Techno India NJR Institute of Technology

Course File

Session 2021-22

Basic Mechanical Engineering (1FY3- 07/ 2FY3-07)

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पंकज पोरवाल
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(Principal)

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I & II Semester
Common to all branches of UG Engineering & Technology

1FY3-07/ 2FY3-07: Basic Mechanical Engineering

SN	CONTENTS
1	**Fundamentals:** Introduction to mechanical engineering, concepts of thermal engineering, mechanical machine design, industrial engineering and manufacturing technology. Steam Boilers classification and types of steam boilers and steam turbines. Introduction and Classification of power plants.
2	**Pumps and IC Engines:** Applications and working of Reciprocating and Centrifugal pumps. Introduction, Classification of IC Engines, Main Components of IC Engines, Working of IC Engines and its components.
3	**Refrigeration and Air Conditioning:** Introduction, classification and types of refrigeration systems and air-conditioning. Applications of refrigeration and Air-conditioning.
4	**Transmission of Power:** Introduction and types of Belt and Rope Drives, Gears.
5	**Primary Manufacturing Processes:** Metal Casting Process: Introduction to Casting Process, Patterns, Molding, Furnaces. Metal Forming Processes: Introduction to Forging, Rolling, Extrusion, Drawing. Metal Joining Processes: Introduction to various types of Welding, Gas Cutting, Brazing, and Soldering.
6	**Engineering Materials and Heat Treatment of Steel:** Introduction to various engineering materials and their properties.

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Course Overview:

To give the fundamental concepts of machine design and its importance. To identify the role of machine design in mechanical engineering. To study about design of various power transmission elements, joints and bearings. To understand and learn the design of pressure vessels.

Course Outcomes:

CO. NO.	Cognitive Level	Course Outcome
1	Analysis	To understand the basics of material properties, stress and strain
2	Synthesis	To apply knowledge of mathematics, science, for engineering applications
3	Synthesis	Ability to identify, formulate, and solve engineering & real life problems
4	Synthesis	Ability to design and conduct experiments, as well as to analyze and interpret data

Prerequisites:

1. Basic Knowledge about Free Body Diagram
2. Must have completed the course on Engineering Mechanics.

Course Scheme -

THEORY											
SN	Category	Course		Contact hrs/week			Marks				Cr
		Code	Title	L	T	P	Exm Hrs	IA	ETE	Total	
1	BSC	3ME2-01	Advance Engineering Mathematics-I	3	0	0	3	30	120	150	3
2	HSMC	3ME1-02/ 3ME1-03	Technical Communication/ Managerial Economics and Financial Accounting	2	0	0	2	20	80	100	2
3	ESC	3ME3-04	Engineering Mechanics	2	0	0	2	20	80	100	2
4	PCC	3ME4-05	Engineering Thermodynamics	3	0	0	3	30	120	150	3
5		3ME4-06	Materials Science and Engineering	3	0	0	3	30	120	150	3
6		3ME4-07	Mechanics of Solids	3	1	0	3	40	160	200	4
			Sub Total	16	1	0		170	680	850	17

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Course Outcome Mapping with Program Outcome:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	3	1	2	1	1	2	2	0	1	2	1	1
CO2	2	2	2	2	1	1	1	0	2	1	0	1	0	1	1
CO3	2	2	2	2	1	2	1	1	1	2	0	1	1	1	1
CO4	2	2	2	2	0	2	1	1	1	2	0	1	1	1	1
CO5	2	2	2	1	1	2	1	0	1	2	0	1	1	0	1
CO6	2	2	2	2	1	1	1	1	1	2	0	1	1	0	1
CO7	2	2	1	1	1	1	1	0	1	1	0	1	1	1	1
Average	2.00	2.00	1.71	1.86	0.86	1.57	1.00	0.57	1.29	1.71	0.00	1.00	1.00	0.71	1.00

Cos -

CO11FY307.1	Students will be able to understand introduction of mechanical engineering and develop knowledge about steam boilers, steam turbines and power plants.
CO11FY307.2	Students will be able to conclude basics of centrifugal, reciprocation pumps and Internal Combustion Engine. Students will be able to create knowledge of various types of refrigeration and air conditioning system with their applications.
CO11FY307.3	Students will be able to analyze basics of different types power tranmission systems such as belt, rope, gears and gear trains
CO11FY307.4	Students will be able to illustrate working of different manufacturing processes
CO11FY307.5	Students will be able to identify different engineering materials their, properties and various types of heat treatment processes

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Course Coverage Module Wise:

Lecture No.	Chapter Number	Topic Name
1	1	**INTRODUCTION:** Introduction to Mechanical Engineering, concepts of thermal engineering
2	1	Mechanical machine design, industrial engineering and manufacturing technology.
3	1	Steam Boilers classification
4	1	types of steam boilers
5	1	Steam turbines.
6	1	Introduction and Classification of power plants.
7	2	**PUMP:** Applications and working of Reciprocating pumps
8	2	Applications and working of Centrifugal pumps.
9	2	Introduction, Classification of IC Engines
10	2	Main Components of IC Engines, Working of IC Engines and its components.
11	2	Numerical on IC Engine
12	3	**REFRIGERATION SYSTEM:** Introduction of refrigeration systems
13	3	classification and types of refrigeration systems
14	3	Air-conditioning types of air-conditioning.
15	3	Applications of refrigeration and Air-conditioning
16	3	Numerical on refrigeration
17	4	**POWER TRANSMISSION:** Transmission of Power
18	4	Introduction and types of Belt and Rope Drives
19	4	Introduction and types of Gears
20	4	Numerical on Belt Drive and Gears
21	5	**PRIMARY MANUFACTURING PROCESES:** Metal Casting Process: Introduction to Casting Process, Patterns
22	5	Moulding, Furnaces
23	5	Metal Forming Processes: Introduction to Forging, Rolling,
24	5	Basic Concept about Extrusion, Drawing.
25	5	Metal Joining Processes: Introduction to various types of Welding,
26	5	Gas Cutting, Brazing, and Soldering.
27	6	**Introduction of Engineering materials.**
28	6	Heat Treatment of Steel

TEXT/REFERENCE BOOKS

1. Tata McGraw Hill Basic Mechanical Engineering.

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Teaching and Learning resources:

- **MOOC (NPTEL): -** https://drive.google.com/drive/u/1/folders/1gimy5aZo207_Oja05Hw6JE2qNjyotPOz.

