Hall Ticket Number :

Code: 7GC42

II B.Tech. II Semester Regular Examinations May 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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UNIT–I

1. a) A Problem in statistics is given to the three students A, B and C whose chances of solving it are 1/2, 3/4 and 1/4 respectively. What is the probability that the problem will be solved if all of them try independently?   7M

    b) State and Prove Baye's theorem   7M

OR

2. a) A random variable X has the following probability distribution:

x:	0	1	2	3	4	5	6	7
p(x):	0	K	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

Find $k, P(X<6), P(X\geq6), P(0<X<5)$ and find a value if $P(X\leq a)>\dfrac{1}{2}$ 7M

    b) A continuous random variable X has a probability density function

$$f(x)=\begin{cases}\dfrac{(x+1)}{2}, & -1\leq x\leq1 \\ 0, & \text{elsewhere}\end{cases}$$ represents the density of a random variable X, then

find $P(X\leq0)$, mean and variance.   7M

UNIT–II

3. a) The number of telephone lines busy at an instant of time is a binomial variate with probability 0.2. If at an instant 10 lines are chosen at random, what is the probability that (i) 5 lines are busy, (ii) at most 2 lines are busy (iii) all lines are busy   7M

    b) Fit a Poisson distribution to the frequency distribution.

x:	0	1	2	3	4
f:	122	60	15	2	1

7M

OR

4. In a normal distribution, 7% are under 35 and 89% are under 63. Find the mean and the standard deviation of the distribution.   14M

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) A random sample of 100 factory workers in a large city revealed a mean weekly earnings of Rs. 487 with a standard deviation of Rs. 48. With what level of confidence can we assert that the average weekly salary of all factory workers in in the cit is between Rs. 472 and Rs. 502? 7M

   b) The mean and standard deviation of marks scored by a sample of 100 students are 67.45 and 2.92. Find (i) 95% and (ii) 99% confidence intervals for estimating the mean marks of the student population. 7M

UNIT–IV

7. Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same, at 5% level 14M

OR

8. 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 7M

   b) The heights of 10 males of a given locality are found to be 70, 67, 62, 68, 61, 68, 70, 64, 64, 66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% significance level assuming that for 9 degrees of freedom 7M

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

14M

OR

10. A pair of dice are thrown 360 times and the frequency of each sum is indicated below:

Sum	2	3	4	5	6	7	8	9	10	11	12
Frequency	8	24	35	37	44	65	51	42	26	14	14

Would you say that the dice are fair on the basis of the chi-square test at 0.05 level of significance? 14M

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II B.Tech. II Semester Regular Examinations May 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. In an air standard diesel cycle, the pressure and volume at the beginning of compression are 100kPa and 0.03m^3 respectively. Pressure after Isentropic compression is 4.2MPa and after isentropic expansion is 200kPa. Determine i) Compression ratio ii) Cut-off ratio iii) Expansion ratio and iv) Cycle efficiency. Assume γ= 1.4, Cv = 0.718kJ/kgK   14M

OR

2. a) Compare the actual and fuel-air cycles of a gasoline engine.   7M
    b) Explain the various factors which affect the volumetric efficiency.   7M

UNIT–II

3. With neat sketch explain the working of magneto-ignition system. Compare its advantage over battery ignition system.   14M

OR

4. Explain briefly the following methods of cooling IC Engines
       i)   Air cooling   ii) Liquid cooling   14M

UNIT–III

5. List the various types of combustion chambers used in SI engines. Explain them briefly.   14M

OR

6. Explain the phenomenon of knock in CI engines and compare it with SI engine knock.   14M

UNIT–IV

7. Following data relates to 4 cylinders, 2 stroke petrol engine. Air/Fuel ratio by weight 16:1. Calorific value of the fuel = 45200 kJ/kg, mechanical efficiency = 82%, Air standard efficiency = 52%, relative efficiency =70%, volumetric efficiency = 78%, stroke/bore ratio = 1.25, suction conditions = 1 bar, 25°C. Speed = 2400 rpm, power at brakes = 72 kW. Calculate (i) Compression ratio.(ii) Indicated thermal efficiency (iii) Brake specific fuel consumption and (iv) Bore and stroke   14M

OR

8. The following observations were taken during a test on a single cylinder four – stroke cycle engine having a bore of 300 mm and stroke of 450mm. Ambient air temperature = 22^{0}C, Fuel Consumption = 11kg/hr, CV of fuel = 42000 kJ/kg, Engine speed = 300 rpm, Mean effective pressure = 6 bar, Net brake load =1.0 kN, Brake drum diameter = 2 m, Quantity of Jacket cooling water = 590 kg/hr, Temperature of entering cooling water = 22^{0}C, Temperature of leaving cooling water = 70^{0}C, Quantity of air as measured = 225 kg/hr, Specific heat of exhaust gas = 1005 J/kgK, Exhaust gas temperature = 405^{0}C, Rope diameter = 2 cm. Determine indicated power, brake power, mechanical efficiency and draw a heat balance sheet on hour basis.   14M

