II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019
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)
****

UNIT–I

1. a) Derive an expression for efficiency of Otto Cycle.   7M

   b) Find the air standard efficiency of a diesel cycle engine if the cut off is 6% of the stroke and the clearance is 1/13th of the stroke. Take =1.4   7M

OR

2. Explain the following relevant to actual cycles.
   i)   Heat loss factor
   ii) Exhaust blowdown factor
   iii) Time loss factor   14M

UNIT–II

3. a) Explain the working of distributor type fuel injection pump with neat sketch.   7M

   b) Elucidate the working of forced circulation cooling system.   7M

OR

4. a) Discuss the difference between theoretical and actual valve timing diagram of a diesel engine.   10M

   b) Justify the need of lubrication in IC engines.   4M

UNIT–III

5. What is meant by abnormal combustion? Explain the phenomenon of knock in SI engine.   14M

OR

6. Explain with figures the various types of combustion chambers used in CI engines.   14M

UNIT–IV

7. The following data refer to a single cylinder four stroke petrol engine: Compression ratio=5.6, Mechanical efficiency = 80%, Brake specific fuel consumption=0.37kg/kW h, Calorific value of fuel = 44000 kJ/kg, Adiabatic index for air = 1.4, Find (i) brake thermal efficiency (ii) Indicated thermal efficiency (iii) Air standard efficiency. (iv) Relative efficiency with respect to indicated thermal efficiency and (v) Relative efficiency with respect to brake thermal efficiency.   14M

OR

8. In a trail of single cylinder oil engine working on dual cycle, the following observations were made.

   Compression ratio = 15   Oil Consumption = 10.2 kg/hr
   Calorific value of fuel = 43890 kJ/kg   Air consumption = 3.8 kg/min
   Speed = 1900 rpm   Torque on the brake drum = 186 N-m
   Quantity of cooling water used = 15.5 kg/min
   Temperature rise = 36°C   Exhaust Gas Temperature = 410°C
   Room temperature = 20°C   Specific Heat of Exhaust Gas = 1.17 kJ/kg K

   Calculate (i) Brake Power (ii) Brake Specific Fuel Consumption (iii) Brake Thermal Efficiency. Also draw heat balance Sheet on minute Basis.   14M

UNIT–V

9. Following data relate to performance test of a single acting 14 cm * 14 cm reciprocating compressor. Suction pressure and temperature 1 bar 20^{0}C, discharge pressure and temperature are 6 bar, 180^{0}C, Speed of the compressor 1200 rpm, Shaft power 6.25 kW, Mass of air delivered 1.7 kg/min. Calculate the following

     i)   The indicated power
     ii)   The isothermal efficiency
     iii)   The mechanical efficiency
     iv)   The overall isothermal efficiency   14M

OR

10. a) With neat sketch, explain the working of Roots blower compressor.   7M

     b) Compare Rotary and Reciprocating Air Compressor.   7M

******

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019
Electrical and Electronics Engineering
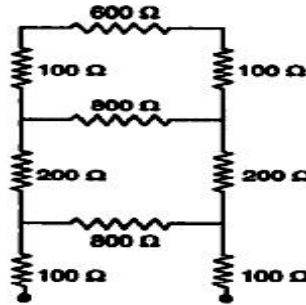(Mechanical Engineering)

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

UNIT–I

1. a) Find the equivalent resistance between two points of the shown figure bellow.

7M

   b) Derive relationship between star to delta and delta to star conversion. 7M

OR

2. a) 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. 7M

   b) Explain KCL and KVL with examples. 7M

UNIT–II

3. a) Explain Constructional Details of DC generator with diagram. 7M

   b) Derive EMF equation of DC Generator. 7M

OR

4. a) Explain principle of operation of DC motor and derive torque equation for DC motor. 7M

   b) Explain different speed control methods for DC Shunt motor. 7M

UNIT–III

5. a) Derive EMF equation of transformer. 7M

   b) Explain OC and SC test on single phase transformer. 7M

OR

6. a) Explain regulation of alternator by synchronous impedance method. 7M

   b) Explain Principle of operation of induction motor. 7M

UNIT–IV

7. a) Explain operation and characteristics of PN junction diode. 7M

   b) Derive the expression for average, RMS efficiency and ripple factor of half-wave rectifier. 7M