- YouTube Videos Link – https://www.youtube.com/c/TECHNICALCLASSES_TC

- **Assessment Methodology:**

1. Two Midterm exams where student have to showcase subjective learning.
2. Final Exam (subjective paper) at the end of the semester.
3. Surprise Test

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Quiz-1 (Thermal Engineering Questions and Answers – Steam Generators – Classification of Boilers)

1. Device used to generate and supply steam at a high pressure and temperature is known as:

(a) Steam injector **(b) Steam boiler** (c) Steam turbine (d) Steam condenser

2. Fire tube boilers are: (a) Internally fired (b) Externally fired **(c) Both** (d) None of the above

3. Fire tube boilers are: (a) Lancashire boiler (b) Cochran boiler (c) Locomotive boiler **(d) All of the above**

4. Number of fire tubes in Lancashire boiler are: (a) 1 **(b) 2** (b) 3 (d) 4

5. In a Lancashire boiler, the economizer is located: (a) Before air preheater **(b) After air preheater** (c) Between the feed pump and drum (d) All of the above

6. Locomotive boiler is: (a) Vertical, multitubular, fire-tube type **(b) Horizontal, multitubular**, fire-tube type (c) Horizontal, multitubular, water-tube type (d) None of the above

7. Water tube boiler is: (a) Babcock and Wilcox boiler (b) Stirling boiler (c) Benson boiler **(d) All of the above**

8. Babcock and Wilcox boiler has water tubes: (a) Vertical (b) Horizontal **(c) Inclined** (d) None of the above

9. If circulation of water takes place by convection currents, set up during the heating of water, the boiler is known as:

(a) Natural circulation boiler (b) Forced circulation boiler (c) Internally fired boiler (d) Externally fired boiler

10. If circulation in boiler made by pump, then it is known as:

(a) Natural circulation boiler **(b) Forced circulation boiler** (c) Internally fired boiler (d) Externally fired boiler

11. If combustion takes place outside the boiling water region, the boiler is known as:

(a) Natural circulation boiler (b) Forced circulation boiler (c) Internally fired boiler **(d) Externally fired boiler**

12. If combustion takes place inside the boiling water region, the boiler is known as:

(a) Natural circulation boiler (b) Forced circulation boiler **(c) Internally fired boiler** (d) Externally fired boiler

13. In forced circulation boiler, forced is applied to:

(a) Draw water (b) Drain off the water **(c) Circulate water** (d) All of the above

14. Forced circulation boiler is:

(a) La-Mont boiler (b) Benson boiler (b) Loeffler boiler **(d) All of the above**

15. Safety Valve used in locomotive boilers is:

(a) Lever safety valve (b) Dead weight safety valve (c) High steam and low water safety valve **(d) Spring loaded safety valve**

16. A device used to empty the boiler, when required and to discharge the mud, scale or sediments collected at the bottom of the boiler, is known as:

(a) Safety valve (b) Stop valve (b) Fusible plug **(d) Blow off cock**

17. An accessory of boiler is:

(a) Feed pump (b) Feed check valve (c) Stop valve (d) Blow off cock

18. A device used for recovery of waste heat of flue gas to heat the air before it passes into the furnace is known as:

(a) Superheater **(b) Air preheater** (c) Injector (d) Economizer

19. Boiler mounting is:

(a) Economizer (b) Injector **(c) Fusible plug** (d) Super heater

20. Ratio of heat used in steam generation and heat supplied to the boiler is known as:

(a) Boiler efficiency (b) Chimney efficiency (c) Economizer efficiency (d) None of the above

Assignment-1

1. Explain very briefly the function of following mountings:
   (i) Steam stop valve (ii) Feed check valve (iii) Blow-off cock (iv) water level indicator (v) Pressure gauge (vi) Safety valve
2. State the advantages of high-pressure boilers. Explain the construction and working of Babcock and Wilcox boiler with a neat sketch?
3. Explain the working of Cochran boiler and fusible plug with neat sketches?
4. State the function of following: (i) Fusible plug (ii) Safety valve (iii) Economizer
5. Explain the principle of working of thermal power plant?

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Quiz-2(Pumps & IC Engine)

1. In I.C. engines, power developed inside the cylinder is known as:

(a) Brake horse power **(b) Indicated horse power** (c) Pumping power (d) None of the above

2. The power spent in suction and exhaust strokes are known as:

(a) Brake horse power (b) Indicated horse power **(c) Pumping power** (d) None of the above

3. The difference of total power produced and pumping power is known as:

(a) Brake horse power (b) Indicated horse power **(c) Net indicated horse power** (d) None of the above

4. The power available at the shaft of an I.C. engine is known as:

(a) Brake horse power (b) Indicated horse power (c) Net indicated horse power (d) None of the above

5. In a four-stroke engine, number of revolutions of the crankshaft for completion of working cycle is:

(a) One **(b) Two** (c) Three (d) Four

6. In a two-stroke engine, number of revolutions of the crankshaft for completion of working cycle is:
(a) One (b) Two (c) Three (d) Four

7. Theoretically, four-stroke engine should develop power as compared to two-stroke engine is:

(a) Half (b) Same (c) Double (d) Four times

8. At the same speed, the number of power strokes given by a two-stroke engine as compared to a four-stroke engine is:

(a) Half (b) Same **(c) Double** (d) Four times

9. Thermal efficiency of two-stroke engine in comparison to four-stroke engine is:

(a) More (b) Same **(c) Less** (d) None of the above

10. Mechanical efficiency of two-stroke engine in comparison to four-stroke engine is:

(a) More (b) Same (c) Less (d) None of the above

11. In a petrol engine, charge is ignited with:

(a) Spark plug (b) Compression (b) Both (d) None of the above

12. In four-stroke petrol engine:

(a) Intake valve closes after top dead center**(b) Intake valve closed after bottom dead center**

