R-11/R-13

Code : 1GC42

II B.Tech. II Semester Supplementary Examinations December 2015
Probability and Statistics
(Common to CE, ME & IT)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1. a) Calculate mean, median and mode of the following data related to weight of 120 articles.

Weight(in gm)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of articles	14	17	22	26	23	18

   7M

   b) 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 co-efficient of correlation.

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

   7M

2. a) Box I contains 10 white and 3 black balls, while Box II contains 3 white and 5 black balls. Two balls are drawn at random from Box I and placed in box II. Then 1 ball is drawn at random from Box II. What is the probability that it is a white ball?   7M

   b) In a factory which manufactures bolts, machines A, B and C manufacture respectively 25%, 35% and 40% of the bolts of their output 5, 4 and 2 percent are respectively defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability it is manufactured by the machine B.   7M

3. a) For the discrete probability distribution

x	0	1	2	3	4	5	6	7
f	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

   Determine **(i)** k **(ii)** mean **(iii)** variance.   7M

   b) The density function of a random variable X is

   $$f(x) = \begin{cases} e^{-x} & \text{if } x > 0 \\ 0 & \text{otherwise} \end{cases}$$

   Find E(X), E(X^2) and Var (X).   7M

4. a) Show that the mean and standard deviation of a Poisson distribution are equal.   7M

   b) In a test on 2000 electric bulbs, it was found that the life of particular make was normally distributed with an average life of 2040 hours and S.D. of 60 hours. Estimate the number of bulbs likely to burn for **(i)** more than 2150 hours, **(ii)** less than 1950 hours and **(iii)** more than 1920 hours and but less than 2160 hours.   7M

5. A Sample size of 2 are taken from the population 1, 2, 3, 4, 5 and 6 without replacement. Find **(i)** the mean of the population **(ii)** the standard deviation of the population **(iii)** the mean of the sampling distribution of means **(iv)** the standard deviation of the sampling distribution of means.   14M

6. a) In a study of an automobile insurance a random sample of 80 body repair costs had a mean of Rs. 472.35 and the standard deviation of 62.35. If $\bar{x}$ is used as a point estimate to the true average repair costs, with that confidence we can assert that the maximum error does not exceed Rs. 10/-?   7M

   b) A random sample of size 100 is taken from a population with   = 5.1. Given that the sample mean is $\bar{x}$ = 21.6, construct a 95% confidence interval for the population mean.   7M

7. a) A random sample of size 25 from a normal population has the mean 47.5 and the standard deviation 8.4. Does this information support or refute the claim that the mean of the population is $\mu = 42.5$?   7M

   b) The means of simple samples of sizes 1000 and 2000 are 67.5 and 68.0 cm. respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5 cm.   7M

8. Fit a Poisson distribution to the following data and test the goodness of fit at 0.05 level of significance

x	0	1	2	3	4	5	6	7	
f	305	306	210	80	28	9	2	1	14M

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Code : 1GC43

R-11/R-13

II B.Tech. II Semester Supplementary Examinations December 2015
Environmental Science
(Common to Civil, ME & CSE)

Max. Marks: 70   **Time: 03 Hours**

Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1.	a)	Describe the multidisciplinary nature of environmental studies.	7M
	b)	Discuss in detail about the different layers of the atmosphere.	7M
2.	a)	Define renewable and non-renewable resources.	6M
	b)	Discuss in detail about uses and over exploitation of forest resources.	8M
3.	a)	Discuss the soil erosion and desertification.	8M
	b)	Explain briefly about equitable use of natural resources for sustainable life style.	6M
4.	a)	What are various methods of control to reduce water pollution?	6M
	b)	Explain about any two pollution case studies.	8M
5		Define ecosystem. Explain about various components of an ecosystem.	14M
6.	a)	India is one of the mega diversity nations. Explain.	7M
	b)	Distinguish between the endemic and endangered species.	7M
7.		Write a short note on.	
	a)	Global warming.	5M
	b)	Ozone layer depletion.	5M
	c)	Acid rain	4M
8.	a)	Write a brief note on environment and human health.	7M
	b)	Explain the necessity of value education.	7M

