II B.Tech. II Semester Supplementary Examinations August 2021
Applied Thermodynamics-I
(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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UNIT–I

1. a) List out the major losses in Actual cycles of IC Engines.   6M

   b) What are Air standard cycles? What are the assumptions made in the air standard cycles? Write down the equation used for estimating the thermal efficiency of Air standard otto cycle in terms of compression ratio?   8M

OR

2. a) The minimum pressure and temperature in an Otto cycle are 100 KPa and 30^0 C. The amount of heat added to the air per cycle is 1500 KJ/Kg. i) Calculate the pressure and temperature at all the points. ii) Calculate specific work and thermal efficiency of the cycle for a compression ratio of 9.   10M

   b) Why the actual cycle efficiency is much lower the air standard cycle efficiency?   4M

UNIT–II

3. a) List out the differences between two stroke engine and four stroke engine.   7M

   b) Elucidate the working of forced circulation cooling system with the help of neat sketch.   7M

OR

4. a) What is carburetion? Explain the working of Simple Carburetor with neat sketch.   10M

   b) Compare and contrast between S.I engines with C.I engines.   4M

UNIT–III

5. a) List out the characteristics of good combustion chambers and its types used in SI engines.   6M

   b) Explain the phenomena of knocking in petrol engines.   8M

OR

6. List the various types of combustion chambers used in CI engines and explain them with the help of neat sketch.   14M

UNIT–IV

7. Explain the measurement of friction power by the following methods.
   i) Willan's line method. ii) Motoring Test   14M

OR

8. A four cylinder, four stroke petrol engine has a 10 cm bore, 15 cm stroke and uses a compression ratio of 6. The engine develops 25 kW indicated power at 2000 rpm. Find the mean indicated pressure and air standard efficiency. Also calculate the fuel consumption per hour, if the indicated thermal efficiency is 30%. Take the calorific value of fuel as 42 MJ/kg.   14M

UNIT–V

9. a) Explain the working principle of axial compressor with a neat sketch. Draw its velocity triangles and Show its velocity and pressure variation.   10M

   b) Write short notes about the importance of Intercooler used in air compressors.   4M

OR

10. a) With a neat sketch explain the working of roots blower and derive the expression for roots efficiency.   10M

    b) Write a short notes on multistage compression.   4M

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Code: 5G245

II B.Tech. II Semester Supplementary Examinations August 2021

Electrical and Electronics Engineering

(Mechanical Engineering)
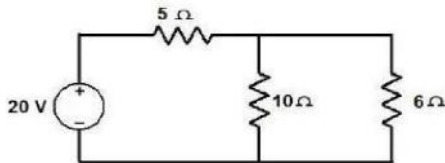
Max. Marks: 70   Time: 3 Hours

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

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UNIT–I

1. a) State and explain Kirchoff's laws with the help of neat diagram   8M

   b) Find the power consumed by each resistor shown in figure below

   6M

OR

2. a) Derive relationship between star to delta and delta to star conversion   10M

   b) Three resistances of 3 ohm, 5 ohm & 10 ohm are connected in parallel across a 100V DC supply. Find the current flowing through each element.   4M

UNIT–II

3. a) With neat diagrams explain the construction DC Machine   10M

   b) Expalin Faradays law of Electromagnetic Induction   4M

OR

4. Explain about speed control methods of DC motor with necessary circuit diagrams   14M

UNIT–III

5. a) Explain the construction, working principle of single phase Induction motor.   10M

   b) Why a single phase induction motor does not self -start?   4M

OR

6. a) Explain in detail Principle of operation of alternator with a diagram.   7M

   b) Deduce EMF equation of alternator.   7M

UNIT–IV

7. a) Describe the working of a PN junction diode with neat diagrams. Also explain its V-I characteristics.   10M

   b) Explain about biasing   4M

OR

8. Derive the expression for average, RMS, efficiency and ripple factor of half-wave rectifier.   14M

UNIT–V

9. a) Explain the working principle of CRO with its component block diagram   10M

   b) What are the applications of CRO   4M

OR

10. What is dielectric heating? Explain the factors on which the dielectric loss of a dielectric material depends? And also the applications.   14M

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Code: 5G542

II B.Tech. II Semester Supplementary Examinations August 2021

Fluid Mechanics and Hydraulic Machinery

(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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UNIT–I

