Hall Ticket Number :

Code: **4GC42**

R-14

II B.Tech. II Semester Regular Examinations May 2016
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) Box A contains 5 red and 3 white marbles and box B contains 2 red and 6 white marbles. If a marble is drawn from each box, what is the probability that they are both of same color?   7M

   b) Two dice are thrown. Let X assign to each point (a,b) in S the maximum of its numbers i.e. $X(a,b) = \max(a,b)$. Find the probability distribution. X is a random variable with $X(s) = \{1,2,3,4,5,6\}$. Also find the mean and variance.   7M

OR

2. a) The probabilities that students A, B, C, D solve a problem are $\frac{1}{3}, \frac{2}{5}, \frac{1}{5}$ *and* $\frac{1}{4}$ *respectively.* If all of them try to solve the problem, what is the probability that the problem is solved.   7M

   b) Probability density function of a random variable X is

   $f(x) = \{\frac{1}{2}\sin x, \ for \ 0 \leq x \leq \pi$. Find the mean, mode and median of the distribution and also find the probability between 0 and $\frac{\pi}{2}$.   7M

UNIT–II

3. a) 20% of items produced from a factory are defective. Find the probability that in a sample of 5 chosen at random **(i)** none is defective **(ii)** one is defective **(iii)** $P(1 < X < 4)$.   7M

   b) Out of 800 families with 5 children each, how many would you expect to have
     (i) 3 boys   **(ii)** 5 girls   **(iii)** either 2 (or) 3 boys   **(iv)** At least one boy.
     Assume that there is equal probability for boys and girls.   7M

OR

4. a) The life of electronic tubes of a certain type may be assumed to be normal distribution with mean 155 hours and S.D. 19 hours. Determine the probability that the life of tube
     (i) Between 136 hours to 174 hours
     (ii) Less than 117 hours
     (iii) More than 195 hours   7M

   b) Using Recurrence relation, find the probabilities when $x = 0,1,2,3,4,5$. If the mean of Poisson distribution is 3.   7M

UNIT–III

5. a) 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 favor of the proposal. Test the hypothesis that proportions of men and women in favor of the proposal are same, at 5%.   7M

   b) An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and a variance of 16 minutes. Test of significance at 0.05 level.   7M

OR

6. a) In a city A, 20% of a random sample of 900 school boys had a certain slight physical defect. In another city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant at 0.05 level of significance?   7M

   b) The mean life of a sample of 10 electric bulbs was found to be 1456hours with S.D. of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with S.D. of 398 hours. Is there a significant difference between the means of two batches?   7M

UNIT–IV

7. a) A random sample of 10 boys had the following I.Q's : 70, 120, 110, 101, 88, 83, 95, 98, 107 and 100.

   (i) Do this data supports the assumption of a population mean I.Q of 100.

   (ii) Find a reasonable range in which most of the mean I.Q. values of sample of 10 boys lie.   7M

   b) Two horses A and B were tested according to the time to run a particular track with the following results.

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	

   Test whether the two horses have the same running capacity.   7M

OR

8. a) The nicotine contents in milligrams in two samples of tobacco were found to be as follows:

Sample A	24	27	26	21	25	-
Sample B	27	30	28	31	22	36

   Can it be said that the two samples have come from the same normal population.   7M

   b) Fit a Poisson distribution to the following data and for its goodness of fit at level of significance 0.05.

x	0	1	2	3	4
Frequencies	419	352	154	56	19

                                                                                                                7M

UNIT–V

9. a) Explain the np- charts.   7M

   b) Show that the variance of queue is

   $$V(n) = E(n^2) - [E(n)]^2$$

                                                                                                                7M

OR

10. a) Construct a control chart for mean and range for the range for the following data on the basis of fuses, samples of 5 being taken every hour (each set of 5 has been arranged in ascending order of magnitude)

42	42	19	36	42	51	60	18	15	69	64	61
65	45	24	54	51	74	60	20	30	109	90	78
75	68	80	89	57	75	72	27	39	113	93	94
78	72	81	77	59	78	95	42	62	118	109	109
87	90	81	84	78	132	138	60	84	153	112	136

