

Code: 7G541

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 )

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**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  $1/13^{\text{th}}$  of the stroke. Take  $\gamma = 1.4$  7M

**OR**

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

**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 trial 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
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9. Following data relate to performance test of a single acting 14 cm \* 14 cm reciprocating compressor. Suction pressure and temperature 1 bar 20°C, discharge pressure and temperature are 6 bar, 180°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

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Code: 7G245

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

**Electrical and Electronics Engineering**

( Mechanical Engineering )

Max. Marks: 70

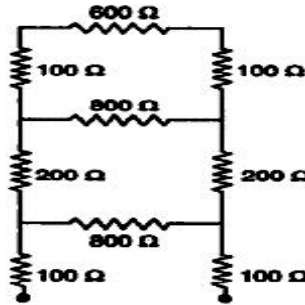
Time: 3 Hours

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

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**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.
- b) Explain KCL and KVL with examples.

7M

7M

**UNIT-II**

3. a) Explain Constructional Details of DC generator with diagram.
- b) Derive EMF equation of DC Generator.

7M

7M

**OR**

4. a) Explain principle of operation of DC motor and derive torque equation for DC motor.
- b) Explain different speed control methods for DC Shunt motor.

7M

7M

**UNIT-III**

5. a) Derive EMF equation of transformer.
- b) Explain OC and SC test on single phase transformer.

7M

7M

**OR**

6. a) Explain regulation of alternator by synchronous impedance method.
- b) Explain Principle of operation of induction motor.

7M

7M

**UNIT-IV**

7. a) Explain operation and characteristics of PN junction diode.
- b) Derive the expression for average, RMS efficiency and ripple factor of half-wave rectifier.

7M

7M

**OR**

8. a) Draw the schematic of an NPN transistor indicating the various current components and explain how each one of them arises.
- b) Explain how transistor works as amplifier.

7M

7M

**UNIT-V**

9. a) Explain induction heating and write the applications of induction heating.
- b) Briefly describe dielectric heating.

7M

7M

**OR**

10. a) Draw block diagram of CRO and write applications of CRO.
- b) Explain voltage and current is measured with CRO.

7M

7M

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Hall Ticket Number : 

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**R-17**

**Code: 7GC41**

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 )

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**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

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Hall Ticket Number :

R-17

Code: 7G542

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 )

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**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 flows with examples 4M  
b) A fluid flow field is given by  $V = x^2y\mathbf{i} + y^2z\mathbf{j} - (2xyz + yz^2)\mathbf{k}$ . 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  $165^\circ$ . 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 148.25 kW power. It is working under a head of 7.62 m. The peripheral velocity =  $0.26\sqrt{2gH}$  and the radial 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  $30^\circ$  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

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Code: 7G543

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 )

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**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  $60^\circ$  from the inner dead centre,
- Velocity of the slider
  - Angular velocity of the connecting rod, and
  - 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 10.5 rad/s and a retardation of  $26 \text{ rad/s}^2$  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.

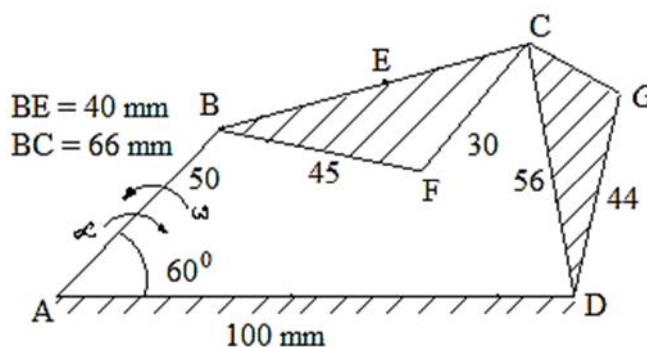


Fig. 4

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  $18^\circ$ . 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
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7. Two gears in mesh have a module of 8 mm and a pressure angle of  $20^\circ$ . 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,
- The number of pairs of teeth in contact, and
  - 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
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9. Draw the profile of a cam to raise a valve with SHM through 40 mm in  $\frac{1}{4}$ <sup>th</sup> revolution., keep it fully raised through  $\frac{1}{10}$ <sup>th</sup> revolution and to lower it with uniform acceleration and retardation in  $\frac{1}{6}$ <sup>th</sup> 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  $30^\circ$  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  $120^\circ$  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

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<b>R-17</b>
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**Code: 7GC42**

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 )

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<b>UNIT-I</b>
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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  $P(A' \cap B')$  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

<b>UNIT-II</b>
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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

<b>UNIT-III</b>
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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  $\alpha = 0.05$  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

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