(c) Exhaust valve closes after top dead center (d) Exhaust valve closes after bottom dead center

13. Compression ratio in petrol engine ranges from:

(a) 6 to 10 (b) 10 to 15 (c) 15 to 25 (d) 25 to 40

14. Compression ratio in diesel engine ranges from:

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(a) 6 to 10 (b) 10 to 15 **(c) 14 to 22** (d) 25 to 40

15. If compression ratio in petrol engines kept higher than that is in diesel engines, then:

(a) Pre-ignition of fuel will occur (b) Ignition of fuel will be delayed (c) Detonation will occur (d) None of the above

16. In C.I. Engines, the combustion is:

(a) Homogeneous **(b) Heterogeneous** (c) Both (d) None of the above

17. Which of the following is not related to C.I. engine:

(a) Fuel pump (b) Fuel injector: **(c) Carburetor** (d) Flywheel

18. Indicator on an engine is used to determine:

(a) B.H.P (b) Speed (c) Temperature **(d) I.H.P and M.E.P**

19. Morse test is conducted on:

(a) Vertical engines (b) Horizontal engines (c) Single cylinder engines **(d) Multi cylinder engines**

20. The m.e.p. of a diesel engine with fixed compression ration can be improved by:

(a) Increasing cut-off ratio (b) Increasing back pressure (c) Increasing operating pressure (d) Reducing charge density

Assignment-2

1. Differentiate S.I. engine and C.I. engine.
2. Explain the fundamental differences between Otto cycle and Diesel cycle mentioning the advantages over each other.
3. What are the fundamental differences between two-stroke and four-stroke engines?
4. Explain the structure and working of four-stroke petrol engine with a neat sketch.
5. Explain the structure and working of four-stroke diesel engine with a neat sketch.
6. What is scavenging? Explain the structure and working of two-stroke petrol engine.
7. Explain working principle of Reciprocating and Centrifugal pumps?

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Quiz-3 (Refrigeration & Air Conditioning)

1. A refrigeration system:

(a) Removes heat from a system at lowtemperature and transfers the same to a system at high-temperature

(b) Delivers less heat to the system at hightemperature than it extracts from the system at low-temperature

(c) Transfers heat from a high-temperature source to a low-temperature sink

(d) Violates second law of thermodynamics

2. The COP of a Carnot refrigeration cycle decreases on:

(a) Decreasing the difference in operating temperatures

(b) Keeping the upper-temperature constant and increasing the lower-temperature

(c) Increasing the upper-temperature and keeping the lower-temperature constant

(d) Increasing the upper-temperature and decreasing the lower-temperature

3. A Carnot refrigerating cycle used in house air conditioning delivers heat to the surroundings at the rate of 10 kw of power. The coefficient of performance of this refrigerator would be:

(a) 1.5 (b) 1.67 (c) 2.5 (d) 0.6

4. If a Carnot cycle is to have a coefficient of performance of 5, the ratio of maximum temperature to minimum temperature in the cycle should be:

(a) 1.2 (b) 1.5 (c) 2.0 (d) 2.5

5. A Carnot refrigerator rejects 3000 kj of heat at 400 k while using 1000 kj of work. The lowest operating temperature in the cycle should be:

(a) 15º C **(b) 27º C** (c) −6º C (d) 0º C

6. A Carnot engine has an efficiency of 80%, If the cycle is reversed in direction and made to operate as a refrigerator, its COP will be:

(a) 0.25 (b) 0.5 (c) 0.75 (d) 1.25

7. A condenser of a refrigeration system rejects heat at a rate of 120 kw, while its compressor consumes a power of 30 kw. The coefficient of performance of the system would be:

(a) 2 (b) 3 **(c) 4** (d) 5

8. The operating temperature of cold storage is 280º k and the heat leakage from the surroundings is 35 kw for the ambient temperature of 310º k. If the actual COP of the refrigeration plant is onefourth of an ideal plant working between the same temperature limits, the power required to drive the plant would be:

(a) 3.7 kw (b) 7.5 kw (c) 12 kw **(d) 15 kw**

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9. A Carnot heat pump for domestic heating works between a cold system (the contents of refrigerator cabinet) at 0ºC and the water in the radiator system at 80ºC. The coefficient of performance of this heat pump would be about:

(a) 1.4 (b) 3.4 **(c) 4.4** (d) 6.2

10. A heat pump working on a reversed Carnot cycle has a COP of 5. If it is made to work as a refrigerator taking 1 KW of work input, the refrigerating effect will be:

(a) 1 KW (b) 2 KW (c) 3 KW **(d) 4 KW**

11. The capacity of refrigerating m/c is expressed as:

(a) Inside volume of cabinet (b) Lowest temperature attained (c) Gross weight of m/c in tons **(d) Rate of abstraction of heat from the space being cooled**

12. One TOR implies that the m/c has a refrigerating effect (capacity of heat extraction from the system being cooled) equal to:

(a) 50 kCal/sec **(b) 50 kCal/min** (c) 50 kCal/hr (d) 50 kCal/day

13. One TOR is equivalent to:

(a) 1 KW (b) 2.5 KW **(c) 3.5 KW** (d) 5 KW

14. The domestic refrigerator has a refrigerating load of the order of:

(a) Less than 0.25 ton (b) Between 0.5 and 1 ton (c) More than 1 ton (d) More than 5 ton

15. The refrigerating capacity of 165 domestic refrigerators is approximately equal to:

(a) 0.05 ton **(b) 0.1 ton** (c) 2 ton (d) 5 ton

16. Round the clock cooling of an apartment having a load of 300 MJ/day requires an air conditioning plant of capacity about:

(a) 1 ton (b) 5 ton (c) 10 tons (d) 25 tons

17. The refrigerating system of passenger air craft works on reversed:

(a) Brayton cycle (b) Atkinson cycle (c) Ericsson cycle (d) Carnot cycle

18. A Bell-Coleman cycle is a reversed:

(a) Brayton cycle (b) Atkinson cycle (c) Ericsson cycle **(d) Carnot cycle**

Assignment-3

1. Define the following: (i) COP, (ii) unit of refrigeration, and (iii) air conditioning.
2. Explain with neat sketch the principle and construction of vapor absorption refrigeration system.
3. What is refrigeration? What is refrigeration effect? Explain window air conditioner with neat sketch.
4. Explain with a neat sketch the working of a vapor compression refrigerator.
5. Carnot refrigeration cycle absorbs heat at 280 K and rejects heat at 310 K. (a) Calculate the coefficient of performance of this refrigeration cycle. (b) If the cycle is absorbing 120 kJ/min at 280 K, how many kJ of work is required per second? (c) If the Carnot heat pump

operates between the same temperatures as the above refrigeration cycle, what is the coefficient of performance? (d) How many kJ/min will the heat pump deliver at 310 K if it absorbs 1120 kJ/min at 280 K.

