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R18

Course Code: A30007

**CMR COLLEGE OF ENGINEERING & TECHNOLOGY**
(UGC AUTONOMOUS)

B.Tech IV Semester Supplementary Examinations Feb/March-2023

Course Name: NUMERICAL TECHNIQUES & PROBABILITY DISTRIBUTIONS
(Common for CE, ME, CSE, IT & CSC)

Date: 21.02.2023 AN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries TWO marks.

10x2=20M

1. Write down the condition for convergence of Newton Raphson Method for $f(x) = 0$. 2 M
2. Find the second degree polynomial through the points (0,2),(2,1),(1,0) using Lagrange's formula. 2 M
3. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Trapezoidal's rule. 2 M
4. What is the major drawback of Taylor's series method? 2 M
5. Find $L^{-1} \left[\frac{1}{(s+2)^2} \right]$. 2 M
6. State the first shifting theorem on Laplace transforms. 2 M
7. Test whether $f(x) = \begin{cases} |x|; & -1 \leq x \leq 1 \\ 0; & \text{otherwise} \end{cases}$ can be the probability density function of a continuous random variable. 2 M
8. If X and Y are two independent random variables with variances 2 and 3 find the variance of $3X+4Y$. 2 M
9. Define null hypothesis and alternative hypothesis. 2 M
10. What are the uses of 'F' - test? 2 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Find the real root of the equation $\cos x = 3x - 1$ correct to four places of decimal using fixed point iteration method. 10M

OR

11. B). From the following table, of half-yearly premium for policies maturing at different ages, estimates the premium for policies maturing at age 46 and 63. 10M

Age	x:	45	50	55	60	65
Premium	y:	114.84	96.16	83.32	74.48	68.48

12. A). The velocities of a car running on a straight road at intervals of 2 minutes are given by 10M

Time(min)	0	2	4	6	8	10	12
Velocity(km/hr)	0	22	30	27	18	7	0

Using Simpson's $\frac{1}{3}$ rule find the distance covered by the car.

(P.T.O.)

OR

12. B). Using fourth order R-K method, Solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2$ 10M

13. A). Apply the convolution theorem to find the inverse Laplace transform of the function 10M
$$\frac{s^2}{(s^2 + a^2)(s^2 + b^2)}$$

OR

13. B). Solve $(D^2 + 3D + 2)y = e^{-t}$, given that $y' = y = 0$, when $t = 0$. 10M

14. A). If the density function of continuous random variables X is given by 10M

$$f(x) = \begin{cases} ax, & 0 \leq x \leq 1 \\ a, & 1 \leq x \leq 2 \\ 3a - ax, & 2 \leq x \leq 3 \\ 0, & \text{elsewhere} \end{cases}$$

(i) Find the value of 'a'

(ii) Find the Cumulative Distribution Function of X

(iii) Compute $P[X \leq 1.5]$

OR

14. B). Six dice are thrown 729 times. How many times do you expect at least three dice to show a five or six? 10M

15. A). In a large city A, 20% of a random sample of 900 school boys had a slight physical defect. In another large city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? (To calculate at 5% level of significance). 10M

OR

15. B). The theory predicts the proportion of beans in the 4 groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the 4 groups were 882, 313, 287 and 118. Does the experimental result support the theory? (To calculate at 5% level of significance). 10M

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Course Code: A30182



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech IV Semester Supplementary Examinations Feb/March-2023

Course Name: FLUID MECHANICS & HYDRAULIC MACHINES
(Mechanical Engineering)

Date: 23.02.2023 AN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries TWO marks.

10x2=20M

- | | |
|---|-----|
| 1. What is surface tension? | 2 M |
| 2. Give one application of differential manometer. | 2 M |
| 3. Differentiate between steady flow and un-steady flow. | 2 M |
| 4. Mention the forces considered in Euler's equation of motion. | 2 M |
| 5. What are minor losses in flow through pipes? | 2 M |
| 6. What are the three zones of boundary layer? | 2 M |
| 7. What do you mean by impact of jet on vanes? | 2 M |
| 8. Classify turbines based on flow direction. | 2 M |
| 9. List the components of Reciprocating pump. | 2 M |
| 10. What is cavitation phenomenon in pumps? | 2 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Explain the phenomenon of capillarity and derive an expression for capillary rise of water in a small diameter glass tube. 10M
- OR
11. B). What would be the pressure in kN/m^2 if the equivalent head is measured as 400mm of 10M
- (i) mercury
- (ii) water
- (iii) oil of specific weight 7.9kN/m^3
- (iv) liquid of density 520kg/m^3 ?
12. A). Derive general three-dimensional continuity equation in Cartesian coordinates. 10M
- OR
12. B). A 40cm diameter pipe conveying water, branches into two pipes of diameters 30cm and 20cm respectively. If the average velocity in the 40cm diameter pipe is 3m/s. Find the discharge in this pipe. Also determine the velocity in 20cm pipe if the average velocity in 30cm diameter pipe is 2 m/s. 10M
13. A). Sketch and explain the formation of boundary layer when fluid flows over a flat plate. 10M
- OR
13. B). A smooth plate 2 m wide and 2.5 m long is towed in oil of specific gravity 0.8 at a velocity of 1.5 m/s along its length. Find the thickness of boundary layer and shear stress at the trailing edge of the plate. Kinematic viscosity for oil is $10^{-4} \text{ m}^2/\text{s}$. 10M