OR

8. a) Draw the schematic of an NPN transistor indicating the various current components and explain how each one of them arises. 7M

   b) Explain how transistor works as amplifier. 7M

UNIT–V

9. a) Explain induction heating and write the applications of induction heating. 7M

   b) Briefly describe dielectric heating. 7M

OR

10. a) Draw block diagram of CRO and write applications of CRO. 7M

    b) Explain voltage and current is measured with CRO. 7M

****

Hall Ticket Number :

R-15

Code: 5GC43

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019
Environmental Science
(Common to CE & ME)

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

UNIT–I

1. a) Write a note on multidisciplinary nature of environmental studies.   7M

    b) How would environmental awareness help to protect our environment?   7M

OR

2. a) Write a note on public awareness of environmental studies.   7M

    b) Explain briefly the importance of environmental studies.   7M

UNIT–II

3. a) Define Mineral resources. Explain about use and environmental effects of extracting mineral resources.   7M

    b) Describe the impact of over grazing.   7M

OR

4.   Discuss in brief account on role of an individual in the conservation of natural resources.   14M

UNIT–III

5. a) Explain the Forest ecosystem with suitable examples.   7M

    b) Write the formation of nitrogen cycle.   7M

OR

6. a) Discuss the desert ecosystem with suitable examples.   7M

    b) Explain brief about the conservation methods of biodiversity.   7M

UNIT–IV

7. a) Define Thermal pollution. Discuss in brief account on causes, effects and control measures of Thermal pollution   7M

    b) Write the effects of nuclear radiation on environment.   7M

OR

8. a) Write a detailed note on consequences of soil pollution.   7M

    b) Describe the causes of ozone layer depletion.   7M

UNIT–V

9. a) Explain in detail about the advantages of rain water harvesting.   7M

    b) Write a note on forest conservation act.   7M

OR

10. a) Describe family welfare programmes in India.   7M

    b) Value education has an important effect on environmental conservation. Justify.   7M

****

Code: 5G542

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019

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)

****

UNIT–I

1. a) Explain Newton's law of viscosity   4M

    b) A uniform body of size 3 m long × 2 m wide × 1 m deep floats in water. What is the weight of the body if depth of immersion is 0.8 m? Determine the meta-centric height also.   10M

OR

2. a) Explain steady and unsteady fows with examples   4M

    b) A fluid flow field is given by $V=x^2yi+y^2zj-(2xyz+yz^2)k$. Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity at the point (2,1,3).   10M

UNIT–II

3. A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m 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

OR

4. A 30 cm × 15 cm venturimeter is provided in a vertical pipe line carrying oil of specific gravity 0.9, the flow being upwards. The difference in elevation of the throat section and entrance section of the venturimeter is 30cm. The differential U-tube mercury manometer shows a gauge deflection of 25 cm. Calculate (i) the discharge of oil (ii) the pressure difference between the entrance section and the throat section. Take the co-efficient of meter as 0.98 and specific gravity of mercury as 13.6.   14M

UNIT–III

5. Sketch the hydroelectric power plant and explain the functions of various components.   14M

OR

6. A jet of water of diameter 7.5 cm strikes a curved plate at its center with a velocity of 20 m/s. The curved plate is moving with a velocity of 8 m/s in the direction of the jet. The jet is deflected through an angle of 165°. Assuming the plate smooth find (i) Force exerted on the plate in the direction of jet, (ii) Power of the jet, and (iii) Efficiency of the jet.   14M