6. The capacity of a refrigerator is 200 TR when working between –4°C and 22oC. Determine the mass of ice produced per day from water at 22°C. Also, find the power required to drive the unit. Assume that the cycle operates on reversed Carnot cycle and latent heat of ice is 336 kJ/kg

Quiz-4 (Power Transmission)

1. In a belt drive pulley act as:

(a) Sliding pair **(b) Rolling pair** (c) Turning pair (d) None of these

2. When two pulleys are connected by a cross-belt drive, then both the pulleys rotate in:

(a) Same direction **(b) Opposite direction** (c) Not necessary (d) None of these

3. Length of open belt connecting two pulleys of radii r1 and r2 and at a center distance D apart, is:

(a) π(r1 + r2) + (r1 - r2)2/D + 2D (b) π(r1 + r2) + (r1 + r2) 2/D + 2D

(c) π(r1 - r2) + (r1 + r2) 2/D + 2D (d) π(r1 + r2) + (r1 - r2) 2/D + 2D

4. Length of cross belt connecting two pulleys of radii r1 and r2 and at a center distance D apart, is:

(a) π(r1 + r2) + (r1 - r2) 2/D + 2D **(b) π(r1 + r2) + (r1 + r2) 2/D + 2D**

(c) π(r1 _ r2) + (r1 + r2) 2/D + 2D (d) π(r1 + r2) + (r1 - r2)2/D + 2D

5. Angle of contact in cross-belt drive in comparison to open belt drive is:

(a) More (b) Less (c) Same (d) None

6. Slip in belt drive is difference between:

(a) Angular velocities between two pulleys **(b) The linear speed of the rim of pulleys and the belt on it** (c) The velocities of two pulleys (d) None of these

7. In belt drives, effect of centrifugal tension is:

(a) To increase the driving power (b) To decrease the driving power **(c) Nor appreciable on driving power** (d) None of these

8. If T1 and T2 are tensions on tight and slack side of belt, θ is angle of contact and μ is coefficient of friction between belt and pulley, then ratio of tension is:

(a) T1/T2 = μθ **(b) $T1/T2 = e^{\mu\theta}$** (c) T1/T2 = eμθ (d) T1/T2 = e1/μθ

9. For maximum power transmission, the maximum tension Tmax in the belt is equal to:

(a) Tc (b) 2Tc **(c) 3Tc** (d) Tc/3

10. Creep in belt is due to:

(a) The elasticity of belt material (b) Elongation of the belt due to tension **(c) Differential elongation of the belt due to the difference in tension on two sides of a pulley** (d) Plasticity of belt material

11. Included angle of V-belt is generally:

(a) 10o to 20o (b) 20o to 30o **(c) 30o to 40o** (d) 50o to 60o

12. In designation 6 by 19 rope, 6 and 19 respectively stand for:

(a) The diameter of wire rope and number of strands (b) The diameter of wire rope and number of wires (c) Number of wires and number of strands **(d) Number of strands and number of wires**

13. A chain drive is used for:

(a) Short distance (b) Medium distance (c) Long distance (d) Distance is no barrier

14. Silent chain is made of:

(a) Links and blocks (b) Links, pins, bushings, and rollers (c) 3 or more roller **chains (d) Inverted tooth and overlapping links**

15. Wire ropes are used for:

(a) Low speeds and low tension **(b) Low speeds and high tension** (c) High speeds and low tension (d) None of these

16. The ratio of the number of teeth and pitch circle diameter is called:

(a) Pitch (b) Circular pitch **(c) Diametral pitch** (d) Module

17. The circle passing through the bottom of the teeth of gear is known as:

(a) inner circle (b) Base circle (c) Addendum Circle **(d) Dedendum circle**

18. The circle passing through the top of the teeth of gear is known as:

(a) Inner circle (b) Base circle **(c) Addendum circle** (d) Dedendum circle

19. Pitch circle diameter of an involute gear is:

(a) Independent of any other factor **(b) Dependent on the pressure angle** (c) Constant for a set of meshing gears (d) Proportional to the base diameter

20. The surface of the gear below the pitch circle is called:

(a) Face **(b) Flank** (c) Bottom tooth (d) Tooth depth

21. Law of the gearing is satisfied if

(a) Two surfaces slide smoothly **(b) Common normal at the point of contact passes through pitch point on the line joining the centers of rotation** (c) The addendum is greater than dedendum (d) None of these

Assignment-4

1. Find the expression for the length of belt in the open belt drive.
2. Find the expression for the length of belt in the cross-belt drive.
3. The speed of a driving shaft is 80 rpm and the speed of the driven shaft is 120 rpm. The diameter of the driving pulley is given as 600 mm. Find the diameter of the driven pulley.

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the following cases: (a) If belt thickness is negligible (b) If belt thickness is 5 mm (c) If total slip is 10% (considering thickness of belt) (d) If a slip of 2% on each pulley (considering thickness of belt).

4. A leather belt of density 1000 kg/m3, the thickness of 10 mm is used to transmit a power of 10 kW from a pulley of diameter 1.2 m and running at 250 rpm. Determine the width of the belt taking centrifugal tension into account. If the angle of the lap is 160° and coefficient of friction between belt and pulley is 0.25. Assuming allowable stress for the leather belt is 1.5 MPa.

