end of useful life of 5 years. **Evaluate:** Depreciation reserves and book value at the end of 03 years using i) straight line method ii) declining balance (sinking fund) method, if the rate of compound interest is 4% per annum. **Draw:** Neat sketches.	**12**	2	I, II, II, VI	3,4
5.	**a) Define:** Entrepreneurship. **Discuss:** Entrepreneurship development. **Describe:** Various financial assistance and incentives for an enterprise / SSI in India.	**10**	3	I, II, IV	5,6
	b) Explain: Need for promotion of Entrepreneurship in India. **Justify:** Economic development of India is directly related to entrepreneurship development in India.	**10**	3	II, VI	5,6
6.	**a) Define:** ERP. **Explain** in detail: i) Process of implementation of ERP system in an organization ii) Requirements and cost of ERP systems.	**10**	4	I, II	7
	b) Discuss: Concept of E-ERP (ERP-II) and **Illustrate:** with two practical examples. **Differentiate:** between ERP (ERP-I) and E-ERP (ERP-II).	**10**	4	II, IV	7
7.	**Explain: ANY THREE** of the following:				
	a) Functions and skills of a Manager	**20**	1	II	1
	b) Theory X and Theory Y		1		2
	c) Types and elements of costs		2		3
	d) Financial statements of an organization		2		4
	e) Qualities of an entrepreneur		1		5

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END SEMESTER/ ~~RE-EXA~~MINATION MAY/~~JUNE~~ 2025 SET 2

Program: B. Tech. (Mechanical Engg) **Duration: 3 Hr**

Course Code: PE-BTM539 **Maximum Points: 100**

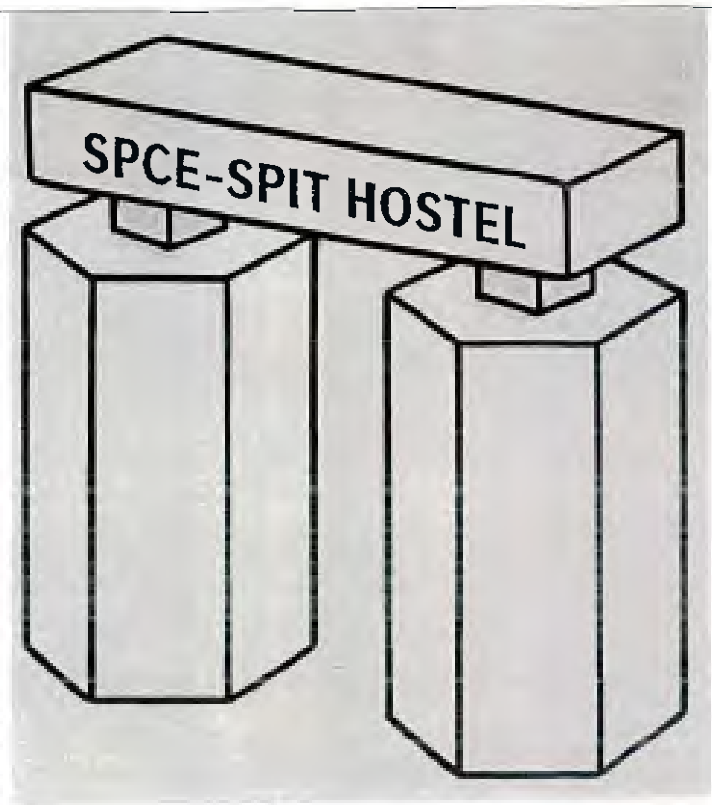
Course Name: Additive Manufacturing (Program Elective) **Semester: VI**

Notes:

1. **Question Number 1 and 2 are compulsory.**
2. **Solve any three questions from Question Number 3 to Question Number 7**
3. **Assume suitable data if required with justification.**

Q. No.	Questions	Points	CO	BL	Module No.
1	The figure below illustrates a conceptual design for the proposed SPCE-SPIT College Hostel building, featuring two hexagonal columns connected by a rib at the top. Assume that the complete hostel building will be constructed using large-scale concrete 3D printing (Additive Manufacturing). Prepare a conceptual framework and a detailed process plan for constructing the proposed SPCE-SPIT Hostel using a concrete 3D printer. Your answer should include: 1. Selection of 3D Printing Technology suitable for concrete structures (e.g., gantry vs robotic arm-based systems). 2. Material specifications, including mix design for printable concrete. 3. Layer-wise deposition strategy for hexagonal columns and the rib structure. 4. Support and reinforcement considerations during and after printing. 5. Curing methods and post-processing requirements.	20	1 to 4	6,7	1 to 7

