II B.Tech. II Semester Regular & Supplementary Examinations May 2018

Applied Thermodynamics - I

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Explain the heat loss factor and exhaust blow down with neat sketches.   8M

    b) How do you classify I.C. engines? Explain.   6M

OR

2. a) Explain the working of four stroke CI engine with help of valve timing diagram.   7M

    b) Explain pressure cooling system with a neat sketch.   7M

UNIT–II

3. a) Explain the different phases of combustion in CI engine with help of P- diagram.   7M

    b) List out the factors that affect the ignition delay period in CI engines.   7M

OR

4. a) Discuss knocking in SI engines   7M

    b) List out the requirements of good combustion chamber in SI engines.   7M

UNIT–III

5.   The compression curve on the indicator diagram for a gas follows the law
        $pV^{1.3}$=constant. At two points on the curve at ¼ stroke and ¾ stroke the
        pressures are 1.4 bar and 3.6 bar respectively. Determine the compression
        ratio of the engine. Calculate the thermal efficiency and the gas consumption
        per I.P. hour, if the relative efficiency is 0.4 and the gas has the calorific value
        of 18800KJ/m^3.   14M

OR

6. a) List out various methods for measurement of friction power and explain Morse
        method of determination of friction power.   7M

    b) Explain the measurement of brake power by using Rope Brake Dynamometer.   7M

UNIT–IV

7. a) How do you classify air compressors? Explain.   4M

    b) Explain the working of roots blower with a neat sketch.   10M

OR

8.   A single-stage single acting air compressor delivers 0.6 kg of air per minute at
        6 bar. The temperature and pressure at the end of suction stroke are 30°C and
        1 bar. The bore and stroke the compressor are 100 mm and 150 mm
        respectively. The clearance is 3% of the swept volume. Assuming the index of
        compression and expansion to be 1.3, find: (i) Volumetric efficiency of the
        compressor; (ii) power required if the mechanical efficiency is 85% and
        (iii) speed of the compressor in r.p.m.   14M

UNIT–V

9. a) Explain the operation of single stage centrifugal air compressor with help of
        inlet and outlet velocity triangles on the compressor vane.   10M

    b) List out the advantages and disadvantages of use of centrifugal air compressor.   4M

OR

10.   An axial flow compressor having eight stages and with 50% reaction design
        compresses air in the pressure ratio of 4:1. The air enters at 20°C and flows
        through it at a constant speed of 90m/s. he rotating blades of compressor rotate
        with a mean speed of 180m/s. Isentropic efficiency of the compressor may be
        taken as 82%. Calculate:
        i. Work done by the machine
        ii. Blade angles   14M

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R-15

Code: 5G245

II B.Tech. II Semester Regular & Supplementary Examinations May 2018

# Electrical and Electronics Engineering

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) A circuit consists of three resistances of 12, 18 and 36 ohms respectively joined in parallel and the combination is connected in series with a resistance of 12 ohms. The whole circuit is connected to 60V supply. Calculate current in each branch, total current drawn and power dissipated in each resistor

    b) Find Rab for the circuit shown below?
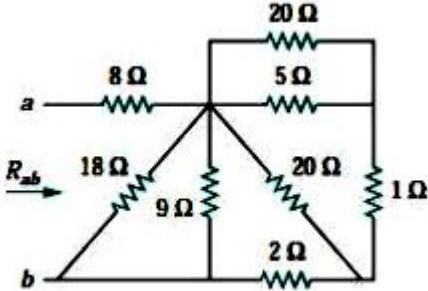
OR

2. a) Explain the star-delta and delta-star transformation for a resistive network?

    b) By applying Kirchhoff's law, find the current through all the elements in the circuit as shown in the Figure 1?
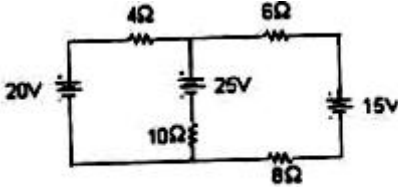

Figure 1

UNIT–II

3. a) Explain in detail about the classification of DC generators based on the type of excitation? Give the connection diagrams.

    b) Derive the torque equation of a DC motor?