Quiz-5 (Engineering Materials, Heat Treatment of Steels and Primary Manufacturing Processes)

1. Ability of material to resist deformation due to stress is known as:

(a) Toughness **(b) Stiffness** (c) Plasticity (d) Hardness

2. Ability of material to resist fracture due to high impact load is known as:

(a) Toughness (b) Stiffness (c) Plasticity (d) Hardness

3. Ability of material to absorb energy in the plastic range is known as:

(a) Resilience (b) Stiffness (c) Plasticity (d) Hardness

4. Ability of material to undergo large permanent deformation in tension is known as:

(a) Toughness (b) Stiffness **(c) Ductility** (d) Hardness

5. In sand molding, the middle part of box is called:

(a) Cope (b) Drag **(c) Cheek** (d) Flask-middle

6. Core is used to:

(a) Make desired recess in casting (b) Strengthen molding sand

(c) Support loose pieces (d) Remove pattern easily

7. Shrinkage allowance is made up by:

(a) Adding to external and internal dimensions (b) Subtracting from external and internal dimensions
(c) Subtracting from the external dimension and adding to the internal dimension

(d) Adding to external dimension and subtracting from the internal dimension.

8. Facing sand in foundry work comprises of:

(a) Silica and clay (b) Cay and alumina (c) Silica and alumina (d) Clay and silica

9. The purpose of sprue is to:

(a) Feed the casting at a rate consistent with the rate of solidification

(b) Act as a reservoir for molten metal

(c) Help in feeding the casting until the solidification takes place

(d) Feed molten metal from pouring basin to the gate

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10. The purpose of riser is:

(a) Feed the casting at a rate consistent with the rate of solidification

(b) Act as a reservoir for molten metal

(c) Help in feeding the casting until the solidification takes place

(d) Feed molten metal from pouring basin to the gate

11. Down sprue in casting is given a taper shape for:

(a) Easy flow of molten metal (b) Easy withdrawal of casting

(c) Preventing aspiration of gases through the sprue (d) Preventing bulging of sprue during pouring

12. Draft on pattern is provided for:

(a) The easy flow of molten metal **(b) Easy withdrawal of casting**

(c) Preventing aspiration of gases through the sprue (d) Preventing bulging of sprue during pouring

13. True centrifugal casting is used to:

(a) Ensure purity and density at extremities of a casting **(b) Cast symmetrical object**

(c) Obtain high density and pure casting (d) Use heavy cast iron mold to act as chill

14. Semi-centrifugal casting is used to:

(a) Ensure purity and density at extremities of a casting (b) Cast symmetrical object

(c) Obtain high density and pure casting (d) Use heavy cast iron mold to act as chill

15. In gas welding, maximum temperature occurs at:

(a) Inner cone (b) Outer cone **(c) Next to the inner cone** (d) Tip of the flame

16. In oxyacetylene as welding, flame temperature used is:

(a) 12000C (b) 18000C **(c) 24000C** (d) 32000C

17. Gray cast iron is generally welded by:

(a) Gas welding (b) Arc welding (b) TIG welding (d) MIG welding

18. In thermit welding, aluminum and iron oxides are mixed in the proportion of:

(a) 1:1 (b) 1:2 **(c) 1:3** (d) 3:1

19. For proper mixing of oxygen and pressure regulation of acetylene and oxygen in oxyacetylene welding, the device used is:

(a) Welding torch (b) Cylinder (c) Hose pipe (d) None of the above

20. In arc welding, penetration is deepest for:

(a) DCRP **(b) DCSP** (c) A.C. (d) None of these

21. The hard filler material used in brazing is:

(a) Solder (b) Flux **(c) Spelter** (d) Electrode

22. Solder is essentially a:

(a) Tin silver base **(b) Tin lead base** (c) Silver lead base (d) Bismuth lead base

23. Oxygen to acetylene ratio in case of neutral flame:

(a) 1:1 **(b) 1.2:1** (c) 0.8:1 (d) 2:1

24. Oxygen to acetylene ratio in case of oxidizing flame:

(a) 1:1 (b) 1.2:1 **(c) 1.5:1** (d) 2:1

25. Oxygen to acetylene ratio in case of carburizing flame:

(a) 1:1 (b) 1.2:1 **(c) 0.9:1** (d) 2:1

26. Main advantage of MIG welding over TIG welding is that:

(a) Former can be used to weld hard metals **(b) Former permits use of large currents thereby allowing higher deposition** (c) Welding rate is very fast (d) Welding is completely automatic

27. Flux used for brazing cast iron is:

(a) A mixture of boric acid, borax and a wetting **agent (b) A mixture of boric acid, borax of fluoride with a wetting agent** (c) Chlorides and fluorides mixed with water (d) None of the above

28. Soldering iron is made of wedge shape in order to:

(a) Apply high-pressure at the edge **(b) Retain heat**

(c) Retain solder (d) Facilitate molecular attraction

29. Carburizing flame is used to weld metal like:

(a) Steel (b) Copper and Brass

(c) Aluminum, stainless steel, Zinc die casting, Nickel, Monel metal (d) None of the above

Assignement-5

1. What is casting? How it differs from other primary shaping processes?

2. Enumerate and explain various allowances provided for pattern making?

3.What are the required properties of molding sands? Classify the molding sand?

4.Describe the working principle of arc welding. Explain the shielded arc welding. How does it save the weldment from oxidation and absorption of nitrogen? What precautions need to be observed in arc welding?

5. Compare the merits and demerits of using A.C. and D.C. set for arc welding.

6. What do you mean by arc blow problem? How can it be minimized?

7. Explain the soldering and brazing process.

8. What is gas welding? Explain with a neat sketch of welding torch and various flames.

9. What are the welding defects? Explain the causes and remedies.

10.Classify the engineering materials and explain the application and constituents of some of the important ferrous and non-ferrous materials?

For Techno India NJR Institute of Technology
पंकज पोरवाल
Dr. Pankaj Kumar Porwal
(Principal)

Last Year Paper.