(P.T.O..)

14. A). Draw the inlet and outlet velocity triangles for a Pelton turbine and derive an expression for work done per second. 10M

OR

14. B). A jet of water of diameter 7.5 cm moving with a velocity of 25 m/s strikes a fixed plate in such a way that the angle between the jet and plate is 60° . Determine the force exerted by the jet on the plate in the direction normal to the plate and in the direction of the jet. 10M

15. A). Illustrate various parts of a reciprocating pump with a neat sketch and explain the working principle. 10M

OR

15. B). A turbine develops 8000 KW at 100 r.p.m. The head on the turbine is 30 m. If the head is 15 m, determine the power developed and the speed. 10M

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Course Code: A30325



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech IV Semester Supplementary Examinations Feb/March-2023

Course Name: APPLIED THERMO DYNAMICS

(Mechanical Engineering)

Date: 25.02.2023 AN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries TWO marks.

10x2=20M

- | | |
|---|-----|
| 1. Define the term "Supercharging". | 2 M |
| 2. Discuss the necessity of lubrication for an IC engine. | 2 M |
| 3. Define normal combustion and abnormal combustion. | 2 M |
| 4. Interpret the terms Octane and Cetane Numbers. | 2 M |
| 5. Define brake thermal efficiency and indicated thermal efficiency. | 2 M |
| 6. A single cylinder engine running at 1800 rpm develops a torque of 8 Nm. The indicated power of the engine is 1.8 kW. Find the brake power. | 2 M |
| 7. Draw p-v diagram for a two stage reciprocating air compressor with clearance volume. | 2 M |
| 8. List any four applications of compressed air. | 2 M |
| 9. Define COP and convert 10TR into kW. | 2 M |
| 10. Define By pass factor. | 2 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- | | |
|--|-----|
| 11.A). Explain the working of a four stroke engine with the help of line diagram. | 10M |
| OR | |
| 11. B). Explain Battery Ignition system with neat sketch. | 10M |
| 12. A). Classify and explain the combustion chambers in SI engines. | 10M |
| OR | |
| 12. B). Explain the importance of usage of antiknock additives in engines. | 10M |
| 13. A). Four stroke four-cylinder diesel engine running at 300 rpm produces 250 kW of brake power. The cylinder dimensions are 30 cm bore and 25 cm stroke. Fuel consumption rate is 1 kg/min while air fuel ratio is 10. The average indicated mean effective pressure is 0.8 MPa. Determine indicated power, mechanical efficiency, brake thermal efficiency and volumetric efficiency of engine. The calorific value of fuel is 43 MJ/kg. The ambient conditions are 1.013 bar, 27°C. | 10M |
| OR | |
| 13. B). A four stroke, four cylinder gasoline engine has a bore of 60 mm and a stroke of 100 mm. On test it develops a torque of 66.5 Nm when running at 3000 rpm. If the clearance volume in each cylinder is 60 cc the relative efficiency with respect to brake thermal efficiency is 0.5 and the calorific value of the fuel is 42 MJ/kg, determine the fuel consumption in kg/h and the brake mean effective pressure. | 10M |

(P.T.O..)

14. A). Describe the axial flow compressor with centrifugal compressors. 10M

OR

14. B). Determine the condition for minimum work required for a two stage reciprocating air compressor and find the work done. 10M

15. A). A dense air machine operates between 20 bar and 4 bar. The temperature of the air after the cooler is 16°C and after the refrigerating coil is 8°C . Estimate i) temperature at the end of compression and expansion, ii) Air circulated rate per TR, iii) Net work done per TR, iv) Theoretical COP and v) Power per TR. 10M

OR

15. B). 150 m^3 of air per minute is passed through the adiabatic humidifier. The condition of air at inlet is 35°C DBT and 20 per cent relative humidity and the outlet condition is 20°C DBT and 15°C WBT. Determine the following: i) Dew point temperature, ii) Relative humidity of the exit air and iii) Amount of water vapour added to the air per minute. 10M

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Course Code: A30327



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech IV Semester Supplementary Examinations Feb/March-2023

Course Name: MANUFACTURING PROCESSES

(Mechanical Engineering)

Date: 28.02.2023 AN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries TWO marks.