OR

4. a) Derive the expression for the e.m.f induced in a DC machine by defining all the terms clearly?

    b) A 4 pole 220V wave connected shunt motor gives 11.19 kW when running at 1000 r.p.m and drawing armature and field current of 50A and 1A respectively. It has 540 conductors. Its resistance is 0.1 ohms. The brush drop is 1V per brush. Calculate total torque, useful torque, flux per pole, rotational losses and efficiency?

UNIT–III

5. a) Explain the working principle of three phase induction motor

   b) A 200 KVA rated transformer has a full-load copper loss of 1.5 kW and an iron loss of 1 kW. Determine the transformer efficiency at full load & half load for 0.85 power factor.

OR

6. a) Draw and explain torque slip characteristics of 3 - Phase induction motor.

   b) A 40 KVA,3300/240 –V,50 Hz,1- phase transformer has 660 turns on the primary. Determine (i) the number of turns on the secondary (ii) the maximum value of flux in the core (iii) the approximate value of primary and secondary full load currents.

UNIT–IV

7. a) Explain the operation of a half wave rectifier with the help of circuit diagram?

   b) Explain about the principle of operation of PNP transistor? Discuss how it is operated as an amplifier?

OR

8. a) With a neat sketch explain operation of a PN junction diode? Draw its V-I characteristics

   b) Explain in detail about the differences between PNP and NPN transistors?

UNIT–V

9. a) What is dielectric heating? Explain the factors on which the dielectric loss of a dielectric material depends?

   b) Explain Induction heating with neat diagram.

OR

10. a) Draw the block diagram of a CRO and explain the functions of its various components?

    b) Explain the applications of dielectric heating.

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II B.Tech. II Semester Regular & Supplementary Examinations May 2018

Environmental Science

(Common to CE, ME and CSE)

Max. Marks: 70   Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Define the term environment and explain scope and importance of environmental studies.   7M
    b) Write a short note on Biosphere and atmosphere.   7M

OR

2. a) Describe the term environmental education.   7M
    b) Explain the role of people and organizations related to provide environmental awareness.   7M

UNIT–II

3. a) Write about the uses and mineral reserves of India.   7M
    b) Explain the environmental impacts of over exploitation of mineral resources.   7M

OR

4. a) Write about the various applications and environmental impacts of any two fossil fuels.   7M
    b) Briefly explain the effects of pesticides.   7M

UNIT–III

5. a) Define the term ecosystem and explain the structural aspects of forest ecosystem.   7M
    b) Write a note on carbon cycle and nitrogen cycle.   7M

OR

6. a) Explain various values of biodiversity.   7M
    b) Discuss ex-situ conservation strategies in detail.   7M

UNIT–IV

7. a) Write about effects, classification of pollutants and control measures of air pollution.   7M
    b) Explain sources, effects and control measures of thermal pollution.   7M

OR

8. a) Explain various municipal solid waste management practices in detail.   7M
    b) Explain briefly impacts of marine pollution with any case study.   7M

UNIT–V

9. a) Write in detail about acid rain.   7M
    b) Explain water pollution prevention and control act.   7M

OR

10. a) Define the term population explosion and explain reasons and impacts of population growth.   7M
    b) Write a short note on human rights.   7M

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Code: 5G542

II B.Tech. II Semester Regular & Supplementary Examinations May 2018

Fluid Mechanics and Hydraulic Machinery

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) State Newton's Law of viscosity and classify the fluids based on this. 7M

   b) A shaft 7.5 cm diameter runs in a bearing of length 15 cm, the two surfaces being separated by a lubricating film of oil 0.015 mm thick. If the viscosity of oil is 0.153 SI units, making suitable and reasonable assumptions find the power absorbed in overcoming the viscous resistance of oil to rotate the shaft at 600 rpm. 7M

