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R-11 / R-13

Code: 1GC43

II B.Tech. II Semester Supplementary Examinations December 2017

Environmental Science

(Common to CE, ME and CSE)

Max. Marks: 70

Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks each**)

1. a) Why should we care about sustainability? Why it is important to study environmental science? 7M
b) Name two Institutions actively involved in environmental activities. Discuss the multidisciplinary nature of environmental science. 7M
2. a) Mention few direct uses of forest resources. Write short notes on 'Joint forest management'. 7M
b) Discuss in detail the problems associated with 'Dam'. 7M
3. a) Prepare a note on world food problem. What is Eutrophication? 7M
b) What is open pit mining? Discuss the role of an individual in the conservation of Natural resources. 7M
4. a) Discuss the effect of air pollution on living organism. What is 'Green house effect'? 8M
b) Describe how an individual can contribute towards a better quality of our environment and human life. 6M
5. a) Describe the structure and functions of a forest ecosystem. 7M
b) What are ecological pyramids? Discuss energy flow in an ecosystem with appropriate diagram. 7M
6. a) Explain 'Ex-situ' and 'In-situ' conservation of biodiversity. 7M
b) Describe India as a megadiversity nation. 7M
7. a) In your opinion what are the major limitations to successful implementation of our environmental legislations? Elaborate. 7M
b) Prepare a note on urban problems related to energy. 7M
8. a) List out various causes of rapid population growth in India. Mention few measures to control the rapid population growth in India. 7M
b) Explain the role of 'Information Technology' in protection of our environment. List out few major precautions to avoid AIDS. 7M

Code: 1G543

II B.Tech. II Semester Supplementary Examinations December 2017

Fluid Mechanics & Hydraulic Machinery

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any **five** questionsAll Questions carry equal marks (**14 Marks each**)

1. a) The right limb of a simple U – tube manometer containing mercury is open to the atmosphere, while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The center of the pipe is 12cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe, if the difference of mercury level in the two limbs is 20cm. 7M
- b) Define Mass density, Specific weight, Vapor pressure, Specific volume, Viscosity, Buoyancy, Specific gravity. 7M
2. a) Water flows through a pipe AB 1.2m diameter at 3m/sec and then passes through a pipe BC 1.5m diameter. At C, the pipe branches. Branch CD is 0.8m in diameter and carries one third of the flow in AB. The flow velocity in branch CE is 2.5m/sec. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE. 6M
- b) State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's equation from first principle. 8M
3. Two pipes have a length L each. One of them has a diameter D and the other diameter d. If the pipes are arranged in parallel, the loss of head when a total quantity of water Q flows through them is h, but if the pipes are arranged in series and the same quantity Q flows through them, the loss of head is H. If $d=D/2$, find the ratio of H to h, neglecting secondary losses and assuming the pipe co-efficient f has a constant value. 14M
4. a) A jet of water of diameter 7.5cm moving with a velocity of 25m/sec, strikes a fixed plate in such a way that, the angle between jet and plate is 60° . Find the force exerted by the jet on the plate
 - (i) In the direction normal to the plate.
 - (ii) In the direction of the jet. 7M
- b) Derive an expression for Force exerted by a jet on stationary inclined flat plate with neat sketch. 7M
5. a) Illustrate the elements of hydro electric power station. 7M
- b) The catchment area at a proposed site for a hydropower plant is 500km^2 , and head of water is 200m. Average annual rain fall is 189 cm and the losses are 20%. Calculate the power that can be developed. 7M
6. a) Classify Hydraulic Turbines according to the type of energy at inlet, direction of flow through runner, head at the inlet of turbine, specific speed of the turbine. 6M
- b) A Pelton wheel is to be designed for the following specifications:
Shaft power= $11,772\text{kW}$; Head= 380m ; Speed= 750rpm ; 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
 - (iii) Diameter of the jet .
 Assume $K_{v1} = 0.985$ and $K_{u1}=0.45$ 8M
7. a) Enumerate the factors governing the selection of types of turbines. 7M
- b) The water is flowing with a velocity of 1.5m/sec in a pipe of length 2500m and of diameter 50cm. At the end of the pipe, a valve is provided. Find the rise in pressure if the valve is closed in 25 seconds. Take the value of $C = 1460 \text{ m/sec}$. 7M
8. a) With the help of neat sketch, explain working principle of centrifugal pump. 7M
- b) A centrifugal pump is to discharge $0.118\text{m}^3/\text{sec}$ at a speed of 1450rpm against a head of 25m. The impeller diameter is 25cm, its width at outlet is 5cm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller. 7M

