Hall Ticket Number :

R-15

Code: 5G542

II B.Tech. II Semester Supplementary Examinations October 2020

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) Define mass density, specific weight, specific volume and specific gravity. **7M**

   b) The dynamic viscosity of oil used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4m and rotates at 190 r.p.m. Calculate the power lost in the bearing for a sleeve length of 90mm. The thickness of the oil film is 1.5mm. **7M**

OR

2. a) Explain the terms stream line, stream tube ,streak line and path line **7M**

   b) Derive Continuity equation? **7M**

UNIT–II

3. From the fundamentals derive Euler's energy equation and from it deduce the Bernoulli's equation. **14M**

OR

4. a) Define body force and surface force **4M**

   b) A main pipe divides into two parallel pipes which again forms one pipe. The length and diameter for the first parallel pipe are 2000m and 1m respectively, while the length and diameter of second parallel pipe are 2000m and 0.8m. Find the rate of flow in each parallel pipe, if total flow in the main is 3m³/s. The co-efficient of friction for each parallel pipe is same and equals to 0.005. **10M**

UNIT–III

5. a) Draw the general layout and explain the elements of hydro electric power plant. **7M**

   b) Explain about pumped storage power plant? **7M**

OR

6. A jet of water of 86 mm diameter strikes a curved vane at the centre with a velocity of 30m/sec. The curved vane is moving with a velocity of 8m/sec in the direction of the jet. Find the force exerted on the plate in the direction of the jet, power and efficiency of the jet. Assume that the plate is smooth. **14M**

UNIT–IV

7. How are Hydraulic turbines classified and explain? **14M**

OR

8. a) State the advantages and disadvantages of Francis turbines over a Pelton wheel. **7M**

   b) How are Hydraulic turbines classified and explain? **7M**

UNIT–V

9. a) What is governing and how it is accomplished for different types of water turbines? **7M**

   b) What is cavitation? How can it be avoided in reaction turbines? **7M**

OR

10. Define specific speed of a centrifugal pump. Derive an expression for the specific speed **14M**

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Code: 5G543

II B.Tech. II Semester Supplementary Examinations October 2020
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. What do you mean by degrees of freedom of a kinematic pair? How are pairs classified? Explain with examples.   14M

OR

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

UNIT–II

3. In a four bar mechanism, the crank OA rotates at 36 rad/s. The lengths of the links are: AB=200mm, BC=400mm, CD=450mm and AD=600mm. AD is the fixed link. At the instant when AB is at right angle to AD, determine the velocities of
    i)   The mid-point of link BC
    ii) A point on link CD, 100mm from the pin connecting the links CD and AD.   14M

OR

4. a) The length of crank and connecting rod of a vertical reciprocating engine are 150mm and 750mm respectively. The crank rotates at 400 rpm clockwise. Find analytically the acceleration of the piston when the crank has turned through 30° from the top dead center, and the piston is moving downwards.   7M

    b) A rigid link AB is rotating anti-clockwise about the point A with angular velocity ' ' and angular acceleration ' '. Describe the method of drawing the acceleration diagram and find the total acceleration of B with respect to A.   7M

UNIT–III

5. Sketch the Peaucellier straight line motion mechanism and prove that the tracing point 'P' describes a straight line path.   14M

OR

6. The angle between the axes of two shafts connected by universal joint is 20^0, the driving shaft rotates at an uniform speed of 240r.p.m. The driven shaft carries a steady load of 9kW. Calculate the radius of gyration of the flywheel of the driven shaft having mass 50 kg and the output torque of the driven shaft does not vary by more than 20% of the input shaft.   14M

UNIT–IV

7. A compound epicyclic gear is shown in figure. The gears A, D and E are free to rotate on axis P. the compound gear B and C rotate together on the axis Q at the end of arm F. All the gears have equal pitch. The number of external teeth on gears, A, B and C are 18, 45 and 21 respectively. The gears D and E are annulus gears. The gear A rotates at 100 rpm in anticlock wise direction and gear D rotates at 450rpm clockwise. Find the speed and direction of the arm and gear E.
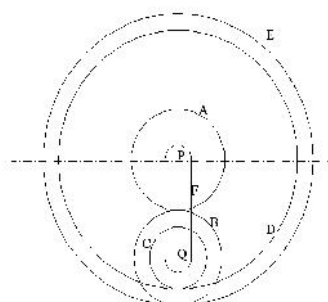
14M

