

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Supplementary Summer Examination – 2023**

**Course: T.E.**

**Branch : Mechanical Engineering**

**Semester :VI**

**Subject Code & Name: BTMC601/Manufacturing Processes -II**

**Max Marks: 60**

**Date: 13 July 2023**

**Duration: 3 Hrs.**

**Instructions to the Students:**

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

	(Level/CO)	Marks
<b>Q.1 Solve Any Two of the following.</b>		<b>12</b>
A) What is grinding? Explain various types of grinding wheels with suitable sketch.	Apply	6
B) Explain Design Consideration for Grinding.	Understanding	6
C) What is grinding wheel wear? Explain the mechanisms of wheel wear.	Apply	6
<b>Q.2 Solve Any Two of the following.</b>		<b>12</b>
A) Explain Merchant's Circle Diagram.	Apply	6
B) Describe various angles of single point cutting tool showing angles on figure.	Understanding	6
C) Differentiate between Orthogonal and Oblique Cutting.	Analyze	6
<b>Q.3 Solve Any Two of the following.</b>		<b>12</b>
A) What is meant by tool life? Which factors affects tool life?	Apply	6
B) Write short notes on – ( i ) Cubic Boron ( ii ) Nitride Coated Tools	Remember	6
C) Explain properties and types of cutting fluid.	Remember	6
<b>Q.4 Solve Any Two of the following.</b>		<b>12</b>
A) State limitations and advantage of Powder Metallurgy process.	Apply	6
B) What is sintering? Explain three stages of sintering.	Understanding	6
C) Explain mechanical method of powder production.	Apply	6
<b>Q.5 Solve Any Two of the following.</b>		<b>12</b>
A) Discuss some of the defects that can occur in plastic injection molding.	Evaluate	6
B) What are the different strengthening techniques of glass? Explain any 2 in details	Apply	6
C) What is (a) Parison, (b) Plastisol, and (c) Prepreg?	Understanding	6

**\*\*\* End \*\*\***

<b>DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE</b> <b>Supplementary Summer – 2023</b> <b>Course: B. Tech.                      Branch : Mechanical                      Semester : VI</b> <b>Subject Code &amp; Name: BTMEC603 Applied Thermodynamics-II</b> <b>Max Marks: 60                      Date:18/07/2023                      Duration: 3 Hr.</b>			
<b>Instructions to the Students:</b> 1. All the questions are compulsory. 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question. 3. Use of non-programmable scientific calculators is allowed. 4. Assume suitable data wherever necessary and mention it clearly. 5. Use of steam table is permitted			
		(Level/CO)	Marks
<b>Q. 1</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	How calorific value of a fuel is calculated with the help of Bomb calorimeter?	CO 1	6
B)	5 kg coal burnt completely in a furnace. Calculate amount of carbon dioxide generated. How much carbon monoxide will be produced if incomplete combustion takes place?	CO 1	3+3
C)	If a fuel contains 86% carbon, 11.75% hydrogen and 2.25% oxygen, calculate theoretical air supplied per kg of fuel and the weight of products of combustion.	CO 1	3+3
<b>Q.2</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Enlist six requirements of a good boiler?	CO 1	6
B)	Explain Boiler efficiency and equivalent evaporation.	CO 1	3+3
C)	Feed water having enthalpy of 142 kJ/kg heated in a boiler till it becomes 95% dry at 11.5 bar ( $h_f = 790$ kJ/kg and $h_{fg} = 1991$ kJ/kg ). Calculate boiler efficiency if 8 kg mass of water evaporated per kg of coal having CV equal to 29,000 kJ/kg .	CO 1	6
<b>Q. 3</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Draw PV and TS diagram of ideal Rankine cycle and explain each process.	CO 3	2+2+2
B)	The adiabatic enthalpy drop across the prime mover of the Rankine cycle is 840 kJ/kg. The enthalpy of steam supplied is 2940 kJ/kg, and at back pressure of 0.1 bar. Calculate the specific steam consumption and thermal efficiency of the cycle.	CO 2	3+3
C)	Starting from equation of first law, establish relation between exit speed and enthalpy drop in an isentropic nozzle.	CO 2	6
<b>Q.4</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Why condensers are used in a steam power plant? How they are classified?	CO 3	3+3
B)	Steam enters a 2 MW adiabatic turbine steadily at 30 bar and 400°C and leaves at 0.5 bar and 100°C. Determine the isentropic efficiency of the turbine and the mass flow rate of the steam flowing through the turbine.	CO 3	3+3

C)	The outlet and inlet temperatures of cooling water to a condenser are 37 <sup>0</sup> C and 30 <sup>0</sup> C respectively. Calculate condenser efficiency if barometer reads 706 mm of Hg with atmosphere pressure reading 760 mm.	CO 4	6
*** End ***			
<b>Q. 5</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	How air compressors are classified?	CO5	6
B)	What are the methods to increase isothermal efficiency of a high speed compressor?	CO5	3+3
C)	A single stage compressor take 1 m <sup>3</sup> air per minute at 1 bar and 15°C and delivers at 15 bar. Assuming $PV^{1.35} = \text{constant}$ , calculate indicated power neglecting clearance.	CO5	6
*** End ***			

**The grid and the borders of the table will be hidden before final printing.**

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Summer Examination – 2023 Course: B. Tech.  
Branch : MECH Semester :VI**

**Subject Code & Name:BTMEC605C/BTAMC605  
Max Marks: 60**

**Date:22/07/23**

**Duration: 3 Hr.**

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***Instructions to the Students:***

- 1. All the questions are compulsory.*
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	(Level/CO)	Marks
Q. 1 Solve Any Two of the following.		12
A) Explain the the term fossil fuel and explain its availability in India.	CO1	6
B) Explain the difference between renewable and non-renewable energy	CO1	6
C) Describe the current status of energy conversion technologies relating to nuclear fission and fusion,	CO1	6
Q.2 Solve Any Two of the following.		12
A) With neat sketch explain the structure of sun and solar radiation on earth.	CO2	6
B) Explain the term ‘Pyrheliometer’ and ‘Pyranometer’ for solar measurement. With neat sketch explain construction and working of any one Pyrheliometer	CO2	6
C) Explain in detail the causes of Solar Attenuation.	CO2	6
Q. 3 Solve Any Two of the following.		12
A) Illustrate the Flat plate Solar Collector in term of Construction, selection criteria,	CO3	6

testing and state the Limitation of flat plate collectors

- |                                      |  |     |    |
|--------------------------------------|--|-----|----|
| B)                                   | Describe the construction and working of different types of <b>Concentrating type Solar</b> collector. | CO3 | 6  |
| C)                                   | Sketch and Explain Solar Tracking system.  | CO3 | 6  |
| Q.4 Solve Any Two of the following.  |  |     | 12 |
| A)                                   | Demonstrate is the process of solar water heating.   | CO4 | 6  |
| B)                                   | Expalin with neat sketch solar drying, and solar still   | CO4 | 6  |
| C)                                   | Compare with neat sketch Solar panel with Photo-voltaic panel  | CO4 | 6  |
| Q. 5 Solve Any Two of the following. |  |     | 12 |
| A)                                   | Illustrate Biomass Gasification Process in agricultural waste  | CO5 | 6  |
| B)                                   | Explain the principle and various techniques of Ocean Thermal Energy Conversion                        | CO5 | 6  |
| C)                                   | Differentiate the Geo-thermal energy source with Tidal Energy source                                   | CO5 | 6  |

\*\*\* End \*\*\*

<b>DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE</b> <b>Summer Examination – 2023</b> <b>Course: B. Tech.      Branch : Mechanical Engineering      Semester: VI</b> <b>Subject Code &amp; Name: BTMC601 &amp; Manufacturing Processes-II</b> <b>Max Marks: 60      Date:      Duration: 3 Hrs.</b>			
<b>Instructions to the Students:</b> 1. All the questions are compulsory. 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question. 3. Use of non-programmable scientific calculators is allowed. 4. Assume suitable data wherever necessary and mention it clearly.			
		<b>Level</b>	<b>Marks</b>
<b>Q. 1</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Define abrasive machining and explain its importance. Draw a schematic diagram of grinding process.	<i>Remember</i>	<b>6</b>
B)	What are the super-abrasives? Which super-abrasive is recommended for grinding of steels and why?	<i>Understand</i>	<b>6</b>
C)	Define G-ratio in grinding operation and explain why does it vary widely.	<i>Analyse</i>	<b>6</b>
<b>Q.2</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	What is mechanics of metal cutting? What are its objectives? Draw a schematic diagram of metal cutting showing the workpiece, cutting tool, and chip.	<i>Remember</i>	<b>6</b>
B)	What is rake angle? Explain positive rake angle and negative rake angle with the help of a schematic diagrams. Why is clearance angle provided on the cutting tool?	<i>Understand</i>	<b>6</b>
C)	Define specific cutting energy. What is its importance? What are the parameters affecting it?	<i>Remember</i>	<b>6</b>
<b>Q. 3</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Explain the principle of measurement of cutting temperature with radiation methods. What is the principle of correlation of cutting temperature with hardness and microstructure changes in the cutting tool material?	<i>Remember</i>	<b>6</b>
B)	Explain the basic requirements of cutting tool materials. What are the major classes of cutting tool materials?	<i>Understand</i>	<b>6</b>
C)	Define machinability and discuss the factors affecting the machinability of metals.	<i>Remember</i>	<b>6</b>

<b>Q.4</b>	<b>Solve <i>Any Two</i> of the following.</b>		<b>12</b>
A)	Define atomization method of producing metal powders. Explain gas atomization and water atomization with the help of schematic diagrams.	<i>Remember</i>	<b>6</b>
B)	Discuss the purposes of blending of metal powders. What are the precautions to be taken during blending of metal powders?	<i>Understand</i>	<b>6</b>
C)	Discuss the sintering mechanisms with the help of schematic diagrams.	<i>Remember</i>	<b>6</b>
<b>Q. 5</b>	<b>Solve <i>Any Two</i> of the following.</b>		<b>12</b>
A)	Describe the processes for producing polymer sheets and films.	<i>Remember</i>	<b>6</b>
B)	Explain injection molding process with the help of a schematic diagram.	<i>Understand</i>	<b>6</b>
C)	Discuss thermoforming process with the help of a suitable diagram.	<i>Understand</i>	<b>6</b>
	<b>*** End ***</b>		

