

Code: 5G541

II B.Tech. II Semester Regular Examinations May 2017

**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) Compare an air standard cycle with an actual cycle by drawing neat sketches and mention the difference in their volumetric efficiency obtained for the both. 8M
- b) Write short notes on (i) Air Injection System, (ii) Battery Ignition System and (iii) Mist Lubrication System 6M

**OR**

2. a) Describe the working principle of an IC engine with neat diagrams. 5M
- b) Write short notes on (i) Solid Injection System, (ii) Magneto Ignition system and (iii) Wet sump Lubrication System 9M

**UNIT-II**

3. a) What is combustion in an S.I. Engine? Elaborate the differences between normal and abnormal combustion? 8M
- b) Explain (i) knocking, (ii) fuel rating and (iii) anti-knock additives 6M

**OR**

4. a) Explain the four stages of combustion in a C.I. engine with neat diagrams. 8M
- b) Write short notes on (i) Diesel Knock, (ii) Delay period, (iii) effect of engine variable 6M

**UNIT-III**

5. a) Explain the performance of an engine with necessary parameters and diagrams 7M
- b) Derive the fundamental equations for brake power and specific fuel consumption. 7M

**OR**

6. a) Derive the basic performance parameters such as mechanical efficiency, mean effective pressure and torque, volumetric efficiency, thermal efficiency and specific fuel consumption. 8M
- b) How do you determine frictional losses and indicated horse power? 6M

**UNIT-IV**

7. a) What do you mean by power producing and power absorbing machines? Explain them with neat sketches 6M
- b) Derive the work required by a reciprocating compressor. 8M

**OR**

8. a) What is meant by positive displacement? Derive the condition for minimum work? 8M
- b) Write short notes on (i) roto dynamic machinery (ii) effect of clearance and (iii) under cooling 6M

**UNIT-V**

9. a) Describe, with a neat sketch, the principle of working of a centrifugal compressor? Show its velocity and pressure variation. 8M
- b) What is (i) pressure coefficient and adiabatic coefficient (ii) slip factor and (iii) velocity diagram 6M

**OR**

10. a) Describe, with a neat sketch, the principle of working of an axial flow compressor? Draw its velocity triangles. 8M
- b) What is meant by (i) degree of reaction, (ii) isentropic efficiency (iii) polytropic efficiency 6M

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Code: 5G245

II B.Tech. II Semester Regular Examinations May 2017

**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) State and explain Ohm's law. What are the limitations of this law? 7M
- b) Two resistors  $R_1$  and  $R_2$  are connected in parallel to a certain supply. The current drawn from the supply is 5A. Calculate the value of  $R_1$  if  $R_2 = 6 \Omega$  and the current through  $R_1$  is 2A. 7M

**OR**

2. a) Derive the expression for equivalent capacitance between any two points of a delta connected capacitance network each arm having a pure capacitance of value  $6 \mu\text{F}$  farad 7M
- b) Three resistances  $4 \Omega$ ,  $6 \Omega$  and  $10 \Omega$  are connected in delta. Find the equivalent star network resistance values. 7M

**UNIT-II**

3. a) Classify dc generators according to their connections and draw the equivalent circuit for each category. 7M
- b) A separately excited dc generator running at 1500 rpm supplies 250 A at 125 V to a circuit of constant resistance. What will be the current when the speed is dropped to 1200 rpm with the field current unaltered? The armature resistance is  $0.05 \Omega$  and the total drop at the brushes is 1.5 V. Ignore armature reaction. 7M

**OR**

4. a) Why is starter required for a dc motor? Explain the working of three point starter for dc motor with complete circuit diagram. 7M
- b) A dc shunt motor has an armature resistance of  $0.4 \Omega$  and is connected across a dc supply of 300 V. An external resistance is connected in the armature circuit. Calculate the value of the resistance so that the armature current is limited to 60 A while starting. Calculate the magnitude of the generated emf when the armature takes a current of 30 A (with the additional resistance in the circuit) at constant speed. 7M