UNIT–V

9. A two stage single acting reciprocating compressor takes in air at the rate of 0.2m^3/s. The intake pressure and temperature of air are 0.1 MPa and 16^{0}C. The air is compressed to final pressure of 0.7 MPa. The intermediate pressure is ideal and intercooling is perfect. The compressor index in both the stage is 1.25 and the compressor runs at 600 rpm. Neglecting clearance, Determine

       i)   The intermediate pressure,
       ii) The total volume of each cylinder
       iii) The Power required to drive the compressor
       iv) The rate of heat rejection in the intercooler
    Take Cp=1.005 kJ/kg K, R=0.287 kJ/kg K   14M

OR

10. a) Explain the working principle of axial compressor with a neat sketch.   10M
    b) What is multi stage compression? State its advantages.   4M

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II B.Tech. II Semester Regular Examinations May 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) 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

   b) Explain the following terms
      i) Potential difference
      ii) Ohm's law   7M

OR

2. a) Find the current I supplied by the battery of the Fig.2 through delta / star transformation.
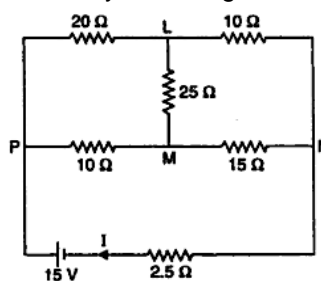

Fig 2   7M

   b) Explain KCL and KVL with examples.   7M

UNIT–II

3. a) Explain working principle of DC Generator and classify dc generators.   7M

   b) Explain principle and operation of DC motor.   7M

OR

4. a) Explain break test on DC shunt motor   7M

   b) Explain Swinburne's test on DC shunt motor when the machine as acting as motor.   7M

UNIT–III

5. a) Explain principle and operation of transformer and derive emf equation of transformer.   7M

   b) Explain working principle and operation of alternator.   7M

OR

6. a) Explain working principle of induction motor.   7M

   b) Explain break test on 3 phase induction motor.   7M

UNIT–IV

7. a) Explain the operation of full wave rectifier and draw its output waveforms. List out its applications.   7M

   b) Explain the operation of Half wave bridge rectifier and draw its output waveforms. List out its applications.   7M

OR

8. a) Explain the operation and characteristics of PNP transistor with suitable diagram.   7M

   b) Explain the operation of transistor as an 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 and explain construction of cathode ray tube   7M

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

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R-17

Code: 7GC41

II B.Tech. II Semester Regular Examinations May 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) What is mean by environmental studies? Explain its importance.   7M
    b) Write the need for public awareness about environment.   7M

OR

2. a) Write about the scope of Environmental Studies.   7M
    b) List out different disciplines involved with environment. Explain?   7M

UNIT–II

3. a) Write a brief note on renewable energy resources.   7M
    b) Explain briefly about the water resources.   7M

OR

4.   Explain the advantages and disadvantages of construction of dams.   14M

UNIT–III

5. a) Define ecosystem. Explain different components of an ecosystem.   7M
    b) Explain about the formation of carbon cycle.   7M

OR

6. a) Discuss the structure and functions of grassland ecosystem.   7M
    b) Write about the values of biodiversity.   7M

UNIT–IV

7. a) Explain the causes and control measures of Air pollution.   7M
    b) Define Water pollution. Discuss in brief account on causes and effects of Water
        pollution   7M

OR

8. a) Define Noise pollution. Explain the causes and effects of noise pollution.   7M
    b) Describe about the Marine pollution.   7M

UNIT–V

9. a) Discuss the salient features of Wildlife (Protection) Act, 1972.   7M
    b) Write a note on environmental protection act.   7M

OR

10. a) Define rain water harvesting and explain its objectives.   7M
    b) Explain briefly impact of population explosion on environment.   7M

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II B.Tech. II Semester Regular Examinations May 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) Define specific gravity and metacentre   4M

   b) Calculate the capillary rise in a glass tube of 2.5 mm diameter when immersed vertically in (i) water and (ii) mercury. Take surface tensions σ = 0.0725 N/m for water and σ = 0.52 N/m for mercury in contact with air. The specific gravity for mercury is given as 13.6 and angle of contact 130°.   10M

OR

2. a) Define stream line and path line   6M

   b) Derive the equation of continuity for one dimensional flow of an incompressible fluid.   8M

UNIT–II

3. 250 litres/s of water is flowing in a pipe having a diameter of 300 mm. If the piper is bent by 135° (that is change from initial to final direction is 135°), find the magnitude and direction of the resultant force on the bend. The pressure of water flow is 39.24 N/cm².   14M

