

**4TH SEM./AUTO/DIP IN MECH./MECH./MECH(IND.INTG)
/MECH(MAINT)/MECH(PROD)/MECH(SANDWICH)/ 2022(S)
Th1-Theory of Machines**

Full Marks: 80

Time- 03 Hrs

Answer any five Questions including Q No.01 & 02
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Define kinematic link. Mention its types.
 - b. What is the difference between Brake and Dynamometer?
 - c. What is Amplitude and Time period related to vibration?
 - d. What is crowning of pulleys?
 - e. Write down the length of Open belt drive formula.
 - f. What is the function of Cam and Followers?
 - g. Define Co-efficient of friction.
 - h. What are the uses of Chain drive and Gear drive?
 - i. What is Vibration and Types of vibration?
 - j. What is the function of Clutch?
2. Answer **Any Six** Questions 6 x 5
 - a. What is the function of bearing? Describe the roller bearing with neat sketch.
 - b. Derive an expression for the height of Watt Governor with neat sketch.
 - c. Differentiate between Static and Dynamic balancing.
 - d. Define Velocity ratio of gear train. Derive velocity ratio of a Simple Gear train with neat sketch.
 - e. What is four bar chain? Explain any two inversion of four bar chain.
 - f. What are the causes and remedies of Vibration?
 - g. Comparison between Flywheel and Governor.
3. Derive the expressions for frictional torque in Pivot bearing considering uniform pressure. 10
4. A belt is running over a pulley of diameter 120 cm at 200rpm. The angle of contact is 165° and co-efficient of friction between the belt and pulley is 0.3. If the maximum tension in the belt is 3000N. Find power transmitted by the belt. 10

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| 5 | Describe the working of Absorption type of dynamometer. | 10 |
| 6 | Explain the terms:
(i.)Sensitivity of Governor
(ii.)Stability of Governor
(iii.)Isochronisms of Governor
(iv.) Ratio of Belt tension
(v.)Co-efficient of fluctuation of speed. | 10 |
| 7 | With neat sketch describe the Longitudinal and Torsional vibration. | 10 |

**4TH SEM./MECH(IND.INT.)/ MECH(SAND)/MECH(PROD.)/
MECH(MAINT)/AERO/DME/MECH/AUTO/2022(S)**

TH 2 Manufacturing Technology

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right-hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Define superfinishing.
 - b. Explain grinding.
 - c. Define indexing.
 - d. Name four major parts of lathe machine.
 - e. What do you understand by quick return mechanism?
 - f. What is multiple holder?
 - g. Define lapping.
 - h. State the composition of 18-4-1 HSS tool.
 - i. Compare drilling with boring operation.
 - j. Define speed and feed of cut.
2. Answer **Any Six** Questions 6 x 5
 - a. Why ram is used in shaper?
 - b. Explain work holding attachment in milling machine.
 - c. Write different parts of a slotter and their function.
 - d. Explain tool geometry of a single point cutting tool.
 - e. State the advantages of broaching.
 - f. Discuss about the tooling layout of a hexagonal bolt.
 - g. Discuss about the functions of centreless grinder.
3. Name various cutting tool materials. Briefly describe one important tool material along with its characteristics and uses. 10
4. Describe the function of different components of a shaper with schematics. 10
5. With neat sketch explain the function of pillar drilling machine. 10
6. Explain with a neat sketch, the working of an universal dividing head. 10
7. Describe in brief various parts of capstan and turret lathe. 10

**4TH SEM./MECH(SAND)/MECH(PROD)/MECH(IND.INT)/
MECH(MAINT)AERO/DME/MECHANICAL/ 2022(S)
TH-03 FLUID MECHANICS**

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Define Impact of jet.
 - b. What is the difference between Poise and stoke?
 - c. Explain Archimedes principle?
 - d. What is the difference between Notch and Weir?
 - e. Define discharge and its unit in S.I system.
 - f. State Darcy Weisbach and Chezy's formula.
 - g. What is the statement of Pascal's law?
 - h. Write down the relationship between Atmospheric pressure, Gauge pressure and Absolute pressure.
 - i. Define Density and its unit.
 - j. Write down the discharge formula for rectangular weir.