2E2306

Roll No. _____ Total No of Pages: 3

2E2306

B. Tech. II Sem. (Main) Exam., May – 2018

ME -102 Basic Mechanical Engineering

Time: 3 Hours Maximum Marks: 80

Min. Passing Marks: 28

Instructions to Candidates:

Attempt any five questions including Question No. 1, which is Compulsory. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. NIL 2. NIL

Q.1 Compulsory [8×2=16]

Answers for each sub-question be given 50 words- (each question carry 2 marks)

(a) Describe different modern tools used in mechanical engineering.

(b) Describe law of thermodynamics.

(c) Describe different fields of manufacturing technology.

(d) Differentiate between water tube boiler and fire tube boiler.

(e) Differentiate between impulse and reaction turbine.

(f) Write a short note on different types of power plant.

(g) What is industrial engineering & its scope?

(h) Define steam boiler & write different types of boiler.

Q.2 (a) Differentiate between 2 stroke & 4 stroke engine. [4]

(b) Describe ideal Otto cycle & derive formula for its efficiency. [4]

(c) Diesel cycle with compression ratio of CR=20 : 1 and cut –off ratio α=2. The air is at 100 kPa=1 bar, 20°C (293K), and the volume of the chamber is 500 cm^3 prior to the compression stroke.

(i) Specific heat capacity at constant pressure of air at atmospheric pressure and room temperature: C_p = 1.01 kJ/kgK

(ii) Specific heat capacity at constant volume of air at atmospheric pressure and room temperature: C_v = 0.718 kJ/kgK.

(iii) $K = C_p/C_v = 1.4$

Calculate: The mass of intake air, the temperature T2, the pressure P2, the temperature T3, the amount of heat added by burning of fuel-air mixture, the thermal efficiency of this cycle. [8]

Q.3 (a) What is meant by refrigeration system?Describe vapor compression refrigeration system. [8]

(b) What is air conditioning ? Draw and describe different components used in it. [4]

(c) Ice is formed at 0°C from water at 20°C, the temperature of refrigerant is 10°C. Find the ice formed per KWH ,assume latent heat of ice is 334 kJ/kg. Assume working in perfect Carnot cycle. [4]

Q.4 (a) What is gear transmission? Describe different types of gear. [8

(b) Describe with figure different types of belt drive. [4

(c) Two spur gear have velocity ratio 1/3, driven gear has 72 teeth of 8 module & rotate at 300 rpm, calculate no. of teeth & speed of driver, also calculate pitch line velocity. Given:

T2=72, VR=1/3, N2=300 rpm, m=8mm

VR=N2/ N1= T1/T2=1/3. [4]

Q.5 (a) Write a short note on- [6]

(i) Extrusion

(ii) Rolling

(iii) Drawing

(b) What is metal casting? Describe different methods of metal casting. [5]

(c) Write a brief note on Lathe machine. [5]

Q.6 (a) Describe hardening and tempering of steel. [8]

(b) Describe the following terms- [8]

(i) Case hardening

(ii) Carburizing

(iii) Nitriding

(iv) Cyaniding

(v) Carbonitriding

Q.7 (a) What is Computer Added Design (CAD)? Describe its working. [8]

(b) What is MEMS? Write an essay on it. [8]

1E2407

1E2407

B. Tech. I - Sem. (Main/Back) Exam., Dec. 2019
1FY1 – 07 Basic Mechanical Engineering

Time: 2 Hours

Maximum Marks: 80
Min. Passing Marks: 28

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only) [5×2=10]

All questions are compulsory

Q.1 Define blade velocity co – efficient.

Q.2 What is the role of moderator in nuclear power plant?

Q.3 Why priming of a pump is required?

Q.4 Describe Zeroth law of thermodynamics.

Q.5 Differentiate between Joule's law and Gay – Lussac's law

PART – B

(Analytical/Problem solving questions) [4×10=40]

Attempt any four questions

Q.1 Write a short note on points given below-

(a) Power output of Parson's reaction turbine.

(b) Velocity diagram of Parson's reaction turbine

(c) Blade efficiency of Parson's reaction turbine.

(d) Stage efficiency of Parson's reaction turbine

(e) Nozzle efficiency of Parson's reaction turbine

Q.2 (a) Discuss various components of nuclear power plant.

(b) Differentiate between coal thermal power plant and Geo thermal power plant in brief.

Q.3 Explain working of a reciprocating pump along with their applications and neat diagram.

Q.4 Describe the following points –

(a) Case hardening

(b) Unit of Refrigeration

(c) Co – efficient of performance

(d) Cast Iron and types

(e) Cutting speed

Q.5 Explain Locomotive Boiler by using following points –

(a) Neat sketch

(b) Working principle

(c) Components / parts & their working

(d) Applications

Q.6 Explain the following processes-

(a) Soaking

(b) Brazing

(c) Soldering

(d) Drilling

(e) Extrusion

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [2×15=30]

Attempt any two questions

Q.1 (a) Describe different types of belt drives.

(b) Derive an expression for the length of open belt drive.

(c) Ice is formed at 0°C from water at 20°C. The temperature of refrigerant is 10°C. Find the Ice formed per kWh. Assume latent heat of Ice is 334 kJ/kg. Assume working in perfect Carnot cycle.

Q.2 (a) Explain working of an I.C. Engine with their components.

(b) Derive the formula of mechanical efficiency and indicated power of an I.C. Engine.

Q.3 (a) Describes Electrolux refrigerator with neat sketch.

(b) Two parallel shafts 6m apart are to be connected by a belt running over pulleys of diameter 50 cm and 30 cm respectively. Determine the exact and approximate lengths of belt required.

(i) If the belt is open

(ii) If the belt is crossed

(c) What is centrifugal tension? Derive an expression for the same.