**UNIT-III**

5. a) Why is the short circuit test performed on the hv side of a transformer? Why is the core loss almost negligible in this test? 7M
- b) A single phase transformer working at unity power factor has an efficiency of 90 % both at half load and at the full load of 500 W. Determine the efficiency at 75 per cent of full load and unity power factor. 7M

**OR**

6. a) Explain the effect of rotor circuit resistance on the torque speed characteristic of 3-phase induction motor with the relevant plot of the characteristic. 7M
- b) A 1250 kVA, 6000V three phase synchronous generator has armature resistance of  $0.45 \Omega$  and synchronous reactance of  $6.5 \Omega$ . The armature winding is star connected. The machine supplies full load current at 0.85 power factor lagging at normal rated voltage. Find the terminal voltage at the same excitation and the load current at 0.85 power factor leading. 7M

**UNIT-IV**

7. a) Draw and explain the V-I characteristics of a PN junction diode. 7M  
b) Explain the working of a half wave rectifier with circuit diagram and relevant waveforms 7M

**OR**

8. a) Why is the common emitter configuration most commonly used in transistor amplifier? Obtain the expression for the collector current of a transistor in the CE configuration. 7M  
b) How does a feedback amplifier operate as an oscillator. Mention the necessary conditions for oscillator. Explain the working principle with relevant circuit diagram. 7M

**UNIT-V**

9. a) Explain the principle of dielectric heating with relevant diagram 8M  
b) Enumerate the applications of induction heating. 6M

**OR**

10. a) Explain the working principle of CRO with its component block diagram 7M  
b) Explain the voltage and frequency measurement by CRO with relevant diagram. 7M

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**R-15**

**Code: 5GC43**

*II B.Tech. II Semester Regular Examinations May 2017*

**Environmental Science**

( Common to CE, ME & 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) Discuss the various segments of environment. 7M  
b) What is the scope and importance of environmental studies? 7M

**OR**

2. a) Write a short note on ethics of environmental studies? 7M  
b) Describe the multidisciplinary nature of environmental studies. 7M

**UNIT-II**

3. a) Write about the various applications of alternative energy resources 7M  
b) Write a short note on advantages of natural resources 7M

**OR**

4. a) Distinguish between traditional agricultural and modern agricultural. 7M  
b) Summarize the effects of dams on forest and tribal people. 7M

**UNIT-III**

5. a) Write a short note on sustainable development with examples. 7M  
b) Write a short note on food chain and food web with examples. 7M

**OR**

6. a) What are the various threats leading to loss of biodiversity? 7M  
b) Discuss the various strategies of in-situ conservation of biodiversity 7M

**UNIT-IV**

7. a) What are the major effects and control measures of noise pollution? 7M  
b) What are the various methods of control to reduce water pollution? 7M

**OR**

8. a) Explain about causes of air pollution. 7M  
b) Explain about any two pollution case studies. 7M

**UNIT-V**

9. a) Write a note on global warming. 7M  
b) What are the salient provisions of Wild life Act? 7M

**OR**

10. a) Explain the necessity of value of environment education. 7M  
b) Explain the necessity of role of women and environment. 7M

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Code: 5G542

II B.Tech. II Semester Regular Examinations May 2017

**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 )

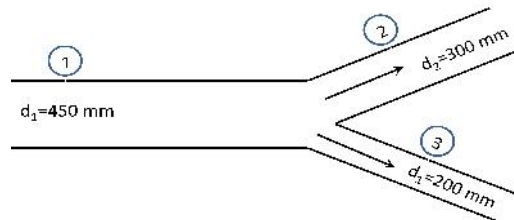
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**UNIT-I**