UNIT–IV

7. a) Obtain an expressions for unit speed, unit discharge and unit power for a turbine.   9M

    b) What is cavitation? How can it be avoided in reaction turbine?   5M

OR

8. A Francis turbine with an overall efficiency of 75% is required to produce 148.25kW power. It is working under a head of 7.62 m. The peripheral velocity=$0.26\sqrt{2gH}$ and the redial velocity of flow at inlet is $0.96\sqrt{2gH}$. The wheel runs at 150 r.p.m and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine: (i) the guide blade angle, (ii) the wheel vane angle at inlet (iii) diameter of the wheel at inlet and (iv) width of the wheel at inlet. 14M

UNIT–V

9. A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1200 r.p.m. works against a total head of 75 m.The velocity flow through the impeller is constant and equal to 3 m/s. The vanes are set back at an angle of 30° at outlet. If the outer diameter of the impeller is 600 mm and width at outlet is 50 mm, determine: (a) vane angle at inlet, (b) work done per second by impeller, (c) manometric efficiency. 14M

OR

10. A single-acting reciprocating pump, has a cylinder of a diameter 150 mm and of stroke length 300 mm. The centre of the pump is 4 m above the water surface in the sump. The atmospheric pressure head is 10.3 m of water and pump is running at 40 r.p.m. If the length and diameter of the suction pipe are 5 m and 10 cm respectively, determine the pressure head due to acceleration in the cylinder (i) at the beginning of the suction stroke, and (ii) in the middle of suction stroke. 14M

****

Code: 5G543

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019
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)
****

UNIT–I

1. a) Define the following
    a) Link   b) Structure
    c) Mechanism   d) Degrees of freedom   4M

    b) Explain with a neat sketch crank and slotted mechanism   10M

OR

2. a) State and explain Grubler's criterion   4M

    b) Describes the various inversions of a single slider crank chain with sketches.   10M

UNIT–I

3.   The crank of a slider crank mechanism is 480 mm long and rotates at 20 rad/sec
        in the counter clock wise direction. It has a connecting rod of 1600 mm long.
        Determine the following when the crank is at 60^0 from the inner dead centre,
        i)   Velocity of the slider
        ii) Angular velocity of the connecting rod, and
        iii) The position and velocity of a point P on the connecting rod having least
             absolute velocity.   14M

OR

4.   The Fig. 4 shows the configuration diagram of a four link mechanism along with
        the lengths of the links in mm. The link AB has an instantaneous velocity of
        10.5rad/s and a retardation of 26 rad/s^2 in the counter-clock wise direction. Find
        i) the angular acceleration of the link BC and CD, and ii) the linear accelerations of
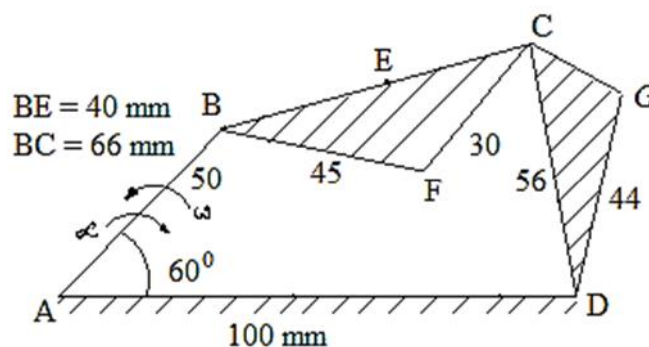   the points E, F and G.

Fig. 4   14M

UNIT–III

5.   Derive an expression for the velocity of the driven shaft in a Hook's coupling   14M

OR

6.   Two shafts are connected by a Hook's joint. The power supplied to the driving shaft
        is 7.5 kW and the driving shaft rotates at uniform speed of 200 rpm. The angle
        between the axes of two shafts is 18^0. If the output torque on the driven shaft is not
        to vary by more than 20% of the input torque, what is the necessary radius of
        gyration of the fly wheel of 40 Kg mass mounted on the driven shaft.   14M

UNIT–IV

7. Two gears in mesh have a module of 8 mm and a pressure angle of 20^0. The larger gear has 57 teeth while the pinion has 23 teeth. If the addenda on the pinion and gear wheel are equal to one module find,
    i) The number of pairs of teeth in contact, and
    ii) The angle of action of the pinion and gear wheel.   14M