**The grid and the borders of the table will be hidden before final printing.**

**Course:** B. Tech.

**Branch :** Mechanical Engineering **Semester :** VI

**Subject Code & Name:** BTMC602 Machine Design II

**Max Marks:** 60

**Date:** 14/07/2023

**Duration:** 3 Hr.

**Instructions to the Students:**

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		(Level/CO)	Marks
<b>Q. 1</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
<b>A)</b>	A single-row deep groove ball bearing is subjected to a pure radial force of 3 kN from a shaft that rotates at 600 rpm. The expected life L <sub>10h</sub> of the bearing is 30,000 h. The minimum acceptable diameter of the shaft is 40 mm. Select a suitable ball bearing for this application from manufacturer's catalogue.	L3 Apply CO1 CO2	<b>6</b>
<b>B)</b>	Explain <ol style="list-style-type: none"> <li>a. Dynamic Load Carrying Capacity and</li> <li>b. Equivalent dynamic load for a roller bearing</li> </ol>	L2 Understand CO1 CO2	<b>6</b>
<b>C)</b>	A single-row deep groove ball bearing has a dynamic load capacity of 40500 N and operates on the following work cycle: <ol style="list-style-type: none"> <li>(i) radial load of 5000 N at 500 rpm for 25% of the time;</li> <li>(ii) radial load of 10000 N at 700 rpm for 50% of the time; and</li> <li>(iii) radial load of 7000 N at 400 rpm for the remaining 25% of the time.</li> </ol> Calculate the expected life of the bearing in hours.	L3 Apply CO1 CO2	<b>6</b>
<b>Q.2</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
<b>A)</b>	It is required to design a pair of spur gears with 20° full-depth involute teeth based on the Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to a 10 kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4:1. The pinion as well as the gear is made of plain carbon steel 40C8 (S <sub>ut</sub> = 600 N/mm <sup>2</sup> ). The factor of safety can be taken as 1.5. Considering pitch line velocity 5 m/s to begin, calculate <ol style="list-style-type: none"> <li>1. No. of teeth on pinion and gear</li> <li>2. Module based on beam strength</li> <li>3. PCD of pinion and gear</li> <li>4. Effective load in gear tooth using corrected pitch line velocity</li> <li>5. Beam strength</li> </ol>	L3 Apply CO4 CO5	<b>6</b>
<b>B)</b>	A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20°, while the helix angle is 25°. The face width is 40 mm and the normal module is 4 mm. The pinion as well as the gear is made of steel 40C8 (S <sub>ut</sub> = 600 N/mm <sup>2</sup> ) and heat treated to a surface hardness of 300 BHN. Calculate beam strength and wear strength of helical gears.	L3 Apply CO4 CO5	<b>6</b>

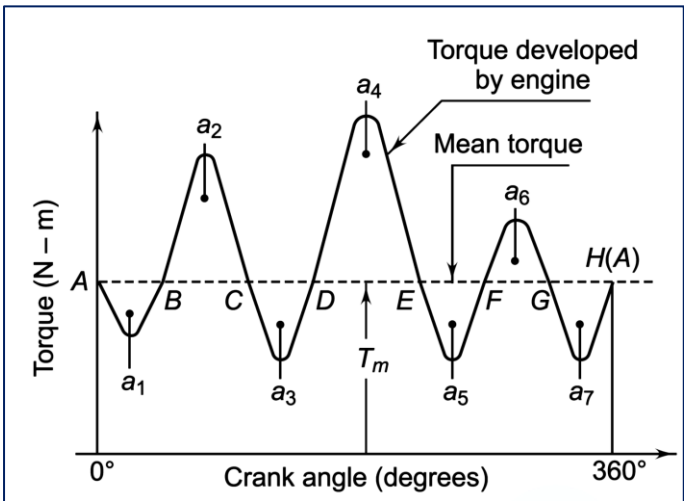


C)	Differentiate between Spur Gears and Helical Gears.	L2 Understand CO4 CO5	6
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**Q.3 Solve Any Two of the following. 12**

A)	A pair of bevel gears, with 20° pressure angle, consists of a 20 teeth pinion meshing with a 30 teeth gear. The module is 4 mm, while the face width is 20 mm. The material for the pinion and gear is steel 50C4 ( $S_{ut} = 750 \text{ N/mm}^2$ ). The gear teeth are lapped and ground (Class-3) and the surface hardness is 400 BHN. The pinion rotates at 500 rpm and receives 2.5 kW power from the electric motor. The starting torque of the motor is 150% of the rated torque. Determine 1. Pitch angle 2. Virtual no. of teeth on pinion 3. Lewis Form Factor 4. PCD of pinion and gear 5. Cone Distance $A_o$ 6. Beam Strength	L3 Apply CO4 CO5	6
B)	Explain advantages and disadvantages of worm gears as compared to other gears.	Level 2 Understand CO4 CO5	6
C)	Explain following terminologies of worm gears. a. Axial Pitch b. Lead c. Lead angle	Level 2 Understand CO4 CO5	6

**Q.4 Solve Any Two of the following. 12**

A)		Level 3 Apply	6
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Demonstrate the concept & mathematical equation of maximum fluctuation of energy and coefficient of fluctuation of energy by using this diagram.

B)	A chain drive is used in a special purpose vehicle. The vehicle is run by a 30kW rotary engine. There is a separate mechanical drive from the engine shaft to the intermediate shaft. The driving sprocket is fixed to this intermediate shaft. The efficiency of the drive between the engine and the intermediate shafts is 90%. The driving sprocket has 17 teeth and it rotates at 300 rpm. The driven sprocket rotates at 100 rpm. Assume moderate shock conditions and select a suitable four-strand chain for this drive. Use Given data from tables for selection of various factors.	Level 3 Apply CO5	6
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<b>C)</b>	It is required to select a flat belt drive for a compressor running at 720 rpm, which is driven by a 25 kW, 1440 rpm motor. Space is available for a centre distance of 3 m. The belt is open-type. Use belt velocity as 18 m/s.	L3 Apply CO5	<b>6</b>
<b>Q. 5 Solve Any Two of the following.</b>			<b>12</b>
<b>A)</b>	A pivoted double-block brake, has two shoes, which subtend an angle ( $2\theta$ ) of $100^\circ$ . The diameter of the brake drum is 500 mm and the width of the friction lining is 100 mm. The coefficient of friction is 0.2 and the maximum intensity of pressure between the lining and the brake drum is $0.5 \text{ N/mm}^2$ . The pivot of each shoe is located in such a manner that the moment of the frictional force on the shoe is zero. Calculate: (i) the distance of the pivot from the axis of the brake drum (ii) the torque capacity of each shoe (iii) the reactions at the pivot	L3 Apply CO3	<b>6</b>
<b>B)</b>	An automotive plate clutch consists of two pairs of contacting surfaces with an asbestos friction lining. The torque transmitting capacity of the clutch is 550 N-m. The coefficient of friction is 0.25 and the permissible intensity of pressure is $0.5 \text{ N/mm}^2$ . Due to space limitations, the outer diameter of the friction disk is fixed as 250 mm. Calculate (i) the inner diameter of the friction disk; and (ii) the spring force required to keep the clutch in an engaged position. Use uniform wear theory.	L3 Apply CO3	<b>6</b>
<b>C)</b>	A cone clutch with asbestos friction lining transmits 30 kW power at 500 rpm. The coefficient of friction is 0.2 and the permissible intensity of pressure is $0.35 \text{ N/mm}^2$ . The semi-cone angle $\alpha$ is $12.5^\circ$ . The outer diameter is fixed as 300 mm from space limitations. Assuming uniform wear theory, calculate: (i) the inner diameter; (ii) the face width of the friction lining; and (iii) the force required to engage the clutch.	L3 Apply CO3	<b>6</b>

**\*\*\* End \*\*\***

**Table 17.3** Values of the Lewis form factor  $Y$  for  $20^\circ$  full-depth involute system

$z$	$Y$	$z$	$Y$	$z$	$Y$
15	0.289	27	0.348	55	0.415
16	0.295	28	0.352	60	0.421
17	0.302	29	0.355	65	0.425
18	0.308	30	0.358	70	0.429
19	0.314	32	0.364	75	0.433
20	0.320	33	0.367	80	0.436
21	0.326	35	0.373	90	0.442
22	0.330	37	0.380	100	0.446
23	0.333	39	0.386	150	0.458
24	0.337	40	0.389	200	0.463
25	0.340	45	0.399	300	0.471
26	0.344	50	0.408	Rack	0.484

**Table 15.5 Dimensions and Static and Dynamic Load Capacities of Single Row Deep Groove Ball Bearing**

<i>Principal dimensions (mm)</i>			<i>Basic load ratings (N)</i>		<i>Designation</i>
$d$	$D$	$B$	$C$	$C_0$	
40	52	7	4160	3350	61808
	68	9	13300	7800	16008
	68	15	16800	9300	6008
	80	18	30700	16600	6208
	90	23	41000	22400	6308
	110	27	63700	36500	6408
45	58	7	6050	3800	61809
	75	10	15600	9300	16009
	75	16	21200	12200	6009
	85	19	33200	18600	6209
	100	25	52700	30000	6309
	120	29	76100	45500	6409
50	65	7	6240	4250	61810
	80	10	16300	10000	16010
	80	16	21600	13200	6010
	90	20	35100	19600	6210
	110	27	61800	36000	6310
	130	31	87100	52000	6410