1. a) Enunciate Newton's law of viscosity. Explain the importance of viscosity in fluid motion. What is the effect of temperature on viscosity of water and that of air? 6M
- b) An oil film of thickness 1.5 mm is used for lubrication between a square plate of size 0.9m×0.9m and an inclined plane having an angle of inclination 20°. The weight of the square 392.4 N and it slides down the plane with a uniform velocity of 0.2 m/s. Find the dynamic viscosity of the oil. 8M

**OR**

2. a) A pipe (1) 450 mm in diameter branches into two pipes (2) and (3) of diameters 300 mm and 200 mm respectively as shown in figure. If the average velocity in 450 mm diameter pipe is 3 m/s, find : (i) discharge through 450 mm dia. pipe and (ii) velocity in 200 mm diameter pipe if the average velocity in 300 mm pipe is 2.5 m/s.

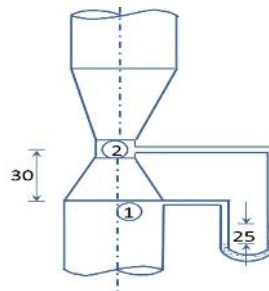


- b) Distinguish between:
- (i) Steady flow and un steady flow
  - (ii) Uniform and non-uniform flow
  - (iii) Compressible and incompressible flow
  - (iv) Laminar and turbulent flow
- 8M

**UNIT-II**

3. A 30 cm×15 cm venturimeter is provided in a vertical pipeline 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 30 cm.

The differential U-tube mercury manometer shows a gauge deflection of 25 cm. Calculate: (i) the discharge of oil and (ii) the pressure difference between the entrance section and throat section. Take the coefficient of meter as 0.98 and specific gravity of mercury as 13.6.

**OR**

4. State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's theorem from first principle and state the assumptions made for such derivation. 14M

<b>UNIT-III</b>
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5. What are the elements of hydroelectric power plant and explain them with neat sketch. 14M

**OR**

6. 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. The vane is symmetrical and is so shaped that the jet is deflected through  $120^\circ$ . Find the angle of the jet at inlet of the vane so that there is no shock. What is the absolute velocity of the jet at outlet in magnitude and direction and the work done per unit weight of water. Assume the vane to be smooth. 14M

<b>UNIT-IV</b>
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7. Define the term "Governing of a turbine". Describe with a neat sketch the working of an oil pressure governor. 14M

**OR**

8. A reaction turbine works at 500 r.p.m. under a head of 100 m. The diameter of the turbine at inlet is 100 cm and flow area is  $0.35 \text{ m}^2$ . The angles made by absolute and relative velocities at inlet are  $15^\circ$  and  $60^\circ$  respectively with tangential velocity. Determine:
- (i) The volume flow rate.
  - (ii) The power developed
  - (iii) Efficiency. Assume the whirl at outlet to be zero. 14M

<b>UNIT-V</b>
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9. a) Define specific speed of a centrifugal pump. Derive an expression for the same. 6M
- b) The internal and external diameters of the impeller of a centrifugal pump are 300 mm and 600 mm respectively. The pump is running at 1000 r.p.m. The vane angles at inlet and outlet are  $20^\circ$  and  $30^\circ$  respectively. The water enters the impeller radially and velocity flow is constant. Determine the work done by the impeller per unit weight of water. 8M

**OR**

10. A single acting reciprocating pump has a plunger of 10 cm diameter and a stroke of length 200 mm. The center of the pump is 4 m above the water level in the sump and 14 m below the level of water in a tank to which water is delivered by the pump. The diameter and length of suction pipe are 40 mm and 6 m while of the delivery pipe are 30 mm and 18 mm respectively. Determine the maximum speed at which the pump may be run without separation, if the separation occurs at  $7.848 \text{ N/cm}^2$  below the atmospheric pressure. Take atmospheric pressure head = 10.3 m of water. 14M

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Code: 5G543

II B.Tech. II Semester Regular Examinations May 2017

**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. Differentiate between
- Machine and Mechanism
  - Kinematic chain structure
  - Lower pair and Higher pair
  - Mobility and Degree of freedom
- 14M

**OR**

2. What is inversion? Sketch and explain any two inversions of double slider crank chain.
- 14M

**UNIT-II**

3. A quick return motion mechanism is shown in Fig. 3. Link 2 rotates uniformly at 20 rad/sec in clockwise direction. Determine the acceleration of link 3. OC = 350 mm, CA = 150 mm, CB = 250 mm.