OR

4. A 30 cm × 15 cm venturimeter is inserted in vertical pipe carrying an oil of sp. gr. 0.8, flowing in the upward direction. A differential mercury manometer connected to the inlet and throat gives a reading of 30 cm. The difference in the elevation of the throat section and inlet section is 50 cm. Find the rate of flow of oil.   14M

UNIT–III

5. 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 it so shaped that the jet is deflected through 120°. 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

OR

6. A 7.5 cm, diameter jet having a velocity of 30 m/s strikes a flat plate, the normal of which is inclined at 45° to the axis of the jet. Find the normal pressure on the plate: (i) when the plate is stationary, and (ii) when the plate is moving with a velocity of 15 m/s and away from the jet. Also determine the power and the efficiency of the jet when the plate is moving.   14M

UNIT–IV

7. a) Define the specific speed of the turbine? Derive an expression for the specific speed. What is the significance of the specific speed?   8M

   b) Define the terms: speed ratio, flow ratio and jet ratio.   6M

OR

8. A Pelton wheel is to be designed for the following specifications:

   Shaft power = 11,772kW; Head = 380 meters; Speed 750 r.p.m.; Overall efficiency = 86%; Jet diameter is not to exceed one-sixth of the wheel diameter. Determine (i) The wheel diameter, (ii) The number of jets required, and (iii) Diameter of the jet. Take coefficient of velocity= 0.985 and Speed ratio=0.45.   14M

UNIT–V

9. 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°at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm, determine (i) Vane angle at inlet, (ii) Work done by impeller on water per second and (iii) Manometric efficiency.   14M

OR

10. A single acting reciprocating pump has a stroke length of 15 cm. The suction pipe is 7 metres long and the ratio of the suction diameter to the plunger diameter is 3/4. The water level in the sump is 2.5 meters below the axis of the pump cylinder, and the pipe connecting the sump and pump cylinder is 7.5 cm diameter. If the crank is running at 75 r.p.m., determine the pressure head on the pistion: (i) in the beginning of the suction stroke, (ii) in the end of the suction stroke, and (iii) in the middle of the suction stroke. Take co-efficient of friction as 0.01.   14M

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Code: 7G543

II B.Tech. II Semester Regular Examinations May 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. What are degrees of freedom of a kinematic pair? Explain classification of
    kinematic pair with examples.   14M

OR

2. What is inversion? Sketch and discuss 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.

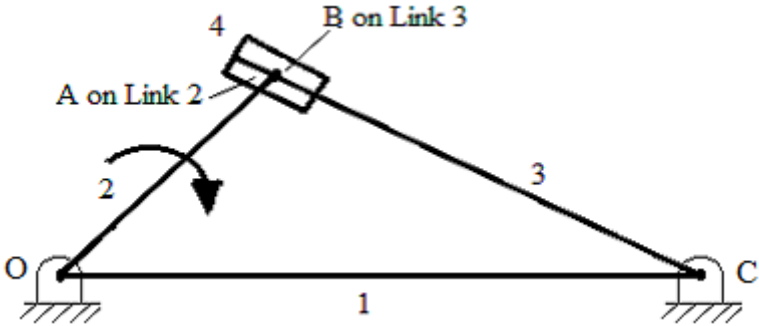Fig. 3   14M

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 30^0 from inner dead centre, by Klein's construction.   14M

UNIT–III

5. Sketch the Hart's straight line motion mechanism and prove that the tracing point
    'P' describes a straight line path.   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

UNIT–IV

7. a) Develop 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 14.5^0. Prove that gears have interference. Determine the
       minimum number of teeth and the velocity ratio to avoid interference. 8M

OR

8. In an epicyclic gear train of sun and planet type, the pitch circle diameter of the annular wheel A is to be nearly equal to 220 mm and the module is 4 mm. when the annular wheel is stationary, the spider which carries 3 planet gears P of equal size has to make one revolution for every five revolutions of the driving spindle carrying sun wheel S. Determine the number of teeth on all the wheels and also the exact diameter of the pitch circle of wheel A.   14M

UNIT–V

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 120^0 cam rotation with simple harmonic motion.
    iii) Follower to dwell for 60^0 cam rotation.
    iv) Follower to return during 90^0 cam rotation with uniform acceleration and deceleration.
    v) Follower to dwell for remaining period.

    Construct the profile of the cam and determine the maximum velocity and acceleration during rise and return.   14M

OR

10. The exhaust valve of a diesel engine has a lift of 31.4 mm. it is operated by a cam to give cycloidal motion during the opening and closing periods, each of which corresponds to 60^0 of cam rotation and dwell for the rest cam rotation. The follower is provided with a roller 10 mm radius and its line of stroke is radial. With neat sketch illustrate the profile of the cam, if the minimum radius of the cam is 20 mm. determine the maximum velocity and acceleration of the follower during outward stoke for 2000 rpm.   14M

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