## Design Data for Roller Chains

**Table 14.2** Power rating of simple roller chain

<i>Pinion speed (rpm)</i>	<i>Power (kW)</i>								
	<i>06 B</i>	<i>08A</i>	<i>08 B</i>	<i>10A</i>	<i>10 B</i>	<i>12A</i>	<i>12 B</i>	<i>16A</i>	<i>16 B</i>
50	0.14	0.28	0.34	0.53	0.64	0.94	1.07	2.06	2.59
100	0.25	0.53	0.64	0.98	1.18	1.74	2.01	4.03	4.83
200	0.47	0.98	1.18	1.83	2.19	3.40	3.75	7.34	8.94
300	0.61	1.34	1.70	2.68	3.15	4.56	5.43	11.63	13.06
500	1.09	2.24	2.72	4.34	5.01	7.69	8.53	16.99	20.57
700	1.48	2.95	3.66	5.91	6.71	10.73	11.63	23.26	27.73
1000	2.03	3.94	5.09	8.05	8.97	14.32	15.65	28.63	34.89
1400	2.73	5.28	6.81	11.18	11.67	14.32	18.15	18.49	38.47
1800	3.44	6.98	8.10	8.05	13.03	10.44	19.85	—	—
2000	3.80	6.26	8.67	7.16	13.49	8.50	20.57	—	—

**Table 14.3** Service factor ( $K_s$ )

<i>Type of driven load</i>	<i>Type of input power</i>		
	<i>IC engine with hydraulic drive</i>	<i>Electric motor</i>	<i>IC engine with mechanical drive</i>
(i) <i>Smooth:</i> agitator, fan, light conveyor	1.0	1.0	1.2
(ii) <i>Moderate shock:</i> machine tools, crane, heavy conveyor, food mixer, grinder	1.2	1.3	1.4
(iii) <i>Heavy shock:</i> punch press, hammer mill, reciprocating conveyor, rolling mill drive	1.4	1.4	1.7

**Table 14.4** Multiple strand factor ( $K_1$ )

<i>Number of strands</i>	$K_1$
1	1.0
2	1.7
3	2.5
4	3.3
5	3.9
6	4.6

**Table 14.5** Tooth correction factor ( $K_2$ )

<i>Number of teeth on the driving sprocket</i>	$K_2$
15	0.85
16	0.92
17	1.00
18	1.05
19	1.11
20	1.18
21	1.26
22	1.29
23	1.35
24	1.41
25	1.46
30	1.73

## Data Tables for Belt Design

**Table 13.1** Load correction factor ( $F_a$ )

<i>Type of load</i>	$F_a$
(i) Normal load	1.0
(ii) Steady load, e.g., centrifugal pumps, fans, light machine tools, conveyors	1.2
(iii) Intermittent load, e.g., heavy duty fans, blowers, compressors, reciprocating pumps, line shafts, heavy-duty machines	1.3
(iv) Shock load, e.g., vacuum pumps, rolling mills, hammers, grinders	1.5

**Table 13.2** Arc of contact factor ( $F_d$ )

$\alpha_s$ (Deg.)	120	130	140	150	160	170	180	190	200
$F_d$	1.33	1.26	1.19	1.13	1.08	1.04	1.00	0.97	0.94

HI-SPEED	0.0118 kW per mm width per ply
FORT	0.0147 kW per mm width per ply

**The standard widths of belts (in mm)**

3-Ply	25	40	50	63	76					
4-Ply	40	44	50	63	76	90	100	112	125	152
5-Ply	76	100	112	125	152					
6-Ply	112	125	152	180	200					

**Table 13.3** Minimum pulley diameters for given belt speeds and belt plies (mm)

<i>No. of plies</i>	<i>Maximum belt speed (m/s)</i>				
	10	15	20	25	30
3	90	100	112	140	180
4	140	160	180	200	250
5	200	224	250	315	355
6	250	315	355	400	450
7	355	400	450	500	560
8	450	500	560	630	710
9	560	630	710	800	900
10	630	710	800	900	1000

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Regular End Semester Examination – Summer 2022**

**Branch : Mechanical Engineering/ Mechanical Engineering (Sandwich)**

**Course: B. Tech.**

**Semester : VI**

**Subject Code & Name: BTMEC 601- Manufacturing Processes - II**

**Max Marks: 60**

**Date: 11/08/2022**

**Duration: 3.45 Hr.**

**Instructions to the Students:**

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
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(Level/CO) Marks

**Q. 1 Solve Any Two of the following.**

- A) Define abrasive with the help of a single grain having a negative rake angle. **CO1 6**
- B) What are the advantages of coextrusion? **CO6 6**
- C) Derive mathematical expression to determine the shear angle in orthogonal cutting. **CO2 6**

**Q.2 Solve Any Two of the following.**

- A) Describe with the help of a suitable sketch mechanism of chip formation in orthogonal machining of ductile materials. **CO2 6**
- B) Explain the standard marking system for the given conventional grinding wheel (30 A 46 H 6 V XX). **CO1 6**
- C) Define tool life and discuss the concept of crater wear and flank wear. **CO3 6**

**Q. 3 Solve Any Two of the following.**

- A) What are the major properties required of cutting tool materials? **CO3 6**
- B) In a machining operation that approximates orthogonal cutting, the cutting tool has a rake angle =  $10^\circ$ . The chip thickness before the cut  $t_o = 0.50$  mm and the chip thickness after the cut  $t_c = 1.125$  mm. Calculate the shear plane angle and the shear strain in the operation. **CO2 6**
- C) Describe the advantages and limitations of powder metallurgy parts. **CO4 6**

**Q.4 Solve Any Two of the following.**

- A) Discuss with a suitable sketch the concept of heat generation and temperature distribution in metal cutting. **CO3 6**
- B) How is glass tubing produced? **CO5 6**
- C) Briefly describe the plastic extrusion process. **CO6 6**

**Q. 5 Solve Any Two of the following.**

- A) Discuss powder production using water automatization technique with sketch. **CO4 6**
- B) How flat sheets/ glass are manufacture? Explain float glass method. **CO5 6**
- C) What is an abrasive? Discuss conventional abrasives in brief. **CO1 6**

**\*\*\* End \*\*\***

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular End Semester Examination – Summer 2022

Course: B. Tech. Branch : Mechanical Engineering Semester : 6<sup>th</sup>

Subject Code & Name: BTMEC602, Machine Design - II

Max Marks: 60

Date:17/08/2022

Duration: 3.45 Hr.

Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

	(Level/CO)	Marks
<b>Q.1 Solve Any Two of the following.</b>		
<b>A)</b> The following data is given for a hydrostatic thrust bearing: thrust load = 500 kN, shaft speed = 720 rpm, shaft diameter = 500 mm, recess diameter = 300 mm, film thickness = 0.15 mm, viscosity of lubricant = 160 SUS, specific gravity = 0.86, Calculate (i) supply pressure; (ii) flow requirement in litres/min; (iii) power loss in pumping; and (iv) frictional power loss.	Level 3 - Apply CO1 CO2	6
<b>B)</b> A single-row deep groove ball bearing is subjected to a radial force of 8 kN and a thrust force of 3 kN. The values of X and Y factors are 0.56 and 1.5 respectively. The shaft rotates at 1200 rpm. The diameter of the shaft is 75 mm and Bearing No. 6315 (C =112 000 N) is selected for this application. (i) Estimate the life of this bearing, with 90% reliability. (ii) Estimate the reliability for 20 000 h life	Level 3 - Apply CO1 CO2	6
<b>C)</b> Derive following fundamental equation for viscous flow through rectangular slot. $Q = \frac{\Delta p b h^3}{12 \mu l}$	Level 3 - Apply CO1 CO2	6
<b>Q.2 Solve Any Two of the following.</b>		
<b>A)</b> It is required to design a pair of spur gears with 20° full-depth involute teeth consisting of a 20-teeth pinion meshing with a 50 teeth gear. The pinion shaft is connected to a 22.5 kW, 1450 rpm electric motor. The starting torque of the motor can be taken as 150% of the rated torque. The material for the pinion is plain carbon steel Fe 410 (Sut = 410 N/mm <sup>2</sup> ), while the gear is made of grey cast iron FG 200 (Sut =200 N/mm <sup>2</sup> ). The factor of safety is 1.5. Design the gears based on Lewis form factor and using velocity factor to account for the dynamic load 1. Identify the weaker element out of pinion and gear 2. Calculate the module based on beam strength 3. Calculate tangential force on gear tooth 4. Calculate beam strength and factor of safety to check if design is safe. Refer Table for values of Lewis form factor.	Level 3 Apply CO4 CO5	6
<b>B)</b> A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 40 teeth gear. The helix angle is 25° and the normal pressure angle is 20°. The normal module is 3 mm. Calculate (i) the transverse module; (ii) the transverse pressure angle; (iii) the axial pitch; (iv) the pitch circle diameters of the pinion and the gear; (v) the center distance; and (vi) the addendum and dedendum circle diameters of the pinion.	Level 3 Apply CO4 CO5	6
<b>C)</b> Explain following terminologies of gear nomenclature with mathematical equation (wherever necessary) 1. Transmission ratio	Level 3 Apply CO4	6

2. Velocity ratio
3. Pressure angle
4. Circular Pitch
5. Diametral Pitch
6. Module

CO5

**Q.3 Solve Any Two of the following.**

**A)** A pair of bevel gears, with  $20^\circ$  pressure angle, consists of a 20 teeth pinion meshing with a 30 teeth gear. The module is 4 mm, while the face width is 20 mm. The material for the pinion and gear is steel 50C4 ( $S_{ut} = 750 \text{ N/mm}^2$ ). The gear teeth are lapped and ground (Class-3) and the surface hardness is 400 BHN. The pinion rotates at 500 rpm and receives 2.5 kW power from the electric motor. The starting torque of the motor is 150% of the rated torque. Tangential force acting on gear tooth is 1193.66 N. Determine the factor of safety **against pitting failure only**. Assume that Buckingham's equation is used to account for dynamic load.

Level 3  
Apply  
CO4  
CO5

6

**Data:**

1. The error 'e' for Class-3 gear teeth with 4 mm module is  $0.0125 \text{ mm}$ .
2.  $C = 11400 \text{ N/mm}^2$

**B)** A pair of worm and worm wheel is designated as 3/60/10/6. The worm is transmitting 5 kW power at 1440 rpm to the worm wheel. The coefficient of friction is 0.1 and the normal pressure angle is  $20^\circ$ . Determine the components of the gear tooth force acting on the worm and the worm wheel.