OR

2. a) Define the following (i) Laminar and Turbulent flow (ii) Steady and Unsteady flow (iii) Uniform and Non uniform flow (iv) Compressible and incompressible flow. 8M

   b) The velocity field of a fluid flow is given by $V = (x^2y-2xz)i+(y^2-x^2z)j+xy^2tk$. Compute the acceleration at a point (-1, 2,1) at a time of 2 seconds. 6M

UNIT–II

3. a) State the momentum equation and mention some of its engineering applications. 4M

   b) A 60° reducing bend is connected in a pipe line, the diameter at the inlet and outlet of the bend being 60 cm and 30 cm respectively. Calculate the force exerted by water on the bend if the intensity of pressure at inlet to bend is 1.5 N/cm² and the flow rate is 620 lit/sec. 10M

OR

4. a) Derive the Darcy-Weisbach equation for head loss due to flow in a pipe in terms of friction factor f, for laminar flow. 7M

   b) From a reservoir two parallel pipes of diameter 150mm and 200mm each 100m long convey a total discharge of 0.12cum/s. Find the head lost due to friction. If however the pipes are arranged in series to convey the same discharge what would be the head lost due to friction. Take f=0.0075. 7M

UNIT–III

5. a) Classify Hydroelectric power plants based on various considerations. 4M

   b) A jet of water having a velocity of 15 m/s. strikes a curved vane which is moving with a velocity of 5 m/s in the same direction as that of the jet at inlet. The vane is so shaped that the jet is deflected through 135°. The diameter of jet is 100 mm. Assuming the vane to be smooth, find: (i) Force exerted by the jet on the vane in the direction of motion, (ii) Power exerted on the vane, and (iii) Efficiency of the vane. 10M

OR

6. a) Briefly explain about pumped storage plants. 4M

   b) A jet of water 75 mm diameter having a velocity of 20 m/s strikes normally a flat smooth plate. Determine the thrust on the plate (i) if the plate is at rest (ii) if the plate is moving in the same direction as the jet with a velocity of 5 m/s. Also find the work done per second on the plate in each case and the efficiency of the jet when the plate is moving. 10M

UNIT–IV

7. a) Explain with a neat sketch working principle of a Pelton wheel. 7M

   b) A Pelton wheel has to be designed for the following data: Power to be developed=6000 kW, Net head available = 300 m, Speed = 550 rpm, Ratio of jet diameter to wheel diameter = 1/10 and overall efficiency = 85%. Find the number of jets, diameter of wheel and the quantity of water required. (Assume C_v = 0.98 and =0.46) 7M

OR

8. a) Explain unit speed, unit discharge and unit power of hydraulic turbines. 7M

   b) A Francis turbine working under a head of 5 m at a speed of 210 r.p.m, develops 75 kW when the rate of flow water is 1.8 m^3/s. The runner diameter is 1m. If the head on the turbine is increased to 16 m, determine its new speed, discharge and power. 7M

UNIT–V

9. a) Distinguish between Centrifugal and Reciprocating pumps. 4M

   b) A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 r.p.m., works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40^0 at outlet. If the outer diameter of the impeller is 500 mm and width at out is 50 mm, determine: (i) Vane angle at inlet (ii) Work done by impeller on water per second, and (iii) Manometric efficiency. 10M

OR

10. a) Define indicator diagram. How will you prove that area of indicator diagram is proportional to the work done by the reciprocating pump? 7M

    b) A single acting reciprocating pump running at 30 r.p.m. delivers 0.012 m^3/s of water. The diameter of the piston is 25 cm and stroke length 50 cm. Determine (i) The theoretical discharge of the pump (ii) Co-efficient of discharge and (iii) Slip and percentage slip of the pump. 7M

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II B.Tech. II Semester Regular & Supplementary Examinations May 2018
Kinematics of Machinery
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours
Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)
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UNIT–I