OR

8. a) Define interference in gears.   2M

    b) Two 20° gears have a module of 4mm. The number of teeth on gear is 40 and on gear 2 is 24. If the gear 2 rotates at 600 rpm, determine the velocity of sliding when the contact is at the tip of the teeth of gear 2. Take the addendum equal to one module. Also find the maximum velocity of sliding.   12M

UNIT–V

9. Draw the profile of a cam operating a knife-edge follower having a lift of 30mm. The cam raises the follower with SHM for 150^0 of the rotation followed by a period of dwell for 60^0. The follower descends for the next 100^0 rotation of the cam with uniform velocity, again followed by a dwell period. The cam rotates at an uniform velocity of 120rpm and has a least radius of 20mm. What will be the maximum velocity and acceleration of the follower during the lift and the return?   14M

OR

10. It is required to set out the profile of a cam to give the following motion to the reciprocating follower with a flat mushroom contact surface: (**i**) follower to have a stole of 20mm during 120° of cam rotation, (**ii**) Follower to dwell for 50° of cam rotation, (**iii**) Follower to return to its initial position during 90° of cam rotation (**iv**) Follower to dwell for remaining period of cam rotation. The minimum radius of the cam is 25mm. the outer stroke of the follower is performed with SHM and return stroke with equal uniform acceleration and retardation.   14M

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II B.Tech. II Semester Supplementary Examinations October 2020
Probability & Statistics
(Common to CE, ME, CSE & 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) Find the probability of getting a sum of 10 if we throw two dice

   b) 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	$7K^2+K$

       (i)   Find the value of K
       (ii) Evaluate p(0<X<5)
       (iii) Evaluate p(X<6)

OR

2. a) If $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{5}$ then find (i) P(AUB) (ii) $P(A^c \cap B)$ (iii) $P(A \cap B^c)$
   (iv) $P(A^c \cap B^c)$

   b) Find the continuous probability function $f(x)=k\ x^2\ e^{-x}$ when x 0 find (i) k
   (ii) mean (iii) variance

UNIT–II

3. a) A die is thrown 6 times. If getting an even number is a success, find the probabilities of
   (i) at least one success   (ii) 3 successes   (iii) 4 successes

   b) If a random variable has a poisson distribution such that P(1) = P(2) find
       (i)   Mean of the distribution
       (ii)   P(4)
       (iii)   P(x 1)
       (iv)   P(1<x<4)

OR

4. a) 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)

   b) A hospital switch board receives an average of 4 emergency calls in a 10 minute interval.
   What is the probability that
       (i) There are at most 2 emergency calls in a 10 minute interval
       (ii) There are exactly 3 emergency calls in a 10 minute interval

UNIT–III

5. 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

   b) A random sample of size 81 taken whose variance is 20.25 and mean is 32, construct 98%
   confidence interval

OR

6. a) The variance of population is 2. The size of the sample collected from the population is 169.
   What is the standard error of mean

   b) A research worker wants to determine the average time it takes a mechanic to rotate the
   tires of a car and he wants to be able to assert with 95%. Confidence that the mean of his
   sample is of by at most 0.5 minutes. If he can presume from past experience that σ = 1.6
   minutes how large a sample will have to take

UNIT–IV

7. a) In a sample of 1,000 people in Karnataka 540 are rice eaters and the rest are wheat eaters. Can we assume that both rice and wheat are equally popular in the state at 1% level of significance

    b) If 80 patients are treated with an antibiotic 59 got cured. Find a 99% confidence limits to the true population of cure

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

UNIT–V

9. 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

OR

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

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II B.Tech. II Semester Supplementary Examinations October 2020
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) Why the actual cycle efficiency is much lowers the air standard cycle efficiency? List the major losses and differences in actual engine and air standard cycles.   7M

   b) Explain
      i) Time loss factor   ii) Heat loss factor   iii) Loss due to gas exchange process   7M

OR

2. a) Compare and contrast the differences between Two Stroke engines with Four stroke engines?   7M

   b) Explain Magneto ignition system with diagram.   7M

UNIT–II

3. a) Describe with suitable sketches the combustion phenomenon in C.I engines and explain the two phases of combustion.   8M

   b) What is the effect of
      i) Viscosity **ii)** Specific heat   iii) Density and iv) Gum deposits on the quality of a fuel.   6M

