

Hall Ticket Number :									
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<b>R-17</b>
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**Code: 7G561**

III B.Tech. II Semester Regular & Supplementary Examinations July/ Aug 2021

**Applied Thermodynamics-III**  
( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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		Marks	CO	Blooms Level
<b>UNIT-I</b>				
1.	a) Describe with neat sketch, the working of a simple constant pressure gas turbine.	10M	CO1	L2
	b) State the difference in working of an open and closed cycle gas turbine.	4M	CO1	L2
<b>OR</b>				
2.	Explain the working of a turbo jet propulsion system with the help of schematic arrangement of its different components and the T-s diagram of its basic cycle.	14M	CO1	L2
<b>UNIT-II</b>				
3.	Describe the working of the simple air cooling cycle with the help of schematic and T-s diagrams.	14M	CO1	L2
<b>OR</b>				
4.	Explain the functions of various components of a vapour compression refrigeration system and represent the cycle on T- s and p-h diagrams.	14M	CO1	L2
<b>UNIT-III</b>				
5.	a) Describe with neat sketch the Li-Br and water system.	8M	CO2	L2
	b) Discuss the desirable properties of a good refrigerant.	6M	CO2	L2
<b>OR</b>				
6.	a) Draw the schematic diagram of actual vapour absorption refrigeration system and explain its performance.	10M	CO2	L2
	b) Differentiate between primary and secondary refrigerants.	4M	CO2	L2
<b>UNIT-IV</b>				
7.	It is required to design an air-conditioning plant for a small office room for following winter conditions : Outdoor conditions : 14°C DBT and 10°C WBT Required conditions : 20°C DBT and 60% R.H. Amount of air circulation : 0.30 m <sup>3</sup> /min./person. Seating capacity of office : 60. The required condition is achieved first by heating and then by adiabatic humidifying. Determine the following : (i) Heating capacity of the coil in kW and the surface temperature required if the by pass factor of coil is 0.4. (ii) The capacity of the humidifier.	14M	CO3	L3
<b>OR</b>				
8.	1 kg of air at 313 K dry bulb temperature and 50 % RH is mixed with 2 kg of air at 293 K dry bulb temperature and 293 k dew point temperature. Find the final condition of air.	14M	CO3	L3
<b>UNIT-V</b>				
9.	a) Describe the different types of heating and cooling devices.	7M	CO4	L2
	b) Describe an air-water heat pump circuit and its applications.	7M	CO4	L2
<b>OR</b>				
10.	a) Illustrate the operation of any one type of dehumidifier used during different seasons of the year.	7M	CO4	L2
	b) Write a short note on air-washer type humidifier with diagram.	7M	CO4	L2

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Code: 7G562

III B.Tech. II Semester Regular &amp; Supplementary Examinations July/August 2021

**Design of Machine Elements-II**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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Marks	CO	Blooms Level
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**UNIT-I**

- |   |     |     |    |
|---|-----|-----|----|
| 1. a) What are the advantages and disadvantages of hydrostatic bearings over hydrodynamic bearings.   | 4M  | CO1 | L1 |
| b) The following data is given for a 360° hydrodynamic bearing: Journal diameter =100 mm, bearing length =100 mm, radial load = 50 kN, journal speed = 1440rpm, radial clearance =0.12 mm, viscosity of lubricant =16 Cp. Determine (i) Minimum film thickness (ii) Coefficient of friction and (iii) Power lost in friction. | 10M | CO1 | L5 |

**OR**

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|---|-----|-----|----|
| 2. Estimate the design of a Journal bearing for a centrifugal pump from the following data : Load on the journal = 20000 N, speed of the journal=900rpm, type of oil is SAE 10, for which the absolute viscosity at 55°C = 0.017 kg/m-s, ambient temperature of oil = 15.5°C, Maximum bearing pressure for the pump=1.5 N/mm². Calculate also the mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C. Heat dissipation coefficient = 1232 W/m²/°C. | 14M | CO1 | L6 |
|---|-----|-----|----|