Level 3  
Apply  
CO4  
CO5

6

**C)** Explain advantages and disadvantages of worm gears as compared to other gears.

Level 2  
Understand  
CO4  
CO5

6

**Q.4 Solve Any Two of the following.**

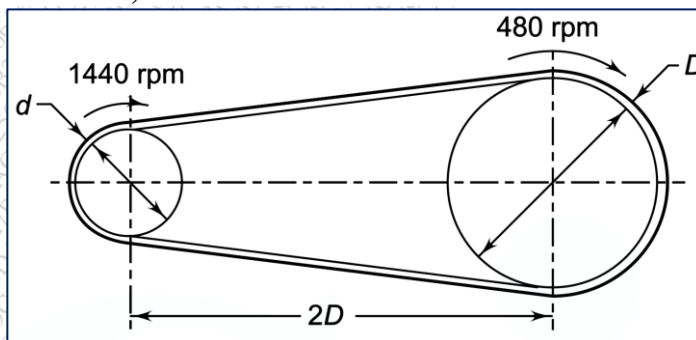
**A)** The layout of a leather belt drive transmitting 15 kW of power is shown in Fig. The centre distance between the pulleys is twice the diameter of the bigger pulley. The belt should operate at a velocity of 20 m/s approximately and the stresses in the belt should not exceed  $2.25 \text{ N/mm}^2$ . The density of leather is  $0.95 \text{ g/cc}$  and the coefficient of friction is 0.35. The thickness of the belt is 5 mm. Calculate:

- (i) the diameter of pulleys;
- (ii) the length and width of the belt; and
- (iii) the belt tensions.

Level 3  
Apply  
CO4  
CO5

6

Consider  $mv^2 = 1.97b$ , where  $m$  is mass of belt and  $b$  is the width of belt



**B)** A chain drive is used in a special purpose vehicle. The vehicle is run by a 30kW rotary engine. There is a separate mechanical drive from the engine shaft to the intermediate shaft. The driving sprocket is fixed to this intermediate shaft. The efficiency of the drive between the engine and the intermediate shafts is 90%. The driving sprocket has 17 teeth and it rotates at 300 rpm. The driven sprocket rotates at 100 rpm. Assume moderate shock conditions and select a suitable four-strand chain for this drive.

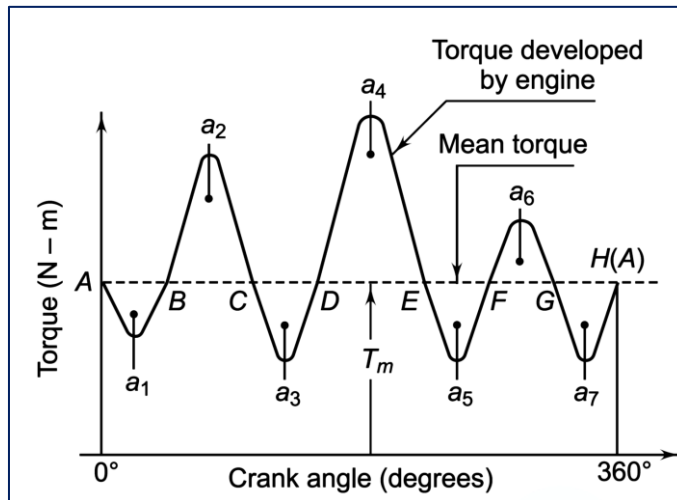
Level 3  
Apply  
CO4  
CO5

6



Use Given data from tables for selection of various factors.

C)



Level 3  
Apply

6

Demonstrate the concept & mathematical equation of maximum fluctuation of energy and coefficient of fluctuation of energy by using this diagram.

**Q. 5 Solve Any Two of the following.**

- A)** An automotive plate clutch consists of two pairs of contacting surfaces with an asbestos friction lining. The torque transmitting capacity of the clutch is 550 N-m. The coefficient of friction is 0.25 and the permissible intensity of pressure is 0.5 N/mm<sup>2</sup>. Due to space limitations, the outer diameter of the friction disk is fixed as 250 mm. Using uniform wear theory, calculate
- the inner diameter of the friction disk; and
  - the spring force required to keep the clutch in an engaged position.

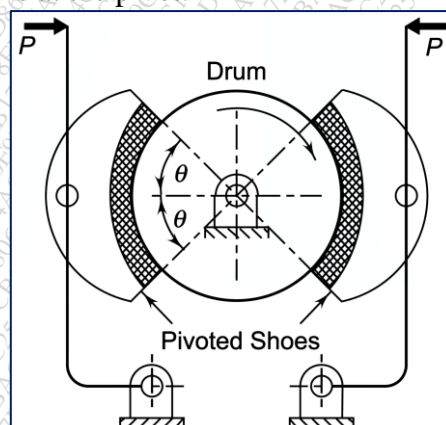
Level 3  
Apply  
CO3

6

- B)** A pivoted double-block brake, has two shoes, which subtend an angle ( $2\theta$ ) of 100°. The diameter of the brake drum is 500 mm and the width of the friction lining is 100 mm. The coefficient of friction is 0.2 and the maximum intensity of pressure between the lining and the brake drum is 0.5 N/mm<sup>2</sup>. The pivot of each shoe is located in such a manner that the moment of the frictional force on the shoe is zero.

Calculate:

- the distance of the pivot from the axis of the brake drum;
- the torque capacity of each shoe; and
- the reactions at the pivot.



Level 3  
Apply  
CO3

6

- C)** What is the meaning of autofrettage in cylinders? Explain three methods of prestressing the cylinders.

Level 2  
Understand  
CO6

6

\*\*\* End \*\*\*

**Table – Values of Lewis Form Factor Y for 20° Full Depth Involute System**

<i>z</i>	<i>Y</i>	<i>z</i>	<i>Y</i>	<i>z</i>	<i>Y</i>
15	0.289	27	0.348	55	0.415
16	0.295	28	0.352	60	0.421
17	0.302	29	0.355	65	0.425
18	0.308	30	0.358	70	0.429
19	0.314	32	0.364	75	0.433
20	0.320	33	0.367	80	0.436
21	0.326	35	0.373	90	0.442
22	0.330	37	0.380	100	0.446
23	0.333	39	0.386	150	0.458
24	0.337	40	0.389	200	0.463
25	0.340	45	0.399	300	0.471
26	0.344	50	0.408	Rack	0.484

**Table – Dimensions and Static and Dynamic Load Capacities of Single Row Deep Groove Ball Bearing**

<i>Principal dimensions (mm)</i>			<i>Basic load ratings (N)</i>		<i>Designation</i>
<i>d</i>	<i>D</i>	<i>B</i>	<i>C</i>	<i>C<sub>0</sub></i>	
70	90	10	12100	9150	61814
	110	13	28100	19000	16014
	110	20	37700	24500	6014
	125	24	61800	37500	6214
	150	35	104000	63000	6314
	180	42	143000	104000	6414
75	95	10	12500	9800	61815
	115	13	28600	20000	10615
	115	20	39700	26000	6015
	130	25	66300	40500	6215
	160	37	112000	72000	6315
	190	45	153000	114000	6415

## Design Data for Roller Chains

**Table 14.2** Power rating of simple roller chain

Pinion speed (rpm)	Power (kW)								
	06 B	08A	08 B	10A	10 B	12A	12 B	16A	16 B
50	0.14	0.28	0.34	0.53	0.64	0.94	1.07	2.06	2.59
100	0.25	0.53	0.64	0.98	1.18	1.74	2.01	4.03	4.83
200	0.47	0.98	1.18	1.83	2.19	3.40	3.75	7.34	8.94
300	0.61	1.34	1.70	2.68	3.15	4.56	5.43	11.63	13.06
500	1.09	2.24	2.72	4.34	5.01	7.69	8.53	16.99	20.57
700	1.48	2.95	3.66	5.91	6.71	10.73	11.63	23.26	27.73
1000	2.03	3.94	5.09	8.05	8.97	14.32	15.65	28.63	34.89
1400	2.73	5.28	6.81	11.18	11.67	14.32	18.15	18.49	38.47
1800	3.44	6.98	8.10	8.05	13.03	10.44	19.85	—	—
2000	3.80	6.26	8.67	7.16	13.49	8.50	20.57	—	—

**Table 14.3** Service factor ( $K_s$ )

Type of driven load	Type of input power		
	IC engine with hydraulic drive	Electric motor	IC engine with mechanical drive
(i) Smooth: agitator, fan, light conveyor	1.0	1.0	1.2
(ii) Moderate shock: machine tools, crane, heavy conveyor, food mixer, grinder	1.2	1.3	1.4
(iii) Heavy shock: punch press, hammer mill, reciprocating conveyor, rolling mill drive	1.4	1.4	1.7

**Table 14.4** Multiple strand factor ( $K_1$ )

Number of strands	$K_1$
1	1.0
2	1.7
3	2.5
4	3.3
5	3.9
6	4.6

**Table 14.5** Tooth correction factor ( $K_2$ )

Number of teeth on the driving sprocket	$K_2$
15	0.85
16	0.92
17	1.00
18	1.05
19	1.11
20	1.18
21	1.26
22	1.29
23	1.35
24	1.41
25	1.46
30	1.73