1. a) What is meant by surface tension? Derive the expressions for i. Pressure intensity inside a droplet. ii. Pressure intensity inside a soap bubble.   6M

   b) Calculate the specific weight, specific mass, specific volume and specific gravity of a liquid having a volume of 6 m^3 and weight of 44 kN.   8M

OR

2. a) Differentiate between Atmospheric, Gauge and Vacuum Pressures.   6M

   b) A U-Tube differential manometer connects two pressure pipes A and B. Pipe A contains carbon tetrachloride having specific gravity 1.594 under a pressure of 11.772 N/cm^2 and the pipe B contains oil of specific gravity 0.8 under a pressure of 11.772 N/cm^2. The pipe A lies 2.5m above pipe B. Find the difference of pressure measured by mercury as fluid filling U-Tube.   8M

UNIT–II

3. a) Describe the Reynolds's experiment with the help of a neat sketch.   6M

   b) Derive the expression for force exerted on pipe bend?   8M

OR

4. A horizontal pipe line 40m long is connected to a water tank at one end and discharges freely into the atmosphere at other end. For the first 25m of its length from the tank, the pipe is 150mm diameter and its diameter is suddenly enlarged to 300mm. The height of water level in the tank is 8m above the centre of the pipe. Considering all losses of head which occur, determine the rate of flow. Take f=0.01 for both sections of the pipe.   14M

UNIT–III

5. a) What is a velocity triangle? Show the velocity triangles at inlet and out let when a jet strikes a moving curved plate.   4M

   b) A nozzle of 50mm diameter delivers a stream of water at 20m/sec perpendicular to a plate that moves away from the Jet at 5m/sec. find i. the force on the plate, ii. work done iii. the efficiency of jet.   10M

OR

6. Show that the efficiency of free jet striking normally on a series of flat plates mounted on the periphery of a wheel can never exceed 50%.   14M

UNIT–IV

7. a) Briefly explain about the working principle of pelton wheel with a neat sketch and derive the expression for work done?   14M

   b) Briefly explain about the working principle of pelton wheel with a neat sketch and derive the expression for work done?   14M

OR

8. A Kaplan turbine working under a head of 25 m develops 16000 kW shaft power. The outer diameter of the runner is 4 m and hub diameter is 2 m. The guide blade angle is 35. The hydraulic and overall efficiency are 90% and 85% respectively. If the velocity of whirl is zero at outlet, determine: (i) runner vane angles at inlet and outlet, and speed of turbine.   14M

UNIT–V

9. a) Define specific speed of centrifugal pump. Derive an expression for the same?   6M

   b) Explain the working principle of centrifugal pump with a neat sketch?   8M

OR

10. a) Differentiate between centrifugal pump and reciprocating pump?   6M

    b) A double acting reciprocating pump, running at 50r.p.m. is discharging 900 liters of water per minute. The pump has stroke of 400mm. The diameter of piston is 250mm. The delivery and suction heads are 25 m and 4m respectively. Find the slip of the pump and power required to drive the pump.   8M

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Code: 5G543

II B.Tech. II Semester Supplementary Examinations August 2021
Kinematics of Machinery
(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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UNIT–I

1. a) Define and explain the following terms: mechanism, machine, link and kinematic pair.   4M

   b) What do you understand by degrees of freedom? For a plane mechanism derive an expression
      for degrees of freedom   10M

OR

2. Sketch and explain any two inversions of a double slider crank chain.   14M

UNIT–II

3. In a four bar chain ABCD, AD is fixed and is 150 mm long. The crank AB is 40 mm long
   and rotates at 120 r.p.m. clockwise, while the link CD = 80 mm oscillates about D. BC
   and AD are of equal length. Find the angular velocity of link CD when angle BAD = 60°.   14M

OR

4. State and prove Kennedy's theorem as applicable to instantaneous centres of rotation of
   three bodies. How is it helpful in locating various instantaneous centres of a mechanism?   14M

UNIT–III

5. a) Sketch a Paucellier mechanism. Show that it can be used to trace a straight line.   7M

   b) What is a Scott-Russel mechanism? What is its limitation? How it is modified?   7M

OR

6. Two shafts with an included angle of 160° are connected by a Hooke's joint. The driving
   shaft runs at a uniform speed of 1500 r.p.m. The driven shaft carries a flywheel of mass
   12 kg and 100 mm radius of gyration. Find the maximum angular acceleration of the
   driven shaft and the maximum torque required.   14M

UNIT–IV

7. A pair of gear has 16 teeth and 18 teeth, a module 12.5 mm an addendum 12.5mm and a
   pressure angle 14.5°. Prove that gears have interference. Determine the minimum number
   of teeth and the velocity ratio to avoid interference.   14M

OR

8. In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound
   gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The
   number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and
   direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise.