**UNIT-II**

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|---|-----|-----|----|
| 3. a) Explain briefly about Static and Dynamic load rating of rolling contact bearings.   | 4M  | CO2 | L2 |
| b) A system involves four identical ball bearings, each subjected to a radial load of 2500 N. The reliability of the system i.e., one out of four bearings failing during the lifetime of five million revolutions, is 82 %. Determine the dynamic load carrying of the bearing, so as to select it from the manufacturer's catalogue based on 90% reliability. | 10M | CO2 | L5 |

**OR**

- |   |     |     |    |
|---|-----|-----|----|
| 4. a) What are rolling contact bearings? Discuss their advantages over sliding contact bearings.  | 4M  | CO2 | L1 |
| b) Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 rpm for an average life of 5 years at 10 hours per day. Assume uniform and steady load. | 10M | CO2 | L5 |

**UNIT-III**

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|---|-----|-----|----|
| 5. Estimate the design of a Connecting rod for a petrol engine from the following data : Diameter of the piston = 120 mm, Weight of the reciprocating parts=2.0kg, Length of the connecting rod=300 mm, stroke length=140mm, speed=2000rpm, Maximum explosion pressure=2.25N/mm². | 14M | CO3 | L6 |
|---|-----|-----|----|

**OR**

- |   |     |     |    |
|---|-----|-----|----|
| 6. Describe the design procedure for the Piston of an I.C.Engine. | 14M | CO3 | L2 |
|---|-----|-----|----|

UNIT-IV
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|-------|--|-----|-----|----|
| 7. a) | Explain the construction of Multileaf Springs.   | 4M  | CO4 | L2 |
| b)    | A railway wagon of mass 20 tonnes is moving with a velocity of 2 m/s. It is brought to rest by two buffers with springs of 300 mm diameter. The maximum deflection of springs is 250 mm. The allowable shear stress in the spring material is 600 MPa. Estimate the design of the springs for the buffers. | 10M | CO4 | L6 |

OR

- |       |   |     |     |    |
|-------|---|-----|-----|----|
| 8. a) | What are the advantages of Flat belt drives?  | 4M  | CO4 | L1 |
| b)    | A flat belt is required to transmit 30 kW from a pulley of 1.5 m effective diameter running at 300 rpm. The angle of contact is spread over $11/24$ of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 9.5 mm, density of its material is $1100 \text{ kg/m}^3$ and the related permissible working stress is 2.5 MPa. | 10M | CO4 | L5 |

UNIT-V
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|-------|---|-----|-----|----|
| 9. a) | What are the applications and advantages of Spur gears?   | 4M  | CO5 | L1 |
| b)    | The pitch circle diameters of the pinion and gear are 100 mm and 300 mm respectively. The pinion is made of plain carbon steel 40C8 ( $S_u = 600 \text{ N/mm}^2$ ) while the gear is made of grey Cast Iron FG 300 ( $S_{ut} = 300 \text{ N/mm}^2$ ). The pinion receives 5 kW power at 500 rpm through its shaft. The service factor and the factor of safety can be taken as 1.5 each. The face width of the gear can be taken as 10 times that of the module. Assume that the velocity factor accounts for the dynamic load. Determine (i) module and (ii) the number of teeth on the pinion and the gear. | 10M | CO5 | L5 |

OR

- |        |   |    |     |    |
|--------|---|----|-----|----|
| 10. a) | What are the advantages of Helical gears?                       | 7M | CO5 | L1 |
| b)     | Briefly discuss about the gear tooth failure and their remedies | 7M | CO5 | L5 |

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Code: 7G563

III B.Tech. II Semester Regular &amp; Supplementary Examinations July/August 2021