                                                                                                                7M

   b) Patients arrive at a clinic according to a poison distribution at the rate of 30 patients per hour. The waiting room does not accommodate more the 14 patients. Examination time per patient is exponential with mean rate 20 per hour.

   i) Find the effective arrival rate at the clinic.

   ii) What is the probability that an arriving patient will not wait. Will he find a vacant seat in the room?

   iii) What is the expected waiting time until a patient is discharged from the clinic.   7M

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Code: 4GC43

R-14

II B.Tech. II Semester Regular Examinations May 2016
Environmental Science
(Common to CE, ME and 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) Enumerate four conceptual spheres in the earth's environment.
   b) Explain briefly the importance of Environmental studies and need for public awareness?

OR

2. a) Define and explain scope of environmental studies?
   b) Explain role of an individual in promoting environmentalism?

UNIT–II

3. a) Explain the importance of forests in maintaining ecological balance and in providing economical and commercial services?
   b) Explain the food problems of India and World

OR

4. a) Write a note on possible conflicts over water, giving examples of Indian and Global context.
   b) Explain role of an individual in conservation of natural resources

UNIT–III

5. a) What are the three different types of ecological Pyramids? Explain
   b) Define and explain "River" ecosystem?

OR

6. a) Explain the concept of "food chain" and "food web"?
   b) Comment on Indian biodiversity with special reference as a mega diversity nation?

UNIT–IV

7. a) Explain the major water pollutants and their effect on the Environment?
   b) Briefly describe sources, effects and control of Noise pollution?

OR

8. a) Discuss briefly any two Global effects of Air Pollution.
   b) Describe various effects and control measures of Thermal pollution?

UNIT–V

9. a) Enumerate and Explain rainwater harvesting methods
   b) Explain the evolution of family welfare programs in India?

OR

10. a) Explain environmental consequences of unethical behavior of human population?
    b) Discuss objectives and elements of value education?

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Code: 4G541

II B.Tech. II Semester Regular Examinations May 2016
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.   Classify and Explain the Kinematic pair.   14M

OR

2.   Sketch and explain any two inversions of four bar chain.   14M

UNIT–II

3.   In the mechanism shown in figure, the crank OA rotates at 20rpm in anticlockwise and gives motion of sliding blocks B and D. the dimensions of various links are OA=300mm, AB=1200mm, BC=450mm and CD=450mm. For the given configuration determine **i**) velocities of sliding at B and D, **ii**) angular velocity of CD, **iii**) Linear acceleration of D.
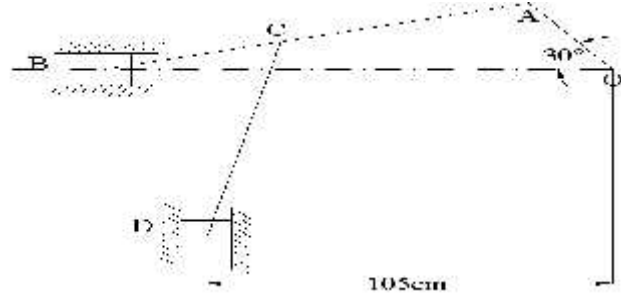
14M

OR

4.   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

UNIT–III

5.   Sketch and explain the working of a T-Chebicheff straight line motion mechanism.   14M

OR

6.   Draw a neat sketch of a Davis steering gear, and show that is exactly satisfies the condition for correct steering.   14M

UNIT–IV

7. a) Define law of gearing. 2M

   b) Two 20° involute spur gears have a module of 10mm. The addendum is one module. The larger gear has 50 teeth and the pinion 13 teeth. Does the interference occur? If it occurs, to what value should the pressure angle be changed to eliminate interference? 12M

OR

8. a) Define Reverted gear train. 2M

   b) 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.
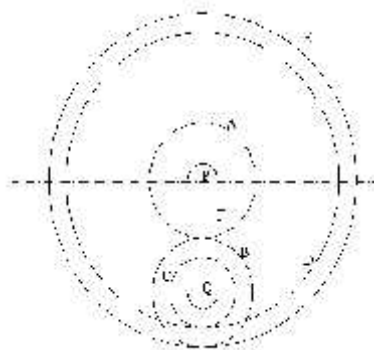
12M