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II B.Tech. II Semester Supplementary Examinations December 2015
Fluid Mechanics and Hydraulic Machines
(Mechanical Engineering)

Max. Marks: 70   Time: 03 Hours

Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1. a) Is there any analogy of Hooke's law in fluids? If so, state the parallel law in fluids. What are the merits and demerits of piezo meter?   6M

   b) A crane is used to lower the weights in to the sea(density = 1025 kg/m^3) for a underwater construction project. Determine the tension in the rope of the crane due to rectangular 0.4 m X 0.4 m X 3 m concrete block (density 2300 kg/m^3) when it is **(i)** suspended in air and **(ii)** completely immersed in water.   8M

2. a) Define and distinguish between steady flow and unsteady flow and show that flow rate per unit width between stream lines in two dimensional flow is equal to the difference between the values of the stream function corresponding to these stream lines.   7M

   b) A 120° bend cum reducer has 300 mm diameter at inlet and 200 mm diameter at the other end. When the bend-cum-reducer carries 0.3 m^3/s of water, pressure at section–1 is 210 kN/m^2. Assume no energy loss in the bend and determine the components of force exerted by the bend on the flow. Assume the weight of bend plus in it to be 1500N. Assume section–2 be 0.4 m above section–1.   7M

3. a) Write short note on Reynold's experiment?   4M

   b) A venturimeter is installed in a pipe line of diameter 200 mm. The throat and inlet pipe diameters are in the ratio of 1/3. Through this venturemeter oil of specific gravity 0.8 flows. The pressure in the pipe line is 97.5 kN/m^2 and vacuum in the throat is 200 mm of Hg. If the differential head lost between gauges is 6 %, find the flow of oil from the pipe.   10M

4. a) Write down the formulae for the forces exerted by a jet of water at a stationary plate (F_x) in the following cases **(i)** vertical plate **(ii)** inclined plate.   7M

   b) A jet of 60 mm diameter impinges on a curved vane and is deflected through on angle of 165^0. The vane moves in the same direction as that of jet with a velocity of 25 m/s. If the rate of flow is 180 litres per second, determine the component of force on the vane in the direction of motion. How much would be the power developed by the vane and what would be the water efficiency?   7M

5. a) What are the various flow measurement methods for a hydro power plant? Explain any one in detail?   6M

   b) Draw a neat diagram of storage type hydroelectric power plant and describe the function of each component used in the plant?   8M

6. a) How does single jet Pelton wheel differ from a multi-jet wheel?   4M

   b) A kaplan turbine produces 60000kW under a net head of 25 m with an overall efficiency of 88 %. Taking the value of speed ratio as 1.6, flow ratio as 0.5 and the hub diameter as 0.35 times the outer diameter. Find the diameter and speed of the turbine.   10M

7. a) Define cavitation? What is Thomas cavitation factor and what is its significance for water turbines?   4M

   b) Discuss the performance and characteristic curves of tangential and reaction turbines?   10M

8. a) Explain the terms manometric efficiency, mechanical efficiency and overall efficiency as applied to centrifugal pumps.   4M

   b) A single-acting reciprocating pump, running at 60 r.p.m., delivers 0.01518 m^3/s of water. The diameter of the piston is 240 mm and stroke length 360 mm. The suction and delivery heads are 3.4 m and 11.4 m respectively. Determine:
      a. Theoretical discharge   **b.** Coefficient of discharge,
      c. percentage slip of the pump   **d.** power required to run the pump   10M

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II B.Tech. II Semester Supplementary Examinations December 2015
*Kinematics of Machinery*
(Mechanical Engineering)
Max. Marks: 70   **Time: 03 Hours**
Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1. a) Explain how I C engine mechanism and steam engine mechanism are kinematically identical?

   b) Explain the first two inversion of double slider crank chain with suitable sketches?

2. Describe one form of mechanism consisting of turning pairs only which will generate an exact straight line motion of a given point. Prove that the path followed by the pint is a true straight line.