<p style="text-align: center;"><b>DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE</b></p> <p style="text-align: center;"><b>Winter Examination – 2022</b></p> <p><b>Course: B. Tech.                                  Branch: Mechanical          Semester : Sixth (6<sup>th</sup>)</b></p> <p><b>Subject Code &amp; Name: (BTMEC602) Machine Design II</b></p> <p><b>Max Marks: 60                                  Date:                                  Duration: 3 Hr.</b></p>			
<p><i>Instructions to the Students:</i></p> <ol style="list-style-type: none"> <li>1. All the questions are compulsory.</li> <li>2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.</li> <li>3. Use of non-programmable scientific calculators is allowed.</li> <li>4. Assume suitable data wherever necessary and mention it clearly.</li> </ol>			
		(Level/CO)	Marks
<b>Q. 1</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
<b>A)</b>	A single-row deep groove ball bearing is subjected to a pure radial force of 3 kN from a shaft that rotates at 600 rpm. The expected life $L_{10h}$ of the bearing is 30,000 h. The minimum acceptable diameter of the shaft is 40 mm. Select a suitable ball bearing for this application from manufacturer's catalogue.	L3 Apply CO1 CO2	<b>6</b>
<b>B)</b>	A single-row deep groove ball bearing has dynamic load capacity of 40,500 N and operates on the following work cycle: (i) radial load of 5000 N at 500 rpm for 25% of the time; (ii) radial load of 10000 N at 700 rpm for 50% of the time; and (iii) radial load of 7000 N at 400 rpm for the remaining 25% of the time. Calculate the expected life of the bearing in hours.	L3 Apply CO1 CO2	<b>6</b>
<b>C)</b>	Explain a. Dynamic Load Carrying Capacity and b. Equivalent dynamic load for a roller bearing	L2 Understand CO1 CO2	<b>6</b>
<b>Q.2</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
<b>A)</b>	It is required to design a pair of spur gears with 20° full-depth involute teeth based on the Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to a 10 kW, 1440 rpm motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4:1. The pinion as well as the gear is made of plain carbon steel 40C8 ( $S_{ut} = 600 \text{ N/mm}^2$ ). The factor of safety can be taken as 1.5. Considering pitch line velocity $v = 5 \text{ m/s}$ , Calculate 1. Module based on beam strength 2. PCD of pinion and gear 3. Beam strength Refer Table for values of Lewis form factor.	L3 Apply  CO4 CO5	<b>6</b>
<b>B)</b>	Differentiate between Spur Gears and Helical Gears.	L2 Understand CO4 CO5	<b>6</b>
<b>C)</b>	A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20°, while the helix angle is 25°. The face width is 40 mm and the normal	L3 Apply CO4	<b>6</b>

	<p>module is 4 mm. The pinion as well as the gear is made of steel 40C8 (<math>S_{ut} = 600 \text{ N/mm}^2</math>) and heat treated to a surface hardness of 300 BHN. Calculate</p> <ol style="list-style-type: none"> <li>Virtual number of teeth</li> <li>Ratio Factor Q</li> <li>The Factor K</li> <li>Pitch circle diameter <math>d_p</math></li> <li>Wear Strength</li> </ol>	CO5	
<b>Q. 3</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
<b>A)</b>	Explain advantages and disadvantages of worm gears as compared to other gears.	Level 2 Understand CO4 CO5	<b>6</b>
<b>B)</b>	<p>A pair of bevel gears, with <math>20^\circ</math> pressure angle, consists of a 20 teeth pinion meshing with a 30 teeth gear. The module is 4 mm, while the face width is 20 mm. The material for the pinion and gear is steel 50C4 (<math>S_{ut} = 750 \text{ N/mm}^2</math>). The gear teeth are lapped and ground (Class-3) and the surface hardness is 400 BHN. The pinion rotates at 500 rpm and receives 2.5 kW power from the electric motor. The starting torque of the motor is 150% of the rated torque. Calculate</p> <ol style="list-style-type: none"> <li>Pitch angle</li> <li>Virtual no. of teeth of pinion</li> <li>Lewis form factor for pinion</li> <li>Beam strength</li> </ol>	L3 Apply CO4 CO5	<b>6</b>
<b>C)</b>	<p>Explain following terminologies of worm gears.</p> <ol style="list-style-type: none"> <li>Axial Pitch</li> <li>Lead</li> <li>Lead angle</li> </ol>	Level 2 Understand CO4 CO5	<b>6</b>
<b>Q.4</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
<b>A)</b>	Explain advantages and disadvantages of belt drives as compared to gear drives.	Level 2 Understand CO4 CO5	<b>6</b>
<b>B)</b>	<p>A chain drive is used in a special purpose vehicle. The vehicle is run by a 30kW rotary engine. There is a separate mechanical drive from the engine shaft to the intermediate shaft. The driving sprocket is fixed to this intermediate shaft. The efficiency of the drive between the engine and the intermediate shafts is 90%. The driving sprocket has 17 teeth and it rotates at 300 rpm. The driven sprocket rotates at 100 rpm. Assume moderate shock conditions and select a suitable four-strand chain for this drive. Use Given data from tables for selection of various factors.</p>	Level 3 Apply CO4 CO5	<b>6</b>
<b>C)</b>	<p>The following data is given for an open-type V-belt drive:            diameter of driving pulley = 200 mm, diameter of driven pulley = 600 mm            groove angle for sheaves = <math>34^\circ</math>, mass of belt = 0.5 kg/m            maximum permissible tension in belt = 500 N, coefficient of friction = 0.2            contact angle for smaller pulley = <math>157^\circ</math>, speed of smaller pulley = 1440 rpm            power to be transmitted = 10 kW. Calculate the tensions <math>P_1</math> and <math>P_2</math> in the</p>	Level 3 Apply CO4 CO5	<b>6</b>

	belt.		
<b>Q. 5</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
<b>A)</b>	<p>An automotive plate clutch consists of two pairs of contacting surfaces with an asbestos friction lining. The torque transmitting capacity of the clutch is 550 N-m. The coefficient of friction is 0.25 and the permissible intensity of pressure is 0.5 N/mm<sup>2</sup>. Due to space limitations, the outer diameter of the friction disk is fixed as 250 mm. Calculate</p> <p>(i) the inner diameter of the friction disk; and</p> <p>(ii) the spring force required to keep the clutch in an engaged position. Use uniform wear theory.</p>	Level 3 Apply CO3	<b>6</b>
<b>B)</b>	<p>A solid cast iron disk, 1 m in diameter and 0.2 m thick, is used as a flywheel. It is rotating at 350 rpm. It is brought to rest in 1.5 s by means of a brake. Calculate</p> <p>(i) the energy absorbed by the brake; and</p> <p>(ii) the torque capacity of the brake.</p> <p>Take mass density of cast iron = 7200 kg/m<sup>3</sup> and</p> <p>Radius of gyration of a solid disk about its axis of rotation = <math>\frac{d_{disc}}{\sqrt{8}}</math></p>	Level 3 Apply CO3	<b>6</b>
<b>C)</b>	<p>What is the meaning of autofrettage in cylinders? Explain three methods of prestressing the cylinders.</p>	Level 2 Understand CO6	<b>6</b>
<b>*** End ***</b>			

**Table – Values of Lewis Form Factor Y for 20° Full Depth Involute System**

<i>z</i>	<i>Y</i>	<i>z</i>	<i>Y</i>	<i>z</i>	<i>Y</i>
15	0.289	27	0.348	55	0.415
16	0.295	28	0.352	60	0.421
17	0.302	29	0.355	65	0.425
18	0.308	30	0.358	70	0.429
19	0.314	32	0.364	75	0.433
20	0.320	33	0.367	80	0.436
21	0.326	35	0.373	90	0.442
22	0.330	37	0.380	100	0.446
23	0.333	39	0.386	150	0.458
24	0.337	40	0.389	200	0.463
25	0.340	45	0.399	300	0.471
26	0.344	50	0.408	Rack	0.484

**Table – Dimensions and Static and Dynamic Load Capacities of Single Row Deep Groove Ball Bearing**

<i>Principal dimensions (mm)</i>			<i>Basic load ratings (N)</i>		<i>Designation</i>
<i>d</i>	<i>D</i>	<i>B</i>	<i>C</i>	<i>C<sub>0</sub></i>	
40	52	7	4160	3350	61808
	68	9	13300	7800	16008
	68	15	16800	9300	6008
	80	18	30700	16600	6208
	90	23	41000	22400	6308
	110	27	63700	36500	6408
45	58	7	6050	3800	61809
	75	10	15600	9300	16009
	75	16	21200	12200	6009
	85	19	33200	18600	6209
	100	25	52700	30000	6309
	120	29	76100	45500	6409
50	65	7	6240	4250	61810
	80	10	16300	10000	16010
	80	16	21600	13200	6010
	90	20	35100	19600	6210
	110	27	61800	36000	6310
	130	31	87100	52000	6410

## Design Data for Roller Chains

**Table 14.2** Power rating of simple roller chain

<i>Pinion speed (rpm)</i>	<i>Power (kW)</i>								
	<i>06 B</i>	<i>08A</i>	<i>08 B</i>	<i>10A</i>	<i>10 B</i>	<i>12A</i>	<i>12 B</i>	<i>16A</i>	<i>16 B</i>
50	0.14	0.28	0.34	0.53	0.64	0.94	1.07	2.06	2.59
100	0.25	0.53	0.64	0.98	1.18	1.74	2.01	4.03	4.83
200	0.47	0.98	1.18	1.83	2.19	3.40	3.75	7.34	8.94
300	0.61	1.34	1.70	2.68	3.15	4.56	5.43	11.63	13.06
500	1.09	2.24	2.72	4.34	5.01	7.69	8.53	16.99	20.57
700	1.48	2.95	3.66	5.91	6.71	10.73	11.63	23.26	27.73
1000	2.03	3.94	5.09	8.05	8.97	14.32	15.65	28.63	34.89
1400	2.73	5.28	6.81	11.18	11.67	14.32	18.15	18.49	38.47
1800	3.44	6.98	8.10	8.05	13.03	10.44	19.85	—	—
2000	3.80	6.26	8.67	7.16	13.49	8.50	20.57	—	—

**Table 14.3** Service factor ( $K_s$ )

<i>Type of driven load</i>	<i>Type of input power</i>		
	<i>IC engine with hydraulic drive</i>	<i>Electric motor</i>	<i>IC engine with mechanical drive</i>
(i) <i>Smooth:</i> agitator, fan, light conveyor	1.0	1.0	1.2
(ii) <i>Moderate shock:</i> machine tools, crane, heavy conveyor, food mixer, grinder	1.2	1.3	1.4
(iii) <i>Heavy shock:</i> punch press, hammer mill, reciprocating conveyor, rolling mill drive	1.4	1.4	1.7

**Table 14.4** Multiple strand factor ( $K_1$ )

<i>Number of strands</i>	$K_1$
1	1.0
2	1.7
3	2.5
4	3.3
5	3.9
6	4.6

**Table 14.5** Tooth correction factor ( $K_2$ )

<i>Number of teeth on the driving sprocket</i>	$K_2$
15	0.85
16	0.92
17	1.00
18	1.05
19	1.11
20	1.18
21	1.26
22	1.29
23	1.35
24	1.41
25	1.46
30	1.73



DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular End-Semester Examination – Summer 2022

Course: T.Y. B.Tech.