END SEMESTER/ RE-EXAMINATION MAY/JUNE 2025 SET 2

					
2	A five year child likes watching "Mau and Zingtu" the two cartoon characters resembling Cat and Dog. Following picture of Mau and Zingtu as topping for birthday cake is designed by a family on the occasion of child's birthday. (Note: Designed toppings of cartoon are on thick extruded base of the cake). You having an engineering background supplemented with the knowledge of Additive Manufacturing/3D Printing have	20	1 to 4	6	1 to 7

020f05

accepted this customized order and decided to prepare a **general purpose computer aided extrusion integrated with baking unit type 3D cake making machine**. The recipe for making the cake base and toppings is as below:

Followings are the ingredients for the base and toppings of the cake

1. 50 gm white sugar
2. 200 gm unsalted butter
3. 2 large eggs
4. 150 gm vanilla extract
5. 200 gm all-purpose flour
6. 100 gm baking powder
7. 250 ml milk
8. 200 gm Icing Sugar

With above ingredients following steps are to be followed for base of the cake

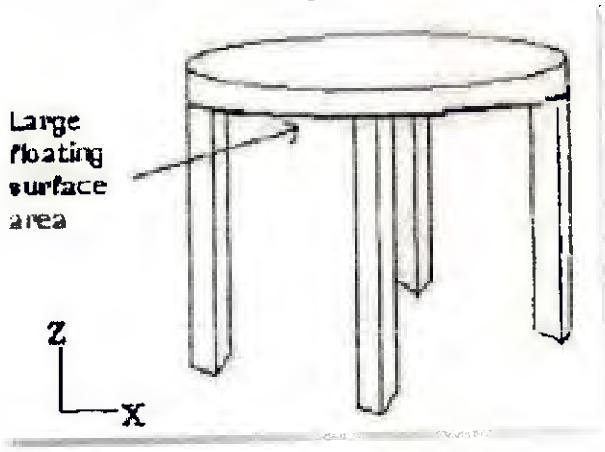
1. Preheat the oven to 350 degrees F (175 degrees C). Grease and flour a 9-inch square cake pan.
2. Cream sugar and butter together in a mixing bowl.
3. Add eggs, one at a time, beating briefly after each addition.
4. Mix in vanilla.
5. Combine flour and baking powder at separate station.
6. Add to the wet ingredients and mix well.
7. Add milk and stir until smooth.
8. Pour batter into the prepared cake pan.
9. Bake in the preheated oven until the top springs back when lightly touched, 30 to 40 minutes.
10. Remove from the oven and cool completely.

Following is the procedure to prepare icing in the form of cartoon characters Mau and Zingtu:

1. Beat the butter with an electric hand mixer until light and fluffy.

2. Sift in the icing sugar, then work it into the butter, starting slowly at first, then beating more vigorously once all the sugar is combined.

END SEMESTER/ RE-EXAMINATION MAY/JUNE 2025 SET 2

	3. Add the milk and the vanilla, then beat until creamy and smooth. 4. Colour the buttercream by adding flavourings such as cocoa/ melted chocolate/lemon/orange zest as required in toppings of the cake. On the basis of above information Provide A. Conceptual drawings of your machine workstations for preparing 1. Base of the cake. 2. Base baking unit 3. Customized Toppings on the cake. B Mechanism for (i) mixing, (ii) Egg cracking (iii) beating (iv) stirring the ingredients, transfer and ingredient deposition mechanisms C. Computer Aided Processes Involved D. Flow Chart depicting Process Plan for executing the customized order in Machine				
3	Part shown below is to be develop using following RP processes  (i) Bulk Lithography (ii) Laminated Object Manufacturing (iii) Selective Inhibition Sintering Part is to be developed using compatible material for above mentioned processes. State (i) Compatible materials for the above processes. (ii) Part orientation in developing part with above processes. (iii) Explain process plan with neat labelled schematic diagram of above processes iv) Support process plan with at least three critical sliced sections of part geometry (Note: Answer shall clearly show slicing place, sliced geometry, hatched section etc.).	20	1 to 4	6	1 to 7
4 (a)	Explain .stl and amf file format and its importance.	10	1	3	2