UNIT–V

9. a) Classify various types of cam. 2M

   b) Draw the profile of a cam operating a Knife-edge follower from the following data:
   i) Follower to move outward through 40 mm during 60° of a cam rotation, **ii)** follower to dwell for the next 45°, **iii**) Follower to return its original position during next 90° **iv**) Follower to dwell for the rest of the cam rotation. The displacement of the follower is to take place with simple harmonic motion during both the outward and return strokes. The least radius of the cam is 50mm. If the cam rotates at 300rpm, determine the maximum velocity and acceleration of the follower during the outward stroke and return stroke 12M

OR

10. Draw the profile of a cam operating a roller reciprocating follower to the following data:
    Minimum radius of cam=25mm, lift =30 mm, Roller diameter =15mm. The cam lifts the follower for 120° with SHM, followed by a dwell period of 30°. Then the follower lowers down during 150° of cam rotation with uniform acceleration and retardation followed by a dwell period. If the cam rotates at a uniform speed of 150rpm. Calculate the maximum velocity and acceleration of follower during the descent period. 14M

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II B.Tech. II Semester Regular Examinations May 2016
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) Differentiate between air standard cycles and actual cycles.   6M
   b) Explain the time loss factor with a neat sketch.   8M

OR

2. a) Explain the working of four stroke SI engine with help of valve timing diagram.   7M
   b) Explain the battery operated ignition system with a neat sketch.   7M

UNIT–II

3. a) Explain the different phases of combustion SI engine with help of P- diagram.   8M
   b) List out the factors that affect the flame front or flame velocity in SI engines.   6M

OR

4. a) Differentiate knocking in SI engines and knocking in SI engines.   7M
   b) List out the requirements of good combustion chamber in CI engines.   7M

UNIT–III

5. Air flow to a four cylinder oil engine is measured by means of a 5 cm diameter orifice having a coefficient of discharge of 0.6. During the test on the engine the following data were recorded: bore = 10 cm; stroke =12 cm; speed =1200 rpm; brake torque = 120 Nm; fuel consumption = 5kg/h; calorific value of fuel = 42MJ/kg; pressure drop across orifice is 4.6cm of water; ambient temperature and pressure are 17 °C and 1 bar respectively. Calculate

   (**i**) thermal efficiency on brake power basis; (**ii**) brake mean effective pressure and (**iii**) the volumetric efficiency based on free air condition.   14M

OR

6. a) List out different methods for measurement of fuel consumption and explain any one method in detail.   8M
   b) Explain the measurement of friction power by Willan's method.   6M

UNIT–IV

7. a) List out the uses of compressed air.   4M
   b) Explain the working of single stage single acting reciprocating air compressor with a neat sketch.   10M

OR

8. The following data relate to a performance test of a single acting 14 cm x 10 cm reciprocating compressor:
   Suction Pressure = 1 bar; Suction temperature = 20°C; Discharge pressure = 6 bar; Discharge temperature =180 °C; Speed of Compressor = 1200 rpm; Shaft Power = 6.25 kW; mass of air delivered = 1.7kg/min. Calculate the following:
   (**i**) Actual volumetric efficiency; (**ii**) indicated power; (**iii**) isothermal efficiency;
   (**iv**) mechanical efficiency (**v**) overall thermal efficiency   14M

UNIT–V

9. a) What do you mean by surging and choking? Explain. 8M

    b) Differentiate between centrifugal air compressor and axial flow air compressor. 6M

OR

10. A centrifugal compressor used as a supercharger for aero-engines handles 150kg/min. of air. The suction pressure and temperature 1 bar and 290K. The suction velocity is 80m/s. After compression in the impeller the conditions are 1.5 bar 345K and 220m/s. Calculate:

i.   Isentropic efficiency.

ii. Power required to run the compressor

iii. The overall efficiency of the unit

It may be assumed that K.E. of air gained in the impeller is entirely converted into pressure in the diffuser. 14M