2. Answer **Any SIX** Questions 6 x 5
 - a. State and derive the Continuity equation.
 - b. Define three Orifice coefficient and also derive the expression:
 $C_d = C_v \times C_c$
 - c. Describe Hydraulic Gradient Line and Total Energy Line.
 - d. Calculate the Specific weight, Specific mass, Specific volume and Specific gravity of a liquid having a volume of 6m^3 and weight of 44kN.
 - e. Derive an expressions for Total Pressure and Centre of Pressure for a vertically immersed surface.
 - f. Describe properties of fluid.

- g The diameter of a pipe at the sections 1-1 and 2-2 are 200mm and 300mm respectively. If the velocity of water flowing through the pipe at section 1-1 is 4m/sec. Find:
- Discharge through the pipe and
 - Velocity of water at section 2-2
- 3 State and prove the Bernoulli's theorem. 10
- 4 The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The centre of the pipe is 12cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20cm. 10
- 5 (a) Derive discharge formula for triangular notch. 10
(b) Find the discharge over a triangular notch of angle 60° when the head over the V-notch is 0.3m. Assume $C_d = 0.6$.
- 6 Derive force exerted & work done by the jet on a stationary (fixed) vertical force. 10
- 7 Water is flowing through a pipe 1500m long with a velocity of 0.8m/sec. What should be the diameter of the pipe, if the loss of head due to friction is 8.7m, take ' f ' for the pipe as 0.01. 10

**4TH SEM./MECH/MECH(IND INTG)/ MECH(MAINT)/
MECH(PROD)/ DME/MECH(SWICH)/ 2022(S)
Th4 Thermal Engineering-II**

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks
(Use of steam table and mollier chart are allowed)

1. Answer **All** questions 2 x 10
 - a. What do you mean by calorific value of fuel?
 - b. Write four industrial uses of compressed air.
 - c. Define pressure ratio of air compressor.
 - d. Define Dryness fraction of steam.
 - e. State kirchoff's law.
 - f. Define Grate for boiler.
 - g. What are the function of boiler mountings with example?
 - h. Define steam and its uses.
 - i. Carnot cycle is not used as a standard reference cycle in any steam power plant, why?
 - j. Define air-fuel ratio.

2. Answer **Any Six** Questions 6 x 5
 - a. The cylinder dimensions of a single stage single acting reciprocating compressor are 300mmx200mm. The compressor runs at 150r.p.m. The intake pressure and temperature of air are respectively 1 bar and 25⁰c and the discharge pressure is 10bar. Determine the work done per cycle when compression follows the law
 - (i) $PV^{1.25}=c$
 - (ii) $PV=c$
 - b. What are classification of air compressors?
 - c. State the modes of heat transfer and explain it.
 - d. Give a comparison between forced draught and induced draught.

- e. What is the difference between Reheat cycle and Regenerative cycle?
 - f. The thermal efficiency of a Carnot heat engine is 60.5%. The minimum temperature of the cycle is 25°C . Find the maximum temperature of the cycle.
 - g. Deduce a formula for work done by a single stage single acting reciprocating air compressor when the law of expansion is $PV^n = \text{constant}$ neglecting clearance.
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3. Steam is being generated in a boiler under a pressure of 12 bar. Find the enthalpy of 5 kg of steam, when
 - (i) Steam is wet having dryness fraction of 0.75
 - (ii) Temperature of steam is 300°C . Take $C_p = 2.1 \text{ kJ/kg}$.
 4. Describe Carnot cycle with vapour with the help of P-V, T-S and H-S diagrams and deduce a formula for its thermal efficiency. 10
 5. Describe the construction and working of Cochran boiler. 10
 6. An engine uses 6.5 kg of oil per hour of calorific value of 30,000 kJ/kg. if the B.P of the engine is 22 kW and mechanical efficiency 85%. Calculate
 - (i) Indicated thermal efficiency.
 - (ii) Brake thermal efficiency
 - (iii) Specific fuel consumption in kg/B.P/h.
 7. Describe Rankine cycle with the help of P-V, T-S and H-S diagram and deduce a formula for its thermal efficiency considering feed pump work. 10