END SEMESTER/ ~~RE~~-EXAMINATION MAY/~~JUNE~~ 2025 SET 2

4 (b)	State process of unconstraint depth photopolymerization with the first principles (using nonlinear Shrodinger equation, diffusion and non-linearity due to change of refractive index)	10	3	3	3,4
5(a)	Explain shape deposition modeling process. Take suitable part geometry to explain processes involved in shape deposition manufacturing.	10	2	5	5
5 (b)	With neat sketches explain projection microstereolithography (MSL)? Discuss advantages and issues with projection surface MSL.	10	1	1	3,4
6 (a)	With neat sketch explain design of flexural mechanism for XY scanning system	10	3	2	3
6 (b)	With neat sketches explain the constraint surface type of microstereolithography.	10	1	3	4
7 (a)	Provide Muellers four-step approach for selecting the proper type of material for additive Manufacturing	10	1	3	1
7 (b)	Describe extrusion based RP systems. Discuss Fused deposition modeling (FDM) process with a neat labeled diagram. Discuss various sub-systems of FDM. In one of the FDM system issues in linear scan speeds is observed due to error in software program. On investigation it is observed that X scan speed is optimum, however the Y scan (in the direction of pitch) is twice the optimum speed. Explain consequences in part fabrication. Further in case if Y scan speed would have been optimum and X scan speed being twice the optimum X scan speed, comment in which case part quality would be worst.	10	3	6	5

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END SEM/~~RE-EXAM~~ EXAMINATION MAY / ~~JUNE~~ 2025

Program :T.Y. Mechanical Engineering Sem VI

Course Code: PC-BTM614

Course Name: Energy Engineering

Duration : 3 Hours

Maximum Points: 100

Semester : VI

Notes: 1. Question Number 1 is compulsory.
2. Attempt any 4 questions from the remaining set of questions.
3. Assume suitable data if necessary and mention it.

Q.No.	Questions	Points	CO	BL	Module No.
1 a)	Explain the role of solar energy in buildings, specifically focusing on passive solar heating and domestic water heating systems. What are the advantages of solar collectors for hot water?	10	1	3	4
1 b)	Explain distributed generation and its management. How does energy storage support the integration of renewable energy into the grid?	10	2	1	5
2 a)	Evaluate the future of carbon emissions, focusing on global initiatives like carbon trading, carbon capture, and storage (CCS). How do these technologies help in achieving a low-carbon future?	10	4	2	1
2 b)	Discuss the process of electric power generation system, including the steps involved from the production to the delivery of electricity to consumers. (with well labelled diagram).	10	3	2	5
3 a)	Explain the concept of a Zero Energy Building (ZEB). What are some popular green building certification systems?	10	3	1	4
3 b)	Discuss the working principle of PEM fuel cells, including the reactions at the anode, cathode, and the role of the electrolyte.	10	1	2	6
4 a)	Define energy monitoring and discuss its significance in improving energy efficiency in commercial or industrial buildings. What tools and technologies are typically used for energy monitoring?	10	2	2	3
4 b)	What are the main economic considerations involved in the development of wind power projects? Discuss both the initial capital investment and ongoing operational costs.	10	3	3	7

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END SEM/~~RE-EXAM~~ EXAMINATION MAY / ~~JUNE~~ 2025

5 a)	Describe the different methods of hydrogen production with their advantages and disadvantages. Specifically, compare Steam Methane Reforming (SMR) and Electrolysis of Water.	10	4	4	5
5 b)	Explain in detail the EPI and the star label for different climatic zones (pertaining to BEE standards).	10	3	3	4
6 a)	What are the key steps involved in conducting an energy audit?	10	2	2	3
6 b)	Write a note on Sustainability and Sustainable Energy. List the criteria for determining whether the source is a Sustainable Energy.	10	1	3	1
7 a)	Enlist the different types of storage devices used for storing the Solar Radiation.	10	4	2	2
7 b)	A photovoltaic (PV) system has the following specifications: • The surface area of the solar panel is 4 m^2. • The solar radiation intensity received on the panel is 1000 W/m^2. • The panel operates at an efficiency of 15%. • The panel generates a voltage of 18V and a current of 5A. 1. Calculate the total solar energy incident on the panel (in watts). 2. Determine the electrical power output of the panel (in watts). 3. Find the total energy converted to electricity by the panel in one hour (in watt-hours). 4. Calculate the theoretical energy output if the panel operated at 100% efficiency. 5. Verify the efficiency of the panel based on the electrical power output and the energy incident on the panel.	10	3	3	6