CSE II Semester Result - (2018-2022 Batch) EXAM-2019 Total 95 Students

S.No.	Roll. No.	Name	Basic Mechanical Engineering		Manufacturing Practices		Computer Aided Machine		Total Credit Earned	SGPA	Result
			Credit	Grade	Credit	Grade	Credit	Grade			
			80	20	20	30	40	60			
1	18ETCCS001	AAYUSH DADHICH	2	C+	1.5	A++	1.5	A+	20.5	7.89	PASS
2	18ETCCS002	ABHISHEK PANCHOLI	0	F	1.5	A++	1.5	A++	6.5	0	FAIL
3	18ETCCS003	ADITI JAIN	2	C	1.5	A++	1.5	A	20.5	8.01	PASS
4	18ETCCS004	ADNAN PIPAWALA	2	C	1.5	A++	1.5	A++	20.5	8.54	PASS
5	18ETCCS005	AKHILESH JOSHI	0	F	1.5	A++	1.5	A+	10.5	0	FAIL
6	18ETCCS006	AKSHAY SHARMA	2	D+	1.5	A++	1.5	A	20.5	7.34	PASS
7	18ETCCS007	ANAM QUAZI	2	E+	1.5	A++	1.5	A+	20.5	7.15	PASS
8	18ETCCS008	ANJALI MEWADA	2	E+	1.5	A++	1.5	A+	20.5	7.88	PASS
9	18ETCCS009	ANN MARY THOMAS	2	E+	1.5	A++	1.5	A++	20.5	7.46	PASS
10	18ETCCS010	APOORV PANWAR	2	E	1.5	A++	1.5	A++	16.5	0	FAIL
11	18ETCCS011	ARYAN JAIN	0	F	1.5	A	1.5	A	10.5	0	FAIL
12	18ETCCS012	ASHA YADAV	2	D+	1.5	A++	1.5	A	20.5	7.47	PASS
13	18ETCCS014	AVI KUMAR TRIPATHI	0	F	1.5	C	1.5	C	6.5	0	FAIL
14	18ETCCS015	AYAN SHARMA	0	F	1.5	A	1.5	B+	18.5	0	FAIL
15	18ETCCS016	AYUSH GADIYA	2	D	1.5	A++	1.5	A++	20.5	7.12	PASS
16	18ETCCS017	BHAVIKA BHATNAGAR	2	C	1.5	A++	1.5	A++	20.5	8	PASS
17	18ETCCS018	BHAVYA KUMAWAT	2	E	1.5	A++	1.5	A+	20.5	6.1	PASS
18	18ETCCS019	BHAVYA LOHAR	2	C+	1.5	A++	1.5	A	16.5	0	FAIL
19	18ETCCS020	BHUMIKA SALVI	2	D	1.5	A++	1.5	A++	20.5	7.41	PASS
20	18ETCCS021	CHAHAT JOSHI	2	D+	1.5	A++	1.5	B+	16.5	0	FAIL
21	18ETCCS022	CHAHAT LODHA	0	F	1.5	B+	1.5	B+	14.5	0	FAIL
22	18ETCCS023	CHARUL MEHTA	2	C+	1.5	A++	1.5	A++	20.5	8.24	PASS
23	18ETCCS024	CHIRAG JAIN	2	D	1.5	A++	1.5	A+	20.5	7.15	PASS
24	18ETCCS025	CHIRAG PALIWAL	0	F	1.5	A++	1.5	A	10.5	0	FAIL
25	18ETCCS027	DARSHAN JAIN	2	B+	1.5	A++	1.5	A	20.5	7.75	PASS
26	18ETCCS028	DHAIRYA KANTHALIA	2	A	1.5	A++	1.5	A++	20.5	8.83	PASS
27	18ETCCS029	DHRUV BHATI	0	F	1.5	B+	1.5	A	10.5	0	FAIL
28	18ETCCS030	DHRUVIT POKHARNA	0	F	1.5	C	1.5	C	8.5	0	FAIL
29	18ETCCS031	EAKANSH JAIN	2	B	1.5	A++	1.5	A++	20.5	7.56	PASS
30	18ETCCS032	GARGI SHARMA	2	C	1.5	A++	1.5	A+	16.5	0	FAIL
31	18ETCCS033	GAZAL LODHA	2	C+	1.5	A++	1.5	A	20.5	7.16	PASS
32	18ETCCS034	GAZALA PATWALA	2	B	1.5	A++	1.5	A+	20.5	8.71	PASS
33	18ETCCS035	GEETESH KASHYAP	2	C+	1.5	A++	1.5	A++	20.5	7.12	PASS
34	18ETCCS036	HARDI JAIN	2	D+	1.5	A++	1.5	A	16.5	0	FAIL
35	18ETCCS038	HARSHIL TAUNK	2	E	1.5	A++	1.5	A	16.5	0	FAIL
36	18ETCCS039	HARSHIT JAIN	0	F	1.5	A++	1.5	A++	10.5	0	FAIL
37	18ETCCS040	HARSHIT KASODNIYA	0	F	1.5	A+	1.5	A	12.5	0	FAIL
38	18ETCCS041	HARSHIT PANERI	0	F	1.5	B+	1.5	A++	14.5	0	FAIL
39	18ETCCS042	HARSHITA MEHTA	2	C+	1.5	A++	1.5	A+	20.5	7.66	PASS
40	18ETCCS043	HEEYA JOSHI	2	D+	1.5	A++	1.5	A+	20.5	7.73	PASS
41	18ETCCS044	HEMANG SINGH BAYA	2	D+	1.5	A++	1.5	A	12.5	0	FAIL
42	18ETCCS045	HIMANSH SONI	2	C	1.5	A++	1.5	A	20.5	7.04	PASS
43	18ETCCS046	ISHIKA JAIN	2	E+	1.5	A+	1.5	B+	12.5	0	FAIL
44	18ETCCS047	JATIN MENARIA	2	E+	1.5	A++	1.5	A	20.5	6.95	PASS
45	18ETCCS048	JAYESH KUGSIYA	2	C+	1.5	A++	1.5	A+	16.5	0	FAIL
46	18ETCCS050	KARTIK DAVE	0	F	1.5	A++	1.5	A	10.5	0	FAIL
47	18ETCCS051	KAVISH LODHA	0	F	1.5	A	1.5	A	10.5	0	FAIL
48	18ETCCS052	KHUSH MENARIA	0	F	0	F	0	F	0.5	0	FAIL
49	18ETCCS053	KOMOLIKA AGARWAL	2	D+	1.5	A++	1.5	A	16.5	0	FAIL
50	18ETCCS054	KRATIK JAIN	2	D	1.5	A+	1.5	A	20.5	6.45	PASS
51	18ETCCS055	KRISHNA GOSWAMI	2	E+	1.5	A+	1.5	B+	14.5	0	FAIL
52	18ETCCS056	KRITHIK JAIN	2	D	1.5	A++	1.5	A++	20.5	8.1	PASS
53	18ETCCS057	LAKHAN PRAJAPAT	0	F	1.5	A++	1.5	A	18.5	0	FAIL
54	18ETCCS058	LAXMI KUNWAR PANW	2	E	1.5	A++	1.5	A+	20.5	7.44	PASS
55	18ETCCS059	MEHUL JOSHI	2	D+	1.5	A++	1.5	A++	18.5	0	FAIL
56	18ETCCS060	MIHIR BHAWSAR	2	E+	1.5	A+	1.5	B+	16.5	0	FAIL
57	18ETCCS061	MOHAMMED RAUF	2	D	1.5	A	1.5	B	10.5	0	FAIL
58	18ETCCS062	MOHIT CHOUDHARY	0	F	1.5	A	1.5	B+	10.5	0	FAIL
59	18ETCCS063	MOHIT MENARIA	2	E+	1.5	A	1.5	[illegible]	16.5	0	FAIL
60	18ETCCS064	MOHIT SADHWANI	2	B	1.5	A++	1.5	A++	20.5	8.6	PASS
61	18ETCCS065	MUSKAN PANJWANI	2	B	1.5	A++	1.5	A++	20.5	8.2	PASS