3. a) A mechanism is shown in figure below. The wheels 2 and 4 roll on 1. The uniform angular velocity of wheel 2 is 10 rad/sec. Determine the angular velocity of link 3 and 4, and also the relative velocity of point D with respect to point E using the instantaneous centre method.
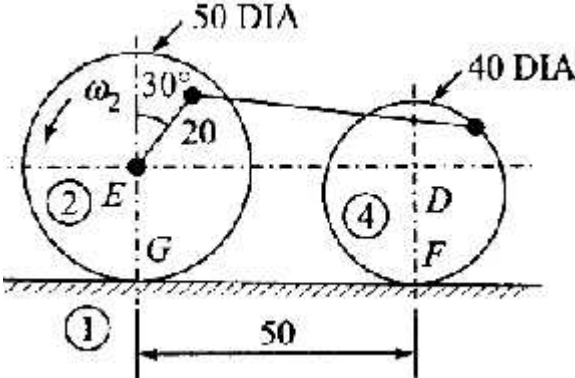
   b) The crank and connecting rod of a horizontal steam engine are 0.5 m and 2 m long respectively. The makes 180 rpm in cw. When the crank has turned 450 from the IDC position, determine: **(i)** Velocity of piston. **(ii)** Angular velocity of connecting rod and **(iii)** velocity of rubbing at the pins of the crank shaft, crank and cross-head when the diameter of their pins are 50 mm, 30 mm and 60 mm respectively.

4. a) What do you mean by coriolis acceleration? Show that coriolis acceleration is 2

   b) A link AB of a four bar ABCD revolves uniformly at 120 rpm in a cw direction. Find the angular acceleration of the links BC and CD and acceleration of point E on link BC. Take AB = 75 mm; BC = 175 mm; EC = 50 mm; CD = 150 mm; DA = 100 mm and angle BAD = 90^0.

5. From the following data draw the cam profile in which the follower moves with SHM during ascent and uniformly accelerated and decelerated motion during descent. The diameter of the roller follower is 30mm and lift is 40 mm.

    a. Angle of ascent = 48^0 and angle of descent = 60^0

    b. Angle of dwell between ascent and descent = 42^0

    c. The least radius of the cam is 50 mm and the distance between line of action of follower and axis of cam = 20 mm

If the cam rotates at 360 rpm ccw, find the maximum velocity and acceleration of the follower during ascent and descent.

6. a) Compare the involute profile and cycloidal profile teeth.

  b) The following particulars refer to 20^0 spur gears in mesh with pinion rotating at 400 rpm. Number of teeth on pinion= 24; Number of teeth on gear wheel= 28. Determine the following:

    i) The addendum of the gears if the path of approach and recess is half the maximum value.

    ii) The arc of contact and contact ratio

    iii) The maximum velocity sliding between the contacting teeth.

7. a) Explain the purpose of a idler in a short-centre belt drive?

  b) An open belt running over two pulleys 240 mm and 600 mm diameter connects two parallel shafts 3 m apart and transmits 4 kW from the smaller pulley that rotates at 300rpm Coefficient of friction between the belt and the pulley is 0.3 and the safe working tension is 10 N per mm width. Determine: 1. Minimum width of the belt. 2. Initial belt tension and 3. Length of the belt required.

8. a) Explain the function of differential gear train in an automobile

  b) Explain the procedure of obtaining the velocity ratio of epicyclic gear train by tabular method?

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Code : 1G544

R-11/R-13

II B.Tech. II Semester Supplementary Examinations December 2015
Manufacturing Technology
(Mechanical Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1. a) What are split and multi-piece patterns? What are the advantages of making them in two or more pieces? Give examples. 7M

    b) Explain different types of gates with their respective functions, applications and advantages in casting process? 7M

2. a) What are the essential conditions that are to be kept in mind while designing risers? Explain. 7M

    b) How a hot chamber die casting differs from a cold chamber die casting? 7M

3. a) Define the terms
     (i) Heat Affected Zone
     (ii) Tack weld
     (iii) Arc crater 6M

    b) Explain different types of flames in gas welding and mention their applications? 8M

4. a) Explain in detail any four welding defects identified during electric arc welding? 4M

    b) Explain the working principle of (i)Explosive welding and (ii) friction welding 10M