Code: 1G541

II B.Tech. II Semester Supplementary Examinations December 2017

Kinematics of Machinery

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any **five** questionsAll Questions carry equal marks (**14 Marks each**)

1. a) Explain with neat sketches the lower and higher pairs. 4M
- b) Sketch and explain the crank and slotted lever quick return mechanism. 10M
2. a) Sketch and explain Peaucellier straight line mechanism. 7M
- b) Sketch and explain Ackermann steering gear mechanism. 7M
3. Find the velocity of slider D and angular velocity of link CD for the engine mechanism shown in fig 1. The crank O_1A rotates at an uniform speed of 20 radians / sec clockwise. The various lengths are: $O_1A = 0.5$ m, $AB = 1.0$ m, $O_2B = 0.75$ m $BC = 1.0$ m and $CD = 1.75$ m.

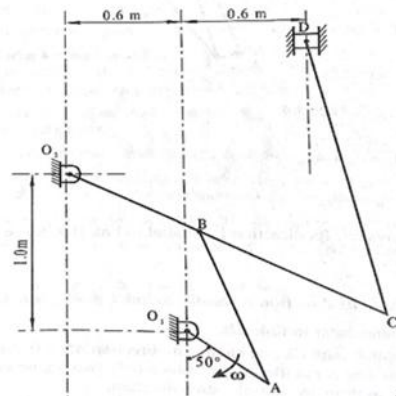


Figure : 1

4. Determine the velocity and acceleration of slider by Klein's construction to the following slider crank mechanism: Radius of crank: 150 mm Length of connecting rod: 600 mm. Speed of engine: 300 rpm. Position of crank: 45° from inner dead center. 14M
5. A cam operating a roller follower has the following data:
 Roller diameter = 20 mm, Minimum radius of cam = 50 mm.
 Follower moves outwards through 40 mm during 90° with SHM.
 Follower dwells for next 30° of cam rotation.
 Follower returns to its original position during next 120° of cam rotation with Uniform Acceleration and Retardation Motion (UARM).
 Follower dwells for remaining rotation of cam.
 Draw the profile of the cam when the axis of follower passes through the cam axis. If the cam rotates at 300 rpm, determine the velocity of follower during ascend. 14M
6. Two mating gears with 6 mm module have 30 teeth and 75 teeth. The addendum is standard one module. Pressure angle is 20° . Find:
 i) pitch diameters, ii) center distance iii) length of path of contact,
 iv) length of arc of contact and v) contact ratio. 14M
7. An open belt drive is required to transmit 9 kW of power from a motor pulley of diameter 120 mm rotating at 900 rpm to another pulley to rotate at 300 rpm. The center distance is 1.8 meters. The belt is 12 mm thick and weighs 1000 kg/ m^3 . Coefficient of friction is 0.3. Allowable stress in the belt is not to exceed 2.1 MPa. Determine the width of the belt. 14M
8. Fig 2 shows an epicyclic gear train where arm A is the driver and the annular wheel D is the follower. The wheel D has 112 teeth and B has 48 teeth. B runs freely on pin P and D is separately driven. If the arm A runs at 100 rpm and wheel D at 50 rpm in the same direction, find the speed of wheels B and C.

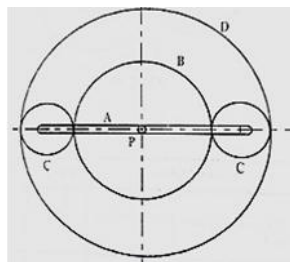


Figure 2.

Code: 1GC42

II B.Tech. II Semester Supplementary Examinations December 2017

Probability & Statistics
(Common to CE, ME and IT)

Max. Marks: 70

Time: 3 Hours

Answer any **Five** questions
All Questions carry equal marks (**14 Marks** each)

1. a) Find the mean, median, mode and standard deviation for the following distribution.

x	1	3	5	7	9	11	13	15
y	3	3	4	14	7	4	3	4

8M

- b) Obtain the rank correlation coefficient for the following data.

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70

6M

2. 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 colours?

7M

- b) A business man goes to hotels X, Y, Z, 20%, 50%, 30% of the time respectively. It is known that 5%, 4%, 8% of the rooms in X, Y, Z hotels have faulty plumbings. What is the probability that business man's room having faulty plumbing is assigned to hotel Z?

7M

3. a) 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 of the distribution.

10M

- b) If X is a continuous random variable with probability density function

$$f(x) = \begin{cases} x^2, & 0 \leq x \leq 1 \\ 0, & \text{else where} \end{cases} \quad \text{If } P(a \leq x \leq 1) = \frac{19}{81}, \text{ find the value of 'a'.$$

4M

4. a) The mean of Binomial distribution is 3 and the variance is $\frac{9}{4}$.