OR

4. a) Explain and discuss the phenomenon of diesel knock in C.I engines   6M

   b) What are the different stages of combustion in C.I engine? Explain with P-   diagram.   8M

UNIT–III

5. a) Explain any one type of brake dynamometer in measuring the power output of an engine.   7M

   b) Describe the various engine performance parameters in brief.   7M

OR

6. a) What is the use of heat balance sheet of an engine? Mention the various items to be determined to complete the heat balance sheet.   10M

   b) A rope brake has brake wheel diameter of 600 mm and the diameter of rope is 5 mm. The dead load on the brake is 210 N and spring balance reads 30 N. If the engine makes 450rpm, find the brake power developed.   4M

UNIT–IV

7. a) List the various types of rotary compressors and explain the working principle of Roots blower.   6M

   b) An air compressor takes in air at 1 bar and 20^0C and compresses it according to law $pv^{1.2}$=constant. It is then delivered to a receiver at a constant pressure of 8 bar. R= 0.287 kJ/kg K. Determine: (i) Temperature at the end of compression; (ii) Work done and heat transferred during compression per kg of air.   8M

OR

8. A single stage, double acting compressor has a free air delivery of 14 m^3 /min. measured at 1.013 bar and 15^0 C. The pressure and temperature in the cylinder during induction are 0.95 bar, 32^0 C. The delivery pressure is 7 bar and index of compression and expansion, n = 1.3. The clearance volume is 5% of the swept volume. Calculate:
   (i) Indicated power required. (ii) Volumetric efficiency.   14M

UNIT–V

9. a) Draw the schematic diagram of axial flow air compressor and explain its working along with velocity triangles.   6M

   b) What is surging in axial- flow compressors? What are its effects? Describe briefly.   8M

OR

10. a) Compare axial flow compressor and centrifugal compressor.   6M

    b) A centrifugal air compressor having a pressure compression ratio of 5 compresses air at the rate of 10 kg/s. If the initial pressure and temperature of the air is 1 bar and 20^0C, find
       (i) The final temperature of the gas and   (ii) Power required to drive the compressor.
       Take =1.4 and Cp=1 kJ/kg K.   8M

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II B.Tech. II Semester Supplementary Examinations October 2020
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 Kirchhoff's laws.   7M
   b) Three resistances of 1 ohm, 2 ohm & 3 ohm are connected in parallel across a 20V DC supply. Find the current flowing through each element.   7M

OR

2. a) Derive the expression for equivalent inductance of two parallel connected inductors.   7M
   b) Three resistances of 1 ohm, 2 ohm & 3 ohm are connected in a Star connection. Find the equivalent Delta network.   7M

UNIT–II

3. a) Derive EMF equation of a DC Generator.   7M
   b) A 4-pole, lap wound, DC generator has a useful flux of 0.07 wb per pole. Calculate the generated emf, when it is rotated at a speed of 900 rpm with the help of prime mover. Armature consists of 440 numbers of conductors. Also calculate the generated emf. If lap wound armature is replaced by wave wound armature.   7M

OR

4. a) Derive the condition for maximum efficiency of dc motor.   7M
   b) Explain the speed control methods used for dc motors.   7M

UNIT–III

5. a) Explain the operation of a 1 phase transformer with the help of relevant diagram.   7M
   b) A 250 KVA, single phase transformer has 98.135% efficiency at full load and 0.8 lagging p.f. The efficiency at half load and 0.8 lagging p.f. is 97.751%. Calculate the iron loss and full load copper loss.   7M

OR

6. a) Define the voltage regulation? Explain about synchronous impedance method of finding regulation.   7M
   b) Explain torque slip characteristics of a three phase induction motor.   7M

UNIT–IV

7. a) Explain the operation of bridge rectifier with relevant diagrams.   8M
   b) Write the necessary conditions for oscillators.   6M

OR

8. a) Explain the operation of a transistor as an amplifier.   7M
   b) Explain about frequency response of a CE amplifier.   7M

UNIT–V

9. a) What are the applications of induction heating?   5M
   b) Explain about induction heating with necessary diagrams.   9M

OR

10. a) List the applications of dielectric heating.   5M
    b) Explain the working of CRO with relevant diagrams.   9M

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