Branch: Mechanical Engineering

Semester: VI

Subject Code & Name: BTMEC603 / Applied Thermodynamics-II

Max Marks: 60

Date: 20-08-2022

Duration: 3.45 Hr.

Instructions to the Students:

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO), on which the question is based, is mentioned in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

	Level/CO	Marks
<b>Q. 1 Solve Any Two of the following:</b>		
A) Classify different types of I.C. Engines	BL4/CO1	6
B) Draw and explain Diesel Cycle with the help of P-V & T-S diagrams.	BL4/CO1	6
C) Derive an expression for efficiency of Otto cycle.	BL6/CO1	6
$\eta_{otto} = 1 - \frac{1}{r^{(\gamma-1)}}$		
Where, r is compression ratio and $\gamma$ is adiabatic index		
<b>Q.2 Solve Any Two of the following:</b>		
A) Draw circuit diagram of a coil/battery ignition system. Write functions of its important components.	BL2/CO2	6
B) Write as short note on 'emission regulation norms'	BL3/CO2	6
C) A 4-cylinder, 4-Stroke, petrol-engine works on indicated mean effective pressure (MEP) of 6 bar and engine speed of 1250 rpm. Find the swept volume and indicated power developed by engine if piston diameter is 100 mm & stroke length is 150 mm. Also calculate the brake power available at crank shaft if mechanical efficiency is 75%	BL3/CO2	6
<b>Q. 3 Solve Any Two of the following:</b>		
A) Classify different types of refrigerants.	BL4/CO3	6
B) Draw and explain ideal vapour-compression refrigeration cycle on T-s and P-h diagrams.	BL3/CO3	6
C) An NH <sub>3</sub> refrigeration plant has a capacity of 20 TR. The condensation and evaporation temperatures are 35°C and -20°C respectively. Refrigerant is dry and saturated at the entry to the compressor. There is no sub-cooling of the liquid refrigerant. If the actual COP is 0.7 times the theoretical COP, Calculate mass flow-rate of the refrigerant.	BL3/CO3	6

(Use P-h chart of NH<sub>3</sub> which is given at the end of question paper)

COP: Coefficient of Performance

**Q.4 Solve Any Two of the following:**

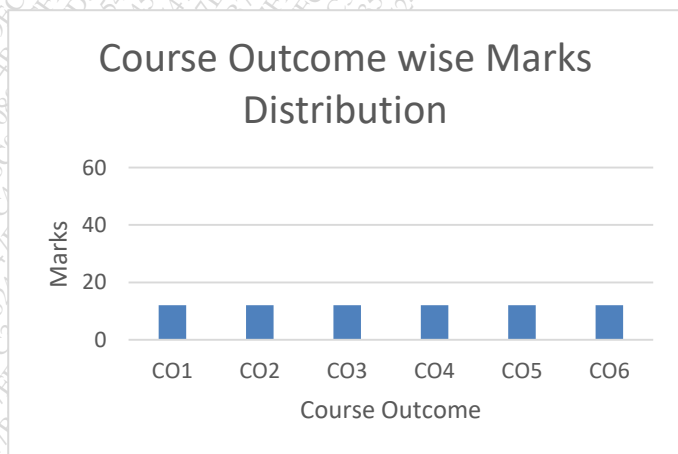
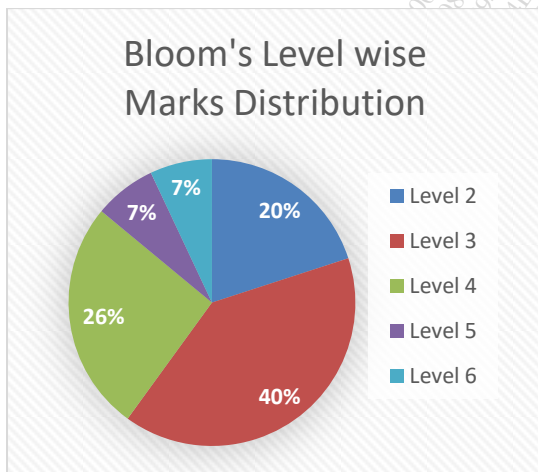
- A) Elaborate the terms SHF and BPF. BL2/CO4 **6**
- B) With reference to air-conditioning, define following terms: BL1/CO4 **6**
  - i) Dry Bulb Temperature
  - ii) Dew Point Temperature
  - iii) Relative Humidity
- C) Differentiate between horizontal axis wind-turbine and vertical axis wind-turbine. BL5/CO5 **6**

**Q.5 Solve Any Two of the following:**

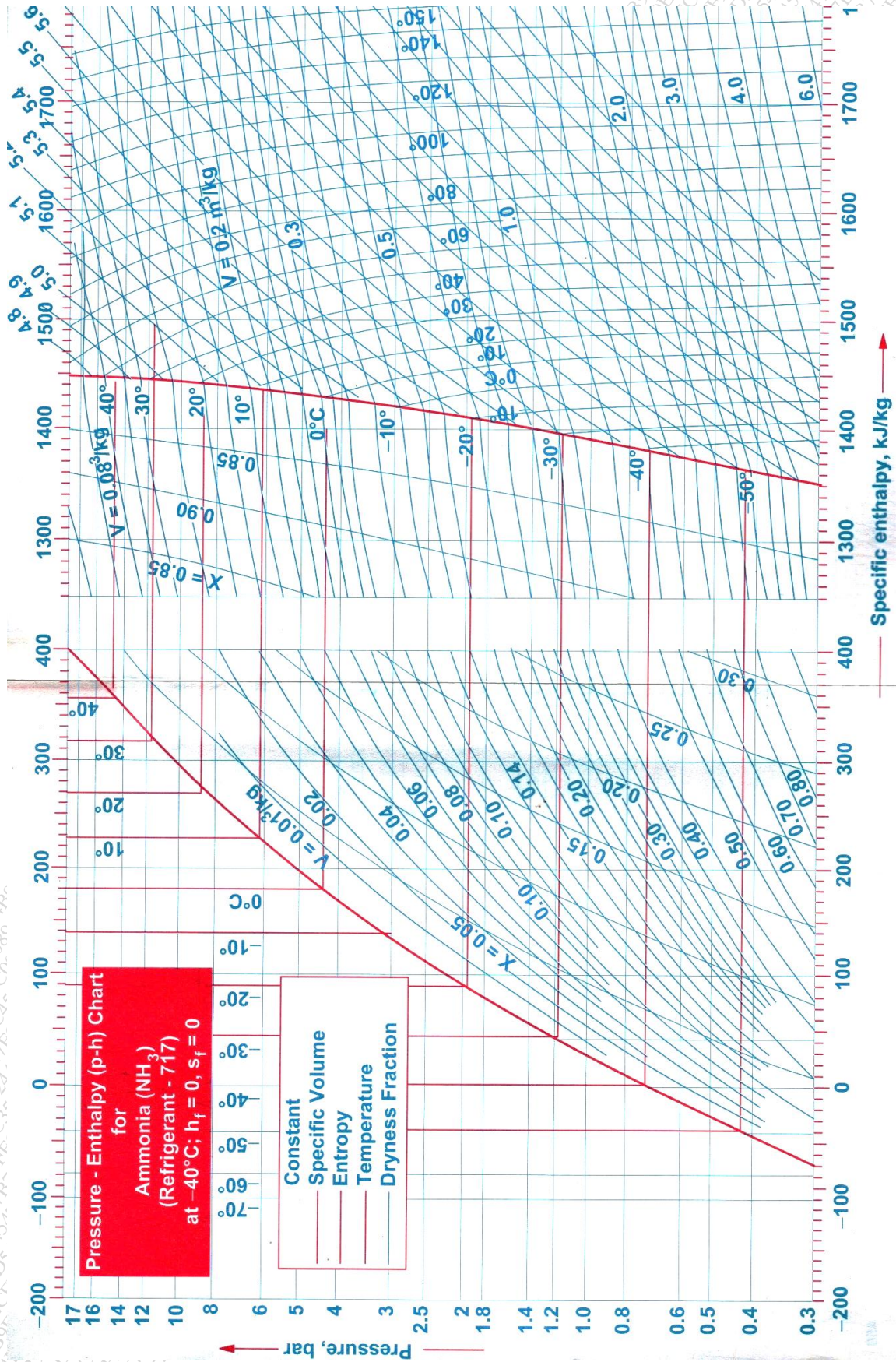
- A) Draw schematic diagram of a simple steam power plant. Also, draw corresponding Rankine cycle on T-s diagram and explain it. BL4/CO5 **6**
- B) Describe Diesel power plant with the help of schematic diagram. BL2/CO6 **6**
- C) What factors should be taken into consideration while selecting a site for steam power plant? BL2/CO6 **6**

\*\*\* End \*\*\*

BL – Bloom’s Taxonomy Levels (1- Remembering, 2- Understanding, 3 – Applying, 4 – Analyzing, 5 – Synthesizing, 6 - Evaluating)  
 CO – Course Outcomes



Note: Attach this P-h chart to your answer sheet



**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Supplementary Examination – Summer 2022**

**Course: T. Y. B. Tech.      Branch : Mechanical Engineering      Semester : VI**

**Subject Code & Name: Applied Thermodynamics-II & BTMEC603**

**Max Marks: 60**

**Date:**

**Duration: 3 Hr.**

***Instructions to the Students:***

1. *All the questions are compulsory.*
2. *Use of non-programmable scientific calculators is allowed.*
3. *Assume suitable data wherever necessary and mention it clearly.*

**Q. 1 Solve Any Two of the following. (6 x 2) 12M**

- A) Explain Otto cycle with the help of P-V & T-S diagram; Also derive an expression for its thermal efficiency.
- B) Describe the stages of combustion in SI engines
- C) With neat sketch explain Battery Ignition system. Also write the functions of each component.