Find (i) the value of n (ii) $P(X \geq 7)$ (iii) $P(1 \leq X < 6)$

7M

- b) If X is a poisson variate such that $3P(x=4) = \frac{1}{2}P(x=2) + P(x=0)$,

Find (i) the mean of x (ii) $P(x \leq 2)$

7M

5. Samples of size 2 are taken from the population 3, 6, 9, 15, 27 with replacement. Find

- a) The mean of the population
- b) The standard deviation of the population
- c) Mean of the sampling distribution of means
- d) The standard deviation of the sampling distribution of means.

14M

6. a) What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with at least 95% confidence.

7M

- b) A random sample of 500 points on a heated plate resulted in an average temperature of 73.54 degrees Fahrenheit with a standard deviation of 2.79 degree Fahrenheit. Find a 99% confidence interval for the average temperature of the plate.

7M

7. To compare two kinds of bumper guards, 6 of each kind were mounted on a car and then the car was run into a concrete wall. The following are the costs of repairs.

Guard 1	107	148	123	165	102	119
Guard 2	134	115	112	151	133	129

Use the 0.01 level of significance to test whether the difference between two sample means is significant.

14M

8. In an investigation on the machine performance, the following results are obtained.

	No. of units inspected	No. of defectives
Machine 1	375	17
Machine 2	450	22

Test whether there is any significant performance of two machines at $\alpha = 0.05$.

14M

Code: 1G542

II B.Tech. II Semester Supplementary Examinations December 2017

Thermal Engineering - I

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any **five** questionsAll Questions carry equal marks (**14 Marks each**)

1. a) Discuss the optimum opening position of exhaust valve to reduce the exhaust blowdown loss. 7M
b) Discuss briefly pumping and rubbing friction losses. 7M
2. a) With a neat sketch explain the magneto ignition system 6M
b) Clearly explain the various wet sump lubrication systems. Compare wet sump and dry sump lubrication systems. 8M
3. a) Explain the phenomenon of knocking in S.I engines. How it can be controlled? 7M
b) Explain the various factors that influence the flame speed in S.I engine combustion. 7M
4. a) Bring out clearly the process of combustion in C.I engines and also explain the various stages of combustion. 7M
b) What are the different methods used in C.I engines to create turbulence in the mixture? Explain its effect on power output and thermal efficiency of the engine? 7M
5. During a trial run on a single cylinder 4 stroke Diesel engine the following observations were recorded:
Bore = 340 mm, Stroke = 460 mm; Area of indicator diagram = 475 mm², Length of indicator diagram = 65 mm, Spring constant = 0.62 bar/mm, Load on hydraulic dynamometer = 1000 N, Dynamometer constant = 7450, Fuel used = 11.2 kg/h, Calorific value of fuel = 48000 kJ/kg, Cooling water circulated = 24.5 litres/min, Rise in temperature of cooling water = 25°C. The main analysis of fuel is: C = 84%, O₂ = 10%, N₂ = 80%. Temperature of exhaust gases = 400°C, Specific heat of exhaust gases = 1.04 kJ/kg°C, Ambient temperature = 25°C, Partial pressure of steam in exhaust gases = 0.032 bar, Specific heat of superheated steam = 2.12 kJ/kg°C. Draw up the heat balance sheet on minute basis. 14M
6. a) Write short notes on the following terms used in reciprocating air compressors:
(i) Free Air Delivered,
(ii) Adiabatic Efficiency, and
(iii) Intercooler. 6M
b) A three stage single-acting air compressor running in an atmosphere at 1.013 bar and 16°C has a free delivery of 3.1 m³/min. The suction pressure and temperature are 0.95 bar 30°C respectively. Calculate the indicate power required, assuming complete intercooling, $n = 1.25$ and that the machine is designed for minimum work. The delivery pressure is to be 74 bar. 8M
7. Air at a temperature of 285 K flows in a centrifugal compressor running at 20500 rpm. The other data given is as follows:
Slip factor = 0.81, Isentropic total head efficiency = 0.74, Outer diameter of blade tip=520 mm. Determine:
(i) The temperature rise of air passing through the compressor
(ii) The static pressure ratio. 14M
Assume that the velocities of air at inlet and exit of the compressor are same.
8. A multi stage axial flow compressor delivers 20 kg/s of air. The inlet stagnation condition is 1.2 bar and 22°C. The power consumed by the compressor is 4240 kW. Calculate:
(i) Delivery pressure,
(ii) Number of stages, and
(iii) Overall isentropic efficiency of the compressor. 14M
Assume temperature rise in the first stage is 18.5°C. The polytropic efficiency of compression is 0.89 and the stage stagnation pressure ratio is constant.