5. A 350 x 30 mm strip is fed through a rolling mill with two powered rolls of radius 300mm. the strip thickness is to be reduced to 25mm in one pass at a roll speed of 60 rev/min. Yield strength of strip material is 175N/mm^2. Determine
     (a) Coefficient of friction
     (b) Roll force
     (c) Power 14M

6. a) Distinguish between wire and tube drawing? 7M

    b) How the process of cold and hot spinning is performed? 7M

7. a) Differentiate forward and backward extrusion process? 7M

    b) Explain the principle of forging and explain drop forging process? 7M

8. Write a short notes on any TWO of the following
     (a)Water jet machining
     (b)Electro discharge machining
     (c)Laser assisted machining 14M

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R-11/R-13

Code : 1G542

II B.Tech. II Semester Supplementary Examinations December 2015
Thermal Engineering -I
(Mechanical Engineering)

Max. Marks: 70 **Time: 03 Hours**

Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1. a) Explain how volumetric efficiency is responsible for power output of the engine. Mention methods by which volumetric efficiency can be increased? 7M

   b) Discuss the effects of angle of advance on the performance of Otto cycle. Define the optimum angle of advance? 7M

2. a) What are the different types of fuel injection systems used in S.I. engines? Explain them in brief? 7M

   b) What do you understand by firing order? Give the firing order of 4 and 6 cylinder engines? Explain battery ignition system with a neat diagram? 7M

3. a) Discuss mixture ratio and their influence on flame speeds in S.I. engines? 7M

   b) Discuss the effect of fuel/air ratio, compression ratio, engine speed and turbulence on flame propagation in S.I. engines? 7M

4. a) Explain the differences between open and divided type combustion chambers? 7M

   b) Explain the phenomenon of Diesel knock in C.I. engines and compare the same with detonation in S.I. engines? 7M

5. a) What are the various methods to find out Indicated power of an I.C. engine? 7M

   b) The following data refers to a test on a single cylinder oil engine working on 4 stroke cycle. Diameter of brake wheel = 60cm, Rope dia=3cm, Dead load=245 N-m, Spring balance reading=49 N-m, Engine speed=400 RPM, Area of indicator diagram=4 cm^2, Length of indicator diagram=6 cm, Spring index=118 N-m/cm^2/cm, Fuel consumption=0.31 kg/B.P.hr, Calorific value of fuel=44.1 MJ/kg, Taking cylinder bore 10 cm and piston stroke 15 cm, Calculate:

   i) Brake power **ii)** Indicated power **iii)** Mechanical efficiency **iv)** Indicated thermal efficiency 7M

6. a) What is the effect of clearance? Derive the volumetric efficiency of a single stage single acting reciprocating compressor in terms of clearance? 7M

   b) A single acting two stage compressor with complete inter cooling delivers 6 kg/min of air at 16 bar. Assuming an intake state of 1 bar and 15^{0}c, and that the compression and expansion processes are reversible and polytrophic with n=1.3, calculate the power required, isothermal efficiency and the free air delivery? If the clearance ratios for the low pressure cylinder are 0.04, calculate the swept and clearance volume of low pressure cylinder. Take speed is 420 RPM. 7M

7. a) With the help of a velocity diagram derive the pressure ratio equation in a centrifugal compressor? 7M

   b) A Rotary compressor delivers 150 m^3 of free air per min. at 0.7 bar gauge, suction pressure and temperature being 1 bar, 27^{0}c. Adiabatic efficiency 70%. Calculate: **i)** final temperature of air **ii)** final pressure required **iii)** increase in entropy per kg of air during compression 7M

8. a) Explain Degree of Reaction as applied to axial flow compressor? Why is the Degree of Reaction generally kept 50% 7M

   b) An Axial compressor is fitted with half reaction blading with blade inlet and outlet angles 50^0 and 15^0 respectively measured from axial direction. The compressor runs at 5500 RPM. The mean diameter of a certain blade pair is 85 cm. Calculate the isentropic efficiency of the stage if the pressure ratio of compression is to be 1.25 when the air inlet temperature is 25^{0}c. Draw velocity diagram to the scale. 7M

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