**Q.2 Solve Any Two of the following. (6 x 2) 12M**

- A) Explain the construction and working of Four strokes CI engine with neat sketch.
- B) Enlist the different components of IC engine. Also differentiate between 4-stroke and 2-Stroke engine.
- C) Describe various Pollutants from SI & CI engines and their control.

**Q. 3 Solve Any Two of the following. (6 x 2) 12M**

- A) Draw and explain ideal vapor compression refrigeration cycle on T-S and P-h diagram.
- B) Explain ideal Rankine cycle on P-V, T-S & h-s diagram also derive the expression for thermal efficiency of cycle.
- C) Differentiate between horizontal axis wind turbine and vertical axis wind turbine.

**Q.4 Solve Any Two of the following. (6 x 2) 12M**

- A) Describe briefly with the help of a diagram, the vapor absorption refrigeration system.
- B) Explain the terms in details:
  1. Dry Bulb Temperature
  2. Dew point temperature
  3. Relative Humidity
- C) Explain steam power plant with the help of schematic diagram. Also write down the functions of each component.

**Q. 5 Solve Any Two of the following.**

**(6 x 2) 12M**

- A) Describe the diesel power plant with the help of schematic diagram.
- B) Draw general layout of Hydroelectric power plant. Also explain functions of its component.
- C) 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  $27^{\circ}\text{C}$  respectively. The peak pressure is 30 bar. Determine the pressure and temperatures at the salient points, the air-standard efficiency and the mean effective pressure. Assume ratio of specific heats to be 1.4 for air.

**\*\*\* End \*\*\***

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Regular End Semester Examination – Summer 2022**

**Course: B. Tech.                      Branch :Mechanical Engineering                      Semester : VI**

**Subject Code & Name: BTMEC604B IC Engines**

**Max Marks: 60**

**Date:23-08-2022**

**Duration: 3.45 Hr.**

**Instructions to the Students:**

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

	(Level/CO)	Marks
<b>Q. 1 Solve Any Two of the following.</b>		
A) Compare Two Stroke and Four Stroke engines in a detail.	(Analyze)	6
B) Explain with neat sketch how actual cycle of engine is different than air-standard cycle?	(Understand)	6
C) Comment on “Zero Pollution Vehicles”? Explain it with neat sketch.	(Understand)	6
<b>Q.2 Solve Any Two of the following.</b>		
A) Explain stages of combustion of Spark Ignition engine with Pressure-Crank angle diagram.	(Understand)	6
B) Explain the phenomenon of Knock in Compression Ignition Engine.	(Understand)	6
C) Compare the factors responsible for reduction of abnormal combustion of Spark Ignition and Compression ignition engine.	(Analyze)	6
<b>Q. 3 Solve Any Two of the following.</b>		
A) Explain Simple Carburetor with a neat sketch	(Understand)	6
B) Discuss Parallel Hybrid vehicle with a neat diagram of layout.	(Understand)	6
C) Explain the battery ignition system of engine with a neat sketch.	(Understand)	6
<b>Q.4 Solve Any Two of the following.</b>		
A) How Supercharging improves the power output of engine? Explain any one type of supercharger with neat sketch.	(Application)	6
B) State different exhaust emissions of I.C.Engine. Explain its effects on ecology.	(Understand)	6
C) A six-cylinder, gasoline engine operates on the four-stroke cycle. The bore of each cylinder is 75 mm and the stroke 95 mm. The clearance volume per cylinder is 65 cc. At a speed of 3800 rpm the fuel consumption is 18 kg/hr and the torque developed is 145 Nm. Calorific		



**Course: B. Tech.      Branch : Mechanical Engineering      Semester : VI**

**Subject Code & Name: BTMEC605C Renewable Energy Sources**

**Max Marks: 60**

**Date:26/08/2022**

**Duration: 3.45 Hr.**

**Instructions to the Students:**

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

	(CO)	Marks
<b>Q. 1 Solve Any Two of the following.</b>		
A) Differential between Renewable Energy sources and non-Renewable Energy sources.	CO1	6
B) Explain in detail energy reserves in India	CO1	6
C) Explain nuclear fission and Fusion.	CO1	6
<b>Q.2 Solve Any Two of the following.</b>		
A) Define a) Declination angle b) Solar Azimuth angle c) Zenith angle.	CO2	6
B) Explain with neat sketch construction and working of pyranometer.	CO 2	6
C) Calculate angle made by beam radiation with normal to a flat plate collector on May 1 at 09. 00 h. The collector is located in New delhi ( $28^{\circ} 35'N$ , $77^{\circ} 12'E$ ). It is tilted at an angle of $36^{\circ}$ with the horizontal and is pointing due south, also calculate for 12.00 h (Local apparent time).	CO 2	6
<b>Q. 3 Solve Any Two of the following.</b>		
A) Explain the different types of concentration collectors with neat sketch.	CO 2	6
B) Explain testing of flat plate collector with neat sketch.	CO 2	6
C) Explain construction and selection criteria for flat plate collector.	CO 2	6
<b>Q.4 Solve Any Two of the following.</b>		
A) Give the different application of solar energy and explain with neat sketch solar space heating.	CO 3	6
B) Explain construction and working of Photo Voltaic cell.	CO 3	6
C) What is wind energy? Explain selection of site for wind turbine generation system.	CO 4	6
<b>Q. 5 Solve Any Two of the following.</b>		
A) What is biomass energy? Explain with neat sketch floating drum type Biogas plant.	CO 4	6
B) Explain with neat sketch 1) Geothermal field. 2) liquid dominated geothermal plant.	CO 4	6
C) What is OTEC system? Explain working of open cycle OTEC system.	CO 4	6

**\*\*\* End \*\*\***



DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE			
Supplementary Examination – Summer 2022			
Course: B. Tech.	Branch : mechanical Engineering	Semester :VI	
Subject Code & Name: Renewable energy resources- BTMEC605C			
Max Marks: 60	Date:	Duration: 3 Hr.	
<b>Instructions to the Students:</b>			
1. All the questions are compulsory.			
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.			
3. Use of non-programmable scientific calculators is allowed.			
4. Assume suitable data wherever necessary and mention it clearly.			
		(Level/CO)	Marks
<b>Q. 1</b>	<b>Solve Any Two of the following.</b>		
A)	Explain in detail energy reserves in India	CO1	6
B)	Explain attenuation of solar radiation in Earth's atmosphere	CO1	6
C)	Differential between Renewable Energy sources and non-Renewable Energy sources.	CO1	6
<b>Q.2</b>	<b>Solve Any Two of the following.</b>		
A)	Explain with neat sketch construction and working of pyroheliometer	CO 2	6
B)	Define a) Declination angle b) Solar Azimuth angle c) Altitude angle.	CO2	6
C)	Calculate angle made by beam radiation with normal to a flat plate collector on May 1st at 09. 00 h. The collector is located in New delhi (28 <sup>0</sup> 35'N, 77 <sup>0</sup> 12'E). It is tilted at an angle of 36 <sup>0</sup> with the horizontal and is pointing due south, also calculate for 12.00h (Local apparent time).	CO 2	6
<b>Q. 3</b>	<b>Solve Any two of the following.</b>		
A)	Explain any two types of concentration collectors with neat sketch.	CO 2	6
B)	Explain construction and selection criteria for flat plate collector.	CO 2	6
C)	Explain testing of flat plate collector with neat sketch.	CO 2	6
<b>Q.4</b>	<b>Solve Any Two of the following.</b>		
A)	Explain construction and working of Photo Voltaic cell.	CO 3	6
B)	What is wind energy? Explain selection of site for wind turbine generation system.	CO 4	6
C)	Explain construction and working of Photo Voltaic cell.	CO 3	6
<b>Q. 5</b>	<b>Solve Any Two of the following.</b>		
A)	What is OTEC system? Explain working of open cycle OTEC system.	CO 4	6
B)	Explain Nuclear Reactor	CO 4	6
C)	What is biomass energy? Explain with neat sketch floating drum type	CO 4	6

	Biogas plant.		
	<b>*** End ***</b>		

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**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Summer Examination – 2023**

**Course: T.Y.B. Tech.      Branch: Mechanical Engineering      Semester: VI**

**Subject Code & Name: BTMOE605C Energy Conservation and Management**

**Max Marks: 60**

**Date: 21-07-2023**

**Duration: 3 Hr.**

**Instructions to the Students:**

1. All the questions are compulsory.
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.

	(Level/CO)	Marks														
<b>Q.1 Solve Any Two of the following.</b>		<b>12</b>														
A) What is the need of energy management? State principles of energy management.	Level 2 Understand CO1	6														
B) What is the difference between Energy conservation and energy efficiency? Explain with suitable examples.	Level 2 Understand CO1	6														
C) Describe the energy conservation opportunities in small and medium scale industries.	Level 2 Understand CO1	6														
<b>Q.2 Solve Any Two of the following.</b>		<b>12</b>														
A) Describe various types of energy audits.	Level 2 Understand CO2	6														
B) Consider a project, which has the following cash flow stream. The cost of capital, k, for the firm is 10 %.	Level 3 Apply CO3	6														
<table border="1"><thead><tr><th>Investment</th><th>Rs. (10,00,000)</th></tr><tr><th>Saving in Year</th><th>Cash Flow</th></tr></thead><tbody><tr><td>1</td><td>200,000</td></tr><tr><td>2</td><td>200,000</td></tr><tr><td>3</td><td>300,000</td></tr><tr><td>4</td><td>300,000</td></tr><tr><td>5</td><td>350,000</td></tr></tbody></table>			Investment	Rs. (10,00,000)	Saving in Year	Cash Flow	1	200,000	2	200,000	3	300,000	4	300,000	5	350,000
Investment	Rs. (10,00,000)															
Saving in Year	Cash Flow															
1	200,000															
2	200,000															
3	300,000															
4	300,000															
5	350,000															
Calculate the Net Present Value of this project.																
C) Enlist different instruments used for Energy auditing and explain any one of them.	Level 2 Understand CO2	6														
<b>Q.3 Solve Any Two of the following.</b>		<b>12</b>														
A) Explain energy conservation techniques in Boiler and Furnace.	Level 2 Understand CO2	6														
B) Explain simple payback period with advantages and disadvantages. Calculate the payback period for following example-	Level 3 Apply CO3	6														

A chemical plant is planning to install continuous deodorizer costing Rs. 60 Lakh for purchasing and installation. It is going to cost Rs. 1.5 Lakh per year for its operation and maintenance. This deodorizer is expected to save Rs. 20 Lakh per year through saving the steam consumption as compared to batch deodorizer.