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II B.Tech. II Semester Regular Examinations May 2016
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) A U-tube differential manometer connects two pressure pipes A and B. Pipe A contains carbon tetrachloride having a specific gravity 1.594 under a pressure of 11.772 N/cm^2 and pipe B contains oil of specific gravity of 0.8 under a pressure of 11.772 N/cm^2. The pipe A lies 2.5m above pipe B. Find the difference of pressure measured by mercury as fluid filling U-tube.   08M

    b) State and Explain the Newton's law of viscosity   06M

OR

2. a) What do you understand by terms: **i**). Total acceleration **ii**). Convective acceleration and **iii**). Local acceleration   06M

    b) Velocity for a three dimensional flow field is given by :

    $V= (6+2xy+t^2)i – (xy^2+10t)j – 25k$. What is the acceleration of a particle at (3, 0, 2) at time t=1?   08M

UNIT–II

3. a) State and prove Bernoulli's equation   08M

    b) Name the different forces present in a fluid flow. For the Euler's equation of motion, which forces are taken into consideration?   06M

OR

4. Two sharp ended pipes of diameters 50mm and 100mm respectively, each of length 100mm respectively, are connected in parallel between two reservoirs which have a difference of level of 10m. If the friction factor for each pipe is 0.32 calculate: **i**) Rate of flow for each pipe and **ii**) The diameter of a single pipe 100m long which would give the same discharge, if it were substituted for the original two pipes   14M

UNIT–III

5. What are Hydro plant controls and safety measurements in Hydro-electric power plants and explain?   14M

OR

6. Write brief explanation about force exerted on a stationary flat plate held normal to the jet?   14M

UNIT–IV

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

OR

8. a) Derive an expression for hydraulic efficiency of a Pelton wheel   08M

    b) State the advantages and disadvantages of Francis turbines over a Pelton wheel.   08M

UNIT–V

9. a) What is governing and how it is accomplished for different types of water turbines?   08M

    b) What is cavitation? How can it be avoided in reaction turbines?   06M

OR

10. A centrifugal pump working in a dock pump 1565 liters per second against a mean left of 6.1m when the impeller rotates at 200rpm. The impeller diameter is 1.22m and the area at outer periphery is 6450 cm^2. If the vanes are set back at an angle of 260^0 at the outlet, determine:
    i) Hydraulic efficiency
    ii) Power required to drive the pump and
    iii) Minimum speed of start pumping if the ratio of external to internal diameters is 2.   14M

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II B.Tech. II Semester Regular Examinations May 2016
Manufacturing Technology
(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) Name the various patterns that are normally encountered in foundry practice and discuss any two patterns in detail?   7M
   b) What is a draft allowance? How is it provided for patterns?   7M

OR

2. a) State the difference between centrifuging and true centrifugal casting?   7M
   b) Specify the advantages of the precision investment casting process over other casting processes?   7M

UNIT–II

3. a) How do you classify different weld positions? Draw at least four positions. 7M
   b) What is a filler metal? Explain its importance in welding, giving its compositions.   7M

OR

4. a) How is an arc cutting different from the oxy-fuel cutting processes? Explain. 7M
   b) Describe the principle of Oxy-Fuel gas welding process?   7M

UNIT–III

5. a) Briefly explain the principle of rolling with neat sketches?   7M
   b) What are specific merits of cold working over hot working?   7M

OR

6. a) Differentiate blanking and piercing with reference to press working processes? 7M
   b) Explain the influence of drawing speed and draw die radius on the components produced?   7M

UNIT–IV

7. a) Briefly explain Hydrostatic extrusion process?   7M
   b) Explain with sketches the difference between direct and indirect extrusion of metals?   7M

OR

8. a) List the advantages of forging of metals? Why is press forging preferred over hammer forging?   7M
   b) Distinguish drop forging and roll forging?   7M

UNIT–V

9. a) Write a short note on Compression moulding?   10M
   b) Identify various properties of plastics?   4M

OR

10. a) Write short notes on blow molding process?   10M
    b) How components are manufactured in transferred molding process? Explain 4M

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