**Heat Transfer**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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		Marks	CO	Blooms Level
<b>UNIT-I</b>				
1.	Derive the general heat conduction equation in cylindrical coordinates.	14M	1	3
<b>OR</b>				
2.	The temperatures on the faces of a plane wall 15 cm thick are 375 °C and 85 °C. The wall is constructed of a special glass with the following properties: $k = 0.78 \text{ W/m}^\circ\text{C}$ , $\rho = 2700 \text{ kg/m}^3$ , $C_p = 0.84 \text{ kJ/kg}^\circ\text{C}$ . What is the heat flow through the wall at steady-state conditions?	14M	1	3
<b>UNIT-II</b>				
3.	Water flows at 50 °C inside a 2.5-cm-inside-diameter tube such that $h_i = 3500 \text{ W/m}^2 \cdot ^\circ\text{C}$ . The tube has a wall thickness of 0.8 mm with a thermal conductivity of $16 \text{ W/m} \cdot ^\circ\text{C}$ . The outside of the tube loses heat by free convection with $h_o = 7.6 \text{ W/m}^2 \cdot ^\circ\text{C}$ . Calculate the overall heat-transfer coefficient and heat loss per unit length to surrounding air at 20°C.	14M	2	3
<b>OR</b>				
4. a)	What is meant by a lumped capacity? What are the physical assumptions necessary for a lumped-capacity analysis to apply?	5M	2	2
b)	A steel ball [ $c = 0.46 \text{ kJ/kg} \cdot ^\circ\text{C}$ , $k = 35 \text{ W/m} \cdot ^\circ\text{C}$ ] 5.0 cm in diameter and initially at a uniform temperature of 450 °C is suddenly placed in a controlled environment in which the temperature is maintained at 100 °C. The convection heat-transfer coefficient is $10 \text{ W/m}^2 \cdot ^\circ\text{C}$ . Calculate the time required for the ball to attain a temperature of 150°C.	9M	2	3
<b>UNIT-III</b>				
5. a)	Explain the formation of hydrodynamic boundary level over a flat horizontal plate.	8M	3	3
b)	Define Prandtl number and Grashof number	6M	3	1
<b>OR</b>				
6.	A large vertical plate 4.0 m high is maintained at 60°C and exposed to atmospheric air at 10°C. Calculate the heat transfer if the plate is 10 m wide.	14M	3	3
<b>UNIT-IV</b>				
7.	A vertical square plate, 30 cm by 30 cm, is exposed to steam at atmospheric pressure. The plate temperature is 98°C. Calculate the heat transfer and the mass of steam condensed per hour.	14M	4	3
<b>OR</b>				
8.	Two very large parallel planes with emissivities 0.3 and 0.8 exchange heat. Find the percentage reduction in heat transfer when a polished-aluminum radiation shield ( $\epsilon = 0.04$ ) is placed between them.	14M	4	3
<b>UNIT-V</b>				
9.	Water at the rate of 68 kg/min is heated from 35 °C to 75°C by an oil having a specific heat of $1.9 \text{ kJ/kg} \cdot ^\circ\text{C}$ . The fluids are used in a counterflow double-pipe heat exchanger, and the oil enters the exchanger at 110 °C and leaves at 75 °C. The overall heat-transfer coefficient is $320 \text{ W/m}^2 \cdot ^\circ\text{C}$ . Calculate the heat-exchanger area.	14M	5	3
<b>OR</b>				
10. a)	What advantage does the effectiveness-NTU method have over the LMTD method?	7M	5	2
b)	Why is a counterflow exchanger more effective than a parallel-flow exchanger?	7M	5	3

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Hall Ticket Number :