1. a) Define and explain the following terms: mechanism, machine, link and kinematic pair.   6M

    b) What do you understand by degrees of freedom? For a plane mechanism derive an expression for degrees of freedom   8M

OR

2. What do you mean by inversion of mechanism? Explain with sketches all inversions of quadric cycle chain.   14M

UNIT–II

3. In a reciprocating engine mechanism the crank CB = 10 cm and connecting rod BA = 30 cm with the center of gravity G, 10 cm from B. The crank makes an angle of 120^0 from inner dead centre. In this position the crank has a velocity of 75 rad/s and an angular acceleration of 1200 rad/s^2, both in clockwise direction. Find (a) the velocity and acceleration of G and (b) the angular velocity and angular acceleration of AB.
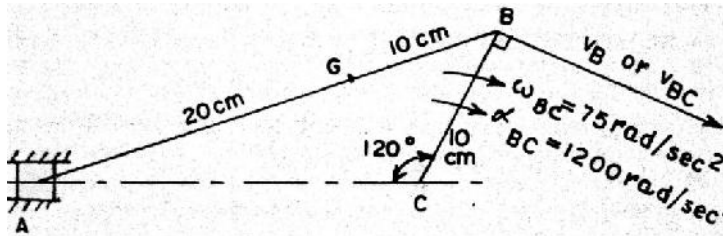
                                                                                                              14M

OR

4. In a slider crank mechanism, the crank is 480 mm long and rotates at 20 rad/s in the counter-clockwise direction. The length of the connecting rod is 2500 mm. When the crank turns 60° from the inner-dead centre, locate all instantaneous centres. Also determine (i) velocity of slider and (ii) angular velocity of connecting rod.   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. a) Derive the condition for correct steering.   7M

    b) Determine the greatest permissible angle between the axes of the two shafts which are connected by a Hooke's joint if the maximum variation in the speed of the driven shaft is 8 % of the mean speed. The driving shaft is rotating at a uniform speed of 500 r.p.m. Also find the maximum and the minimum speeds of the driven shaft.   7M

UNIT–IV

7. a) Calculate (i) length of path of contact, (ii) arc of contact and (iii) the contact ratio when a pinion having 23 teeth drives a gear having teeth 57. The profile of the gears is involute with pressure angle 20°, module 8 mm and addendum equal to one module. 7M

   b) Derive an expression for the minimum number of teeth required on the wheel in order to avoid interference in involute gear teeth. 7M

OR

8. The arm of an epicyclic gear train rotates at 100 r.p.m in the anti-clockwise direction. The arm carries two wheels A and B having 36 and 45 teeth respectively. The wheel A is fixed and the arm rotates about the centre of wheel A. Find the speed of wheel B. What will be the speed of B, if the wheel A instead of being fixed, makes 200 r.p.m. clockwise? 14M

UNIT–V

9. Draw the profile of a cam operating a knife-edge follower when the axis of the follower passes through the axis of cam shaft from the following data:
   (a) Follower to move outwards through 30 mm during 60^0 of cam rotation,
   (b) Follower to dwell for the next 45^0
   (c) Follower to return to its original position during next 90^0,
   (d) Follower to dwell for the rest of cam rotation.

   The displacement of the follower is to take place with S.H.M during both the outward and return strokes. The least radius of the cam is 30 mm. If the cam rotates at 300 r.p.m., determine the maximum velocity and acceleration of the follower during outward stroke and return stroke. 14M

OR

10. Draw the profile of a cam to raise a valve with harmonic motion through 40 mm in 1/3 of revolution, keep it fully raised through 1/12 revolution, and to lower it with harmonic motion in 1/6 revolution. The valve remains closed during the rest of the revolution. The diameter of the roller is 20 mm and minimum radius of the cam is to be 25 mm. The diameter of the cam shaft is 25 mm. The axis of the valve rod passes through the axis of the cam shaft. Assume the cam shaft to rotate with a uniform velocity 14M