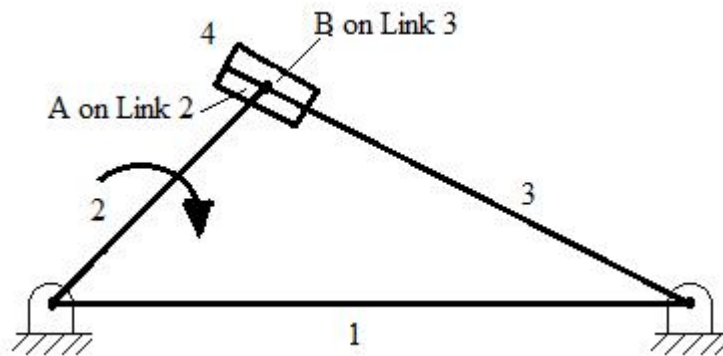


Fig. 3

14M

**OR**

4. The crank of a reciprocating engine is 60 mm long and connecting rod is 240 mm long. The crank rotates at 400 rpm. Find the velocity and acceleration of the piston and the angular velocity and angular acceleration of the connecting rod, when the crank is  $30^\circ$  from inner dead centre, by Klein's construction.
- 14M

**UNIT-III**

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

**OR**

6. a) Draw a neat sketch of a 'Peaucellier straight mechanism' and prove that a point in the mechanism traces an exact straight line. 7M
- b) Show with sketch how pantograph is used to trace the path to a larger or smaller scale of a given path. 7M

<b>UNIT-IV</b>
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7. a) Derive an expression for 'arc of contact'. 6M
- b) A pair of gear has 16 teeth and 18 teeth, a module 12.5 mm an addendum 12.5 mm and a pressure angle  $14.5^\circ$ . Prove that gears have interference. Determine the minimum number of teeth and the velocity ratio to avoid interference. 8M

**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. Find the number of teeth on C and the speed and sense of rotation of C. 14M

<b>UNIT-V</b>
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9. A cam with 30 mm minimum radius is rotating clock wise at 1200 rpm to give the following motion to a roller follower of 20 mm radius.
- i) Lift = 25 mm
  - ii) Follower rise during  $120^\circ$  cam rotation with simple harmonic motion.
  - iii) Follower to dwell for  $60^\circ$  cam rotation.
  - iv) Follower to return during  $90^\circ$  cam rotation with uniform acceleration and deceleration.
  - v) Follower to dwell for remaining period.
  - vi) Draw the profile of the cam and determine the maximum velocity and acceleration during rise and return. 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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**R-15**

**Code: 5GC42**

*II B.Tech. II Semester Regular Examinations May 2017*

**Probability and Statistics**  
( Common to CE, ME & 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) Define Conditional probability. State and prove Multiplication theorem of Probability. 7M
- b) A slip of paper is given to person A who marks it either with a plus sign or a minus sign, the probability of his writing a plus sign is 1/3. A passes the slip to B who may either leave it alone or change the sign before passing it to C. Next C passes the slip to D after perhaps changing the sign. Finally D passes it to a referee after perhaps changing the sign. The referee sees a plus sign on the slip. It is known that B,C and D each change the sign with probability 2/3. Find the probability that A originally wrote a plus. 7M