R-17

Code: 7G564

III B.Tech. II Semester Regular &amp; Supplementary Examinations July/Aug 2021

**Instrumentation and Control Systems**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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		Marks	CO	Blooms Level
<b>UNIT-I</b>				
1.	a) Explain the basic principles of measurement.	7M	CO1	BL2
	b) Explain the use of piezo electric transducers for displacement measurement.	7M	CO2	BL2
<b>OR</b>				
2.	a) Explain the following terms: i) Range and span ii) Resolution iii) Calibration iv) Sensitivity.	8M	CO1	BL2
	b) Explain the working principle of variable-inductance transducer with a neat sketch and also list out its advantages.	6M	CO2	BL2
<b>UNIT-II</b>				
3.	a) Describe the arrangement of thermocouples for the measurement of average temperature of a room.	8M	CO3	BL1
	b) Describe the radiation pyrometer with a neat sketch	6M	CO3	BL1
<b>OR</b>				
4.	a) Explain the working of magnetic flow meter with neat sketch.	7M	CO3	BL2
	b) Explain with the help of suitable sketches, the difference between a Bellow gauge and a diaphragm gauge for pressure measurement.	7M	CO3	BL2
<b>UNIT-III</b>				
5.	a) Explain the mechanical methods to measure the vibrations with neat sketches.	7M	CO4	BL2
	b) How does a mechanical load cell work? Explain the principle of measuring shaft torque using strain gauge torsion meter?	7M	CO4	BL1
<b>OR</b>				
6.	a) Discuss in detail the working of various types of dynamometers used for force measurement.	7M	CO4	BL6
	b) Explain the measurement of vibration by the reed vibrometer.	7M	CO4	BL2
<b>UNIT-IV</b>				
7.	a) What is the temperature compensation with respect to strain gauges?	7M	CO5	BL1
	b) List the essential characteristics required for the backing material of a bonded strain gauge.	7M	CO5	BL1
<b>OR</b>				
8.	a) Explain how strain gauges can be used for the measurement of bending stresses?	7M	CO5	BL2
	b) Name the various types of strain gauges for different applications?	7M	CO5	BL1
<b>UNIT-V</b>				
9.	a) What is a servomechanism? Describe the feature of servomechanism.	8M	CO6	BL1
	b) List the advantages of open loop control system.	6M	CO6	BL1
<b>OR</b>				
10.	a) What is a block diagram? Explain the steps involved in the preparation of block diagrams.	6M	CO6	BL1
	b) Derive an expression for the peak overshoot of a second order under damped system with the following transfer function, subjected to unit step.	8M	CO6	BL6
$G(s) = \frac{\omega_n^2}{s^2 + 2\xi\omega_n s + \omega_n^2}$ <p>****END****</p>				

Hall Ticket Number :

**R-17****Code: 7GA61**

III B.Tech. II Semester Regular &amp; Supplementary Examinations July/August 2021

**Managerial Economics and Financial Analysis**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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Marks CO Blooms  
Level**UNIT-I**

1. Define Elasticity of Demand and its significance in business.

14M

**OR**

2. Define Managerial Economics? Explain its nature and scope.

14M

**UNIT-II**

3. Explain the concept of "Cobb – Douglas Production function"?

14M

**OR**

4. Define BEP. How do you determine it? Show the graphical presentation of Break –Even Analysis.

14M

**UNIT-III**

5. Differentiate between monopoly, monopolistic and oligopoly markets with suitable examples.

14M

**OR**

6. Define Partnership Deed? Explain its features. Evaluate it as against Sole Proprietorship.

14M

**UNIT-IV**

7. Define capital budgeting. Explain the features and scope of capital budgeting.

14M

**OR**

8. A business needs a new machine and has to make the choice between the Machine Y and Machine Z . The initial cost and the net cash flow over five years to the business have been calculated for each machine as follows.

	Machine Y	Machine Z
<b>Initial cost</b>	20,000	28,000
<b>Net Cash Flows</b>		
1	8,000	10,000
2	12,000	12,000
3	9,000	12,000
4	7,000	9,000
5	6,000	9,000

Only one Machine is needed and at the end of the five years, the machine will have no value and will be scrapped. To finance the project the business can borrow money at 10% per annum. Which machine should be chosen under each of these methods?

(a) Payback Method?

(b) Accounting Rate of Return

14M

**UNIT-V**

9. Explain the different methods of Financial statement analysis.

14M

**OR**

10. Define Accounting? What are the different Accounting concepts and its significance?

14M

\*\*\*END\*\*\*