- |   |   |                              |           |
|---|---|------------------------------|-----------|
| C)  | Explain energy conservation techniques in steam and condenser systems.  | Level 2<br>Understand<br>CO2 | 6         |
| <b>Q.4 Solve Any Two of the following.</b>  |   |                              | <b>12</b> |
| A)  | Explain Topping cycle and Bottoming cycle with block diagram.   | Level 2<br>Understand<br>CO4 | 6         |
| B)  | What is the purpose of insulators? Enlist name of different insulating material.  | Level 2<br>Understand<br>CO4 | 6         |
| C)  | What is the refrigeration load in TR when 15 m <sup>3</sup> /hr of water is cooled from 21°C to 15°C?<br>If the compressor motor draws 29 kW, chilled water pump draws 4.6 kW, condenser water pump draws 6.1 kW and Cooling Tower fan draws 2.7 kW, what is overall kW/TR?   | Level 3<br>Apply<br>CO4      | 6         |
| <b>Q. 5 Solve Any Two of the following.</b> |   |                              | <b>12</b> |
| A)  | What is load factor? Explain load factor with load curve analysis.  | Level 2<br>Understand<br>CO5 | 6         |
| B)  | Explain the concept of power factor in electrical system, with its mathematical formula. State the benefits of power factor improvement.  | Level 2<br>Understand<br>CO5 | 6         |
| C)  | A chemical industry has kW consumption of 812 kW with demand of 1160 kVA. To improve the power factor & avoid penalty, the company has added 410 kVAr of reactive power at motor end. Calculate <ol style="list-style-type: none"> <li>1. Previous Power factor</li> <li>2. Previous Reactive power in the system in kVAr</li> <li>3. Reduced Reactive power in the system in kVAr</li> <li>4. Reduced kVA demand in the system, if kW consumption remains unchanged.</li> <li>5. Improved Power Factor.</li> </ol> | Level 3<br>Apply<br>CO5      | 6         |

\*\*\* End \*\*\*

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE**

**Regular End Semester Examination – Summer 2023**

**Course: B. Tech.                      Branch :Mechanical Engineering                      Semester : VI**

**Subject Code & Name: BTMPE603A - IC Engines**

**Max Marks: 60**

**Date: 17 -07- 2023**

**Duration: 3 Hr.**

***Instructions to the Students:***

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

(Level/CO)                      Marks

**Q. 1 Solve Any Two of the following.**

- A) Explain with neat diagram working of Two Stroke Spark Ignition engine.                      (Understand)                      **6**
- B) Explain the losses involved in actual fuel-air cycle.                      (Understand)                      **6**
- C) Describe the following Engine Nomenclature:                      (Understand)                      **6**
- 1)Swept Volume.
- 2)Clearance Volume.
- 3)Compression Ratio.
- (Draw a neat sketch to define above terms).

**Q.2 Solve Any Two of the following.**

- A) Explain with the help of P- $\theta$  diagram, different stages of combustion in Compression Ignition engine.                      (Understand)                      **6**
- B) Describe the phenomenon of Detonation in Spark Ignition Engine.                      (Understand)                      **6**
- C) What are the objectives of combustion chamber design for CI Engine?                      (Understand)                      **6**

**Q. 3 Solve Any Two of the following.**

- A) Explain the working of Simple Carburetor with neat diagram and states its limitations.                      (Understand)                      **6**
- B) Explain Battery Ignition System with neat diagram                      (Understand)                      **6**
- C) Discuss “Force circulation cooling system” of engine.                      (Understand)                      **6**

**Q.4 Solve Any Two of the following.**

- A) What do you mean by super charger? Discuss its effect on – (i)Power output, (ii) Mechanical efficiency (iii) Fuel consumption                      (Understand)                      **6**
- B) What are the ways to control engine emissions? Explain any one in details                      (Understand)                      **6**
- C) During trial of a single cylinder, 4 stroke oil engine the following results were obtained:                      (Application)                      **6**
- Cyl bore=200mm, Stroke=400mm, mep=6 bar, Torque=407Nm, speed=250 RPM, Oil consumption=4kg/hr, CV of fuel=43MJ/kg,

Cooling water rate=4.5kg/min, Air used per kg of fuel= 30kg, Rise in cooling water temp=45°C, Temp of Exhaust gases=420°C, Room temp=20°C, mean sp. heat of exhaust gases=1kJ/kgK, Sp. Heat of water=4.18kJ/kgK, Barometric pressure=1.01325 bar Find IP, BP and draw up heat balance sheet in kJ/hr.

**Q. 5 Solve Any Two of the following.**

- A) Explain Fuel Cell Technology with a neat diagram. (Understand) **6**
- B) Why there is need of alternative fuels? List out different alternative fuels of engine and explain any one. (Understand) **6**
- C) Compare Electric vehicle with Hybrid Electric vehicle and list advantages of Hybrid vehicle (Understand) **6**

**\*\*\* End \*\*\***

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE –**  
**RAIGAD -402 103**  
**Winter Semester Examination – Summer - 2023**

**Branch:- Mechanical**

**Sem.:- V**

**Subject:- :- Engineering Metrology and Quality Control (BTMPE603D) Marks: 60**

**Date:-**

**Time:- 3 Hr.**

**Instructions to the Students**

1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

	<b>(Marks)</b>
<b>Q.1.a)</b> With neat sketch explain the construction and working of a Mechanical Comparator	(06)
b) Describe the use of sine bar in angular measurement.	(06)
<b>Q.2.</b> a) Describe in details interferometer.	(06)
b) Classify & explain different types of Fits.	(06)
<b>Q.3.</b> a) Explain any one surface roughness tester	(06)
b) With the help of a neat sketch, explain profile projector	(06)
<b>Q.4.</b> a) Justify the use of Kaizen in industry	(06)
b) Explain in detail 'Seven Quality Tools'.	(06)
<b>Q.5.</b> a) Elaborate the significance of '5S'	(06)
b) Describe in detail JIT	(06)
<b>Q.6.</b> a) Write a note on 'Codification'	(06)
b) Explain in detail TQM	(06)

**Paper End**

<b>DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE</b>			
<b>Summer Examination – 2023</b>			
<b>Course: B. Tech.</b>		<b>Branch : Mechanical</b>	<b>Semester : 6</b>
<b>Subject Code &amp; Name: BTMPE604B , Product Life Cycle Management</b>			
<b>Max Marks: 60</b>		<b>Date: 19/07/2023</b>	<b>Duration: 3 Hr.</b>
<b>Instructions to the Students:</b>			
1. All the questions are compulsory.			
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.			
3. Use of non-programmable scientific calculators is allowed.			
4. Assume suitable data wherever necessary and mention it clearly.			
		(Level/CO)	Marks
<b>Q. 1</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Define PLM and explain need for PLM.	CO1	6
B)	List and explain the Phases of PLM.	CO6	6
C)	What do you mean by PLM feasibility study? Explain.	CO1	6
<b>Q.2</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	What are different components of PDM systems?	CO2	6
B)	What is product data management? List out the advantages of PDM.	CO2	6
C)	What are different barriers for PDM implementation?	CO2	6
<b>Q. 3</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Explain various steps involved in the engineering design	CO3	6
B)	Write a short note on recycling	CO3	6
C)	Discuss the role of concurrent engineering in product design.	CO3	6
<b>Q.4</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	How to estimate market opportunities for new product	CO4	6
B)	Explain market entry decision in new product development	CO4	6
C)	What is new product development what are the benefits of it.	CO4	6
<b>Q. 5</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	With neat figure explain relevance tree	CO5	6
B)	Define technology forecasting and its necessity	CO5	6
C)	List methods of technology forecasting and explain morphological methods	CO5	6
<b>*** End ***</b>			

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<b>DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE</b>			
<b>Summer Examination – 2023</b>			
<b>Course: B. Tech.</b>		<b>Branch : Mechanical</b>	<b>Semester : 6</b>
<b>Subject Code &amp; Name: BTMPE604B , Product Life Cycle Management</b>			
<b>Max Marks: 60</b>		<b>Date: 19/07/2023</b>	<b>Duration: 3 Hr.</b>
<b>Instructions to the Students:</b>			
1. All the questions are compulsory.			
2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.			
3. Use of non-programmable scientific calculators is allowed.			
4. Assume suitable data wherever necessary and mention it clearly.			
		(Level/CO)	Marks
<b>Q. 1</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Define PLM and explain need for PLM.	CO1	6
B)	List and explain the Phases of PLM.	CO6	6
C)	What do you mean by PLM feasibility study? Explain.	CO1	6
<b>Q.2</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	What are different components of PDM systems?	CO2	6
B)	What is product data management? List out the advantages of PDM.	CO2	6
C)	What are different barriers for PDM implementation?	CO2	6
<b>Q. 3</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	Explain various steps involved in the engineering design	CO3	6
B)	Write a short note on recycling	CO3	6
C)	Discuss the role of concurrent engineering in product design.	CO3	6
<b>Q.4</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	How to estimate market opportunities for new product	CO4	6
B)	Explain market entry decision in new product development	CO4	6
C)	What is new product development what are the benefits of it.	CO4	6
<b>Q. 5</b>	<b>Solve Any Two of the following.</b>		<b>12</b>
A)	With neat figure explain relevance tree	CO5	6
B)	Define technology forecasting and its necessity	CO5	6
C)	List methods of technology forecasting and explain morphological methods	CO5	6
<b>*** End ***</b>			

The grid and the borders of the table will be hidden before final printing.