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II B.Tech. II Semester Regular & Supplementary Examinations May 2018
Probability and Statistics
(Common to CE, ME and IT)

Max. Marks: 70
Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)
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UNIT–I

1 a) A class consists of 6 girls and 10 boys. If a committee of 3 is chosen at random from the class, find the probability that (i) 3 boys are selected (ii) exactly 2 girls are selected. 7M

b) In a bolt factory machines A, B, C manufacture 20%, 30% and 50% of the total of their output and 6%, 3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probabilities that it is manufactured from (i) Machine A. (ii) Machine B. (iii) Machine C. 7M

OR

2 a) A random variable X is defined as the sum of the numbers on the faces when two dice are thrown. Find the mean of X. 7M

b) A sample of 4 items is selected at random from a box containing 12 items of which 5 are defective. Find the expected number E of defective items. 7M

UNIT–II

3 a) Ten coins are thrown simultaneously. Find the probability of getting at least seven heads. 7M

b) Fit a Poisson distribution for the following data and calculate the expected frequencies

x	0	1	2	3	4
f(x)	109	65	22	3	1

7M

OR

4 a) In a normal distribution 31% of the items are under 45 and 8% are over 64. Find the mean and variance of the distribution. 7M

b) In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal, find how many students score between 12 and 15? 7M

UNIT–III

5 A population consists of five numbers 2, 3, 6, 8 and 11. Consider all possible samples of size two which can be drawn with replacement from this population. Find a) The mean of the population. b) The standard deviation of the population. c) The mean of the sampling distribution of means and d) The standard deviation of the sampling distribution of means (i.e., the standard error of means). 14M

OR

6 a) A normal population has a mean of 0.1 and standard deviation of 2.1. Find the probability that mean of a sample of size 900 will be negative. 7M

b) Ten bearings made by a certain process have a mean diameter of 0.5060 cm with a standard deviation of 0.0040 cm. Assuming that the data may be taken as a random sample from a normal distribution, construct a 95% confidence interval for the actual average diameter of the bearings? 7M

UNIT–IV

7 a) An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and the variance of 16 minutes. Test the claim at 0.05 level significance   7M

   b) The mean yield of wheat from a district A was 210 pounds with S.D. 10 pounds per acre from a sample of 100 plots. In another district the mean yield was 220 pounds with S.D.12 pounds from a sample of 150 plots. Assuming that the S.D of yield in the entire state was 11 pounds, test whether there is any significant difference between the mean yield of crops in the two districts.   7M

OR

8 a) 20 people were attacked by a disease and only 18 survived. Will you reject the hypothesis that the survival rate if attacked by this disease is 85% in favour of the hypothesis that is more at 5% level.   7M

   b) A sample of 26 bulbs gives a mean life of 990 hours with a S.D of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours. Is the sample not upto the standard.   7M

UNIT–V

9 a) The measurements of the output of two units have given the following results. Assuming that both samples have been obtained from the normal populations at 10% significant level, test whether the two populations have the same variance.

Unit-A	14.1	10.1	14.7	13.7	14.0
Unit-B	14.0	14.5	13.7	12.7	14.1

7M

   b) The number of automobile accidents per week in a certain community are as follows: 12, 8, 20, 2,14, 10, 15, 6, 9, 4. Are these frequencies in agreement with the belief that accident conditions were the same during this 10 week period.   7M

OR

10 a) In one sample of 10 observations, the sum of the squares of the deviations of the sample values from sample mean was 120 and in the other sample of 12 observations, it was 314. Test whether the difference is significant at 5% level?   7M

   b) Four coins were tossed 160 times and the following results were obtained.

No. of heads	0	1	2	3	4
Observed frequencies	17	52	54	31	6

Under the assumption that coins are balanced, finds the expected frequencies of 0, 1, 2, 3 or 4 heads, and test the goodness of fit at a level of significance 0.05?   7M

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