**OR**

2. a) i. The mathematical expectation of sum of n random variables is equal to the sum of their expectations, provided all the expectations exist i.e  
 $X_1, X_2, \dots, X_n$  are random variables.  
 $E [X_1, X_2, \dots, X_n ] = E [X_1] + E [X_2] + \dots + E [X_n]$
- ii. If X and Y are independent random variables then prove that  $E [ XY ] = E [ X ] E [ Y ]$  7M
- b) Probability density function of random variables X is  $\frac{1}{2} \sin x$  in  $0 < x < \pi$  elsewhere. Find Mean, Mode and Median for the distribution and also find the probability between 0 and  $\frac{\pi}{2}$ . 7M

**UNIT-II**

3. a) Derive Mean and Variance of Binomial Distribution. 7M
- b) Show that Poisson distribution as a limiting case of the Binomial distribution under the conditions that (i) p is very small (ii) n is very large and (iii) np =  $\lambda$  (say) is finite. 7M

**OR**

4. a) Psychological tests of Intelligence and of Engineering ability were applied to 10 students. Here is a record of ungrouped data showing Intelligence ratio ( I.R ) and Engineering ratio(E.R). Calculate the Coefficient of Correlation. 7M

Student	A	B	C	D	E	F	G	H	I	J
I.R	105	104	102	101	100	99	98	96	93	92
E.R	101	103	100	98	95	96	104	92	97	94

- b) The equations of two regression lines obtained in a correlation analysis are  $3x + 12y = 19$ ,  $3y + 9x = 46$ . Find
- (i) Coefficient of Correlation
- (ii) Mean values of X and Y
- (iii) The ratio of the coefficient of variability of X to that of Y. 7M

## UNIT-III

5. a) i. A sample of size 400 is taken from a population whose standard deviation is 16. Find standard error and probable error. 7M
- ii. Define Type I and Type II errors, Null and Alternative hypothesis.
- b) A research worker wishes to estimate mean of a population by using sufficiently large sample. The probability is 95% that sample mean will not differ from the true mean by more than 25 percentage of the standard deviation. How large a sample should be taken? 7M

## OR

6. a) i. A die is thrown 1536 times. An even integer obtained 1000 times. Test whether the die is unbiased.
- ii. The probability that a man aged 60 will live to be 70 is 0.6. What is the probability that out of 9 men 60 at least 6 will live to be 70? 7M
- b) A random sample of 400 men from one stage gives the mean pay of Rs 200 per day with a standard deviation of Rs 10/-. Another random sample of 400 men has a mean pay of Rs 190 per day with a standard deviation of Rs 9/-. Construct 99% confidence interval for  $\mu_1 - \mu_2$ . 7M

## UNIT-IV

7. a) The theory predicts that the proportion of beans available in four groups I, II, III, IV should be 4:3:2:6. In an experiment with 1500 beans the numbers in the four groups are 390, 305, 196, and 609. Use  $\chi^2$  test to verify whether the experiment results supports the theory. 7M
- b) Suppose that in the preceding exercise the first measurement is recorded incorrectly as 16.0 instead of 14.5. Show that now the difference between the mean of the sample is 14.7 and the average tar content by the cigarette manufacturer  $\mu = 14.0$  is not significant at  $\alpha = 0.05$ . Explain the apparent paradox that even though the difference between sample mean and population mean has increased it is no longer significant. 7M

## OR

8. a) The following are the values of skills of 2 samples with individuals 5 and 6.

Sample I	74.1	77.7	74.4	74	73.8	
Sample II	70.8	74.9	74.2	70.4	69.2	72.2

- (i) Is it possible that sample II has come from a population of mean 72?
- (ii) Test the hypothesis that the means of population of a first and second sample are equal.
- (iii) Obtain the confidence limits for the means of the population- II. 7M

- b) Explain the properties of F Distribution. 7M

## UNIT-V

9. An inspection of 10 samples of size 400 each from 10 lots revealed the following number of defective units : 17,15,14,26,9,4,19,12,9,15  
Construct control limits for the number of defective units. Plot the control limits and the observations and state whether the process is under control or not. 14M

## OR

10. a) Discuss about KENDALL'S Notation 7M
- b) Discuss about classification of Queuing Models 7M

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