OR

8. An epicyclic gear train is composed of a fixed annular wheel A having 150 teeth. Meshing with A is a wheel B which drives wheel D through an idle wheel C, D having concentric with A. Wheel B and C are carried on an arm which revolves clockwise at 100 rpm about the axes of A and D. If wheels B and D have 25 and 40 teeth respectively. Predict the number of teeth on C and the speed and sense of rotation of C.   14M

UNIT–V

9. Draw the profile of a cam to raise a valve with SHM through 40 mm in ¼th revolution., keep it fully raised through 1/10th revolution and to lower it with uniform acceleration and retardation in 1/6th revolution. The valve remains closed during the rest of revolution. The diameter of roller is 20 mm and minimum radius of cam is 30 mm. The axis of valve rod passes through the axis of cam shaft. The cam rotates at 360 rpm clockwise. Estimate maximum velocity and acceleration during raise and return of follower.   14M

OR

10. A cam rotates at a uniform speed of 300 rpm clockwise and gives an oscillating follower 75 mm long, an angular displacement of 30^0 in each stroke. The follower is fitted with a roller of 20 mm diameter which makes contact with the cam. The outward and inward displacement of the follower each occupying 120^0 cam rotation and there is no dwell in the lifted position. The follower move through out by SHM. The axis of rotation is 80 mm from the axis of cam and the least distance of roller axis from cam axis is 40 mm.   14M

****

R-15

Code: 5GC42

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2019
Probability and Statistics
(Common to CE, ME and CSE)

Max. Marks: 70   Time: 3 Hours

PART-A
Answer *the following* units by choosing one question from each unit (3 x 14 = 42 Marks)
****

UNIT–I

1.   Given P(A)=1/4, P(B)=1/3 and $P(A \cup B) = 1/2$, then evaluate

$P(A/B), P(B/A), P(A \cap B')$ and $P(A'/B')$ 14M

OR

2.   A random variable X has the following probability function values of X.

x:	-2	-1	0	1	2	3
p(x):	0.1	K	0.2	2k	0.3	k

Find the value k, $P(X \geq -1)$, $P(X \leq 2)$, mean and variance   14M

UNIT–II

3. a) The probability that a pen manufactured by a company will be defective is
1/10. If 12 such pens are manufactured, find the probability that (a) exactly
two will defective, (b) at least two will be defective and (c) none will be
defective.   7M

   b) Fit a Poisson distribution to the frequency distribution

x:	0	1	2	3	4
f:	46	38	22	9	1

7M

OR

4. a) The weekly wages of workers in a company are normally distributed with
mean of Rs. 700 and standard deviation of Rs. 50. Find the probability that
the weekly wage of a randomly chosen worker is (i) between Rs. 650 and Rs.
750, and (ii) more than Rs. 750.   7M

   b) For the normal distribution with mean 2 and standard deviation 4, evaluate (i)
$P(-6 < x < 3)$, (ii) $P\{x \geq 5\}$ and (iii) $P(\{|x| < 4\})$.   7M

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. a) The standard deviation of the life-times of television tubes manufactured by a company is estimated as 100 hours. Find how large a sample must be taken in order to be 99% confident that the error in the estimated mean life-time will not exceed 20 hours   7M

    b) Find 95% confidence limits for the mean of a normality distributed population from which the following sample was taken 15,17,10,18,16,9,7,11,13,14.   7M

UNIT–IV

7. a) A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38. Also calculate 95% confidence interval for the population   7M

    b) Experience had shown that 20% of a manufactured product is of the top quality. In one day production of 400 articles only 50 are of top quality. Test the hypothesis at 0.05 level   7M

OR

8. The mean yield of wheat from a district A was 210 pounds with S.D 2.5 inches per acer 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   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 α = 0.05   14M

OR

10. From the following data, find whether there is any significant liking in the habit of taking soft drinks among the categories of employees

Employees

Soft Drinks	Clerks	Teachers	Officers
Pepsi	10	25	65
Thumsup	15	30	65
Fanta	50	60	30

   14M

*****