          14M
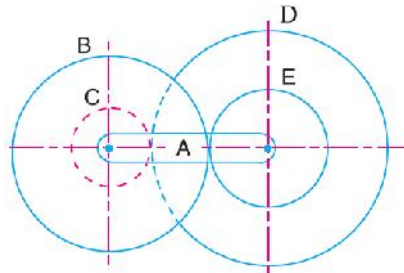
UNIT–V

9. Explain with sketches the different types of cams and followers   14M

OR

10. A cam with 40 mm minimum radius is rotating clockwise at uniform speed of 1200 rpm.
    It has to operate a knife edge follower as defined below:
    i) Follower has to move outward through 30 mm during 900 of cam rotation with uniform velocity
    ii) Dwell for the next 30°
    iii) Follower is to return to its starting position with SHM during next 120°.
    iv) Follower is to dwell for the remaining period. Draw the cam profile taking the line of
       action of the follower passing through the center of the cam.

    Determine the maximum velocity and acceleration of the follower during the return
    stroke   14M

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II B.Tech. II Semester Supplementary Examinations August 2021
Probability & Statistics
(Common to CE, ME and IT)

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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UNIT–I

1. a) Define the following (i) Sample Space (ii) event (iii) Outcome (iv) Probability — 8M

   b) Two marbles are drawn in succession from a box containing 10 red, 30 white, 20 blue and15 orange marbles, with replacement being made after each drawing. Find the probability that (i) both are white (ii) first is red and second is white. — 6M

OR

2. a) State and prove Addition theorem on probability for two events. — 8M

   b) If two dice are throw , Find the probability of getting a sum is10 — 6M

UNIT–II

3. A random variable X has the following probability function

X	0	1	3	4	5	6	7
P(X)	0	K	2K	2K	3K	K^2	$7K^2$+K

Find the value of K , (ii)Evaluate $p(0 < x < 5)$, (iii) Evaluate $p(x < 5)$ — 14M

OR

4. The mean and variance of a binomial variable X with parameters n and p are 16 and 8. Find P(x 1) and P(x > 2) — 14M

UNIT–III

5. A population consists of the four numbers 3, 7, 11, 15. Consider all possible samples of size 2 which can be drawn with replacement from this population. Find the population mean and standard deviation, and mean and standard deviation of the sampling distribution of means. — 14M

OR

6. It is desired to estimate the mean number of hours of continuous use untila certain computer will first require repairs. If it can be assumed that † =48 hours, how large abe needed so that one will be able to assert with 90% confidence that the sample mean is off by at most 10 hours. — 14M

UNIT–IV

7. a) A sample of 64 students has a mean weight of 70 kg. can this be regarded as a sample from a population with mean weight 56kg. and standard deviation is 25 kg. — 7M

   b) In a big city, 325 men out of 600 men were found to be smokers. Thus this information supports the concussion that the majority of men in the city are smokers. — 7M

OR

8. According to the norms established for a mechanical aptitude test, persons who are 18 years old have an average height 73.2 ($\sim = 73.2$) with standard deviation of 8.6($† = 8.6$). If 45 ($n = 45$) members randomly selected of that age average 76.7($\overline{x} = 76.7$). Test the null hypothesis $\sim = 73.2$, against the alternative hypothesis $\sim > 73.2$ at the 0.01 level if significance. — 14M

UNIT–V

9. In an investigation on the machine performance, the following results are obtained

	No. of units inspected	No. of defectives
Machine I	375	17
Machine II	450	22

Test whether there is any significant performance of two machines at = 0.05 — 14M

OR

10. 4 coins were tossed 160 times and the following results were obtained,

No, of Heads	0	1	2	3	4
Frequency	17	52	54	31	6

Under the assumption that coins are unbiased, find the expected frequencies of 0,1,2,3,4 heads and test the googness of fit for =0.05 — 14M

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