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(Principal)

62	18ETCCS067	NIMIT RANKA	2	E	1.5	A++	1.5	A	20.5	7.4	PASS
63	18ETCCS068	NITIN BAGDI	0	F	1.5	A++	1.5	A+	14.5	0	FAIL
64	18ETCCS069	PALASH SIYAL	2	E+	1.5	B+	1.5	B	10.5	0	FAIL
65	18ETCCS070	PAYAL PATEL	2	C	1.5	A++	1.5	A++	20.5	7.71	PASS
66	18ETCCS071	PIHU JAIN	2	C+	1.5	A++	1.5	A	20.5	7.75	PASS
67	18ETCCS072	PORWAL YASH LOKESH	2	D+	1.5	A+	1.5	B+	16.5	0	FAIL
68	18ETCCS073	PRANJAL JAIN	2	E+	1.5	A++	1.5	A	16.5	0	FAIL
69	18ETCCS074	PRIYESH SONI	2	D	1.5	A++	1.5	A	20.5	6.58	PASS
70	18ETCCS075	RAHUL BADLANI	2	B+	1.5	A++	1.5	A++	20.5	8.63	PASS
71	18ETCCS076	RAVINDRA PRATAP SINC	2	C	1.5	A++	1.5	A++	18.5	0	FAIL
72	18ETCCS077	SEJAL JAIN	2	D+	1.5	A++	1.5	A+	20.5	7.29	PASS
73	18ETCCS078	SHASHANK GORANA	0	F	1.5	A+	1.5	A	18.5	0	FAIL
74	18ETCCS079	SHIVANGI DHARMAWA	2	B	1.5	A++	1.5	A	20.5	8.82	PASS
75	18ETCCS080	SHREYANSH KUMAR	2	D+	1.5	A++	1.5	A++	16.5	0	FAIL
76	18ETCCS081	SHUBHAM MAHESHWA	2	D	1.5	A++	1.5	A+	20.5	7.05	PASS
77	18ETCCS082	SIDDHARTH JAIN	2	E	1.5	A++	1.5	A+	18.5	0	FAIL
78	18ETCCS083	SRUSHTI CHOUDHRI	2	E+	1.5	A++	1.5	A	16.5	0	FAIL
79	18ETCCS084	SUHANI JAIN	2	B	1.5	A++	1.5	A	20.5	7.94	PASS
80	18ETCCS085	SUMANT VYAS	2	E+	1.5	A++	1.5	A+	16.5	0	FAIL
81	18ETCCS086	SURBHI SINGH	0	F	1.5	A	1.5	B	8.5	0	FAIL
82	18ETCCS087	SURYAVEER SINGH	0	F	1.5	A	1.5	A	12.5	0	FAIL
83	18ETCCS088	TANMAY PRAJAPAT	2	D+	1.5	A++	1.5	A+	20.5	7.56	PASS
84	18ETCCS089	TARUN TAILOR	2	D+	1.5	A++	1.5	A	20.5	6.78	PASS
85	18ETCCS090	TEJASVINI PRAKASH ME	2	D+	1.5	A++	1.5	A	20.5	7.55	PASS
86	18ETCCS091	THAKUR NUPUR GIRISH	2	E+	1.5	A++	1.5	A++	20.5	6.98	PASS
87	18ETCCS092	TINA SONI	2	B+	1.5	A++	1.5	A+	20.5	8.71	PASS
88	18ETCCS093	VAIBHAV SONI	2	E+	1.5	A+	1.5	A+	16.5	0	FAIL
89	18ETCCS094	VIDUSHI DHAKAR	2	D+	1.5	A++	1.5	A+	20.5	7.73	PASS
90	18ETCCS095	VIVEK SAHU	2	E+	1.5	A++	1.5	A	20.5	6.23	PASS
91	18ETCCS096	VRATI BHANDARI	2	C	1.5	A++	1.5	A	20.5	8.53	PASS
92	18ETCCS097	WASIM AHMAD BHAT	2	E+	1.5	A+	1.5	A	12.5	0	FAIL
93	18ETCCS098	YASH JOSHI	2	E+	1.5	A++	1.5	A	16.5	0	FAIL
94	18ETCCS099	YASRA FATEMA	2	E+	1.5	A++	1.5	A	20.5	6.7	PASS
95	18ETCCS100	YOGYATA RATHORE	2	C	1.5	A++	1.5	A++	20.5	7.85	PASS

Basic Mechanical Engineering
TOTAL = 95
PASS =74
FAIL = 21
PASS%= 78
FAIL% = 22

For Techno India NJR Institute of Technology
पंकज पोरवाल
Dr. Pankaj Kumar Porwa
(Principal)