10x2=20M

- | | |
|--|-----|
| 1. Explain the purpose of chaplet in metal casting. | 2 M |
| 2. How to minimize the residual stresses in casting process? | 2 M |
| 3. State the type of force acting on extrusion process. | 2 M |
| 4. Define Shearing. | 2 M |
| 5. Explain requirement of tool materials. | 2 M |
| 6. Write the function of chip breaker. | 2 M |
| 7. Define the Weldability. | 2 M |
| 8. Write the advantages of brazing. | 2 M |
| 9. List out the process parameters of Ultrasonic Machining. | 2 M |
| 10. Specify the applications of Laser Beam Machining. | 2 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- | | |
|--|----|
| 11.A). i) Discuss the significance of shrinkage in the production of castings. | 5M |
| ii) Calculate the size of a cylindrical riser (Height and diameter equal) necessary to feed a slab casting $45 \times 45 \times 25$ cm with a side riser, casting poured horizontally into the mould. Use Chene's equation and take constants in Chene equation as $a = 0.18$, $b = 0.05$ and $c = 1.0$. | 5M |

OR

- | | |
|--|-----|
| 11. B). With neat sketches, explain Casting process with its equipment. | 10M |
| 12. A). Discuss the main characteristics of hot working and cold working processes with the help of neat sketch. | 10M |

OR

- | | |
|--|-----|
| 12. B). i) Explain the different press working operations? Classify them. | 5M |
| ii) Explain with a neat sketch roll bending. | 5M |
| 13. A). How is the chip formed in metal cutting? Explain the terms Shear plane and Shear Zone. | 10M |

OR

- | | |
|--|-----|
| 13. B). Derive the expression for shear angle in orthogonal cutting in terms of rake angle and chip thickness ratio. | 10M |
|--|-----|

(P.T.O..)

14. A). Explain the adhesive bonding and nature of adhesive joints. Give the advantages and disadvantages of adhesive bonding. 10M

OR

14. B). Enumerate different soldering methods and describe in detail any two of them. 10M

15. A). Explain the ultrasonic machining process and list out the process parameters of machining 10M

OR

15. B). Explain the measurement of MRR, surface finish and tool wear in the EDM Process. 10M

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Course Code: A30531



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech IV Semester Supplementary Examinations Feb/March-2023

Course Name: PYTHON PROGRAMMING

(Common for CE, ME, ECE, CSE & IT)

Date: 04.03.2023 AN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries TWO marks.

10x2=20M

1. How to read input and print output in python? 2 M
2. How Type conversion is done in python? 2 M
3. Define File. 2 M
4. Differentiate between local and global variables. 2 M
5. What is the purpose of string slicing? 2 M
6. Why recursion is used give example? 2 M
7. Define polymorphism. 2 M
8. What is object? 2 M
9. Give the syntax for button and dialog box. 2 M
10. What is image processing? 2 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Explain various control structures supported in Python each with respective example program. 10M

OR

- 11.B). List and explain operators supported by Python. Demonstrate python code to print all prime numbers less than 256. 10M

- 12.A). Define a Function and explain default, keyword and variable length arguments in functions. 10M

OR

- 12.B). Explain the class design techniques with example. And write a python program to print the area of circle. 10M

- 13.A). What is a string and explain different string manipulations techniques? 10M

OR

- 13.B). Discuss about Lists, Dictionaries, sets and Tuple each with and executable code. 10M

- 14.A). List and explain the features of object-oriented programming. 10M

OR

- 14.B). What is inheritance list different types of inheritance with code snippets? 10M

- 15.A). Why GUI is powerful explain using tkinter module? 10M

OR

- 15.B). Discuss about turtle Graphics with an example. 10M

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R18

Course Code: A30329



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

B.Tech IV Semester Supplementary Examinations Feb/March-2023

Course Name: **KINEMATICS OF MACHINERY**

(Mechanical Engineering)

Date: 08.03.2023 AN

Time: 3 hours

Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions (Compulsory)

Each question carries TWO marks.

10x2=20M

1. List some important inversions of single slider crank chain mechanism. 2 M
2. List the types of links. 2 M
3. Define rubbing velocity. 2 M
4. State the properties of instantaneous centre. 2 M
5. What is an automobile steering gear? 2 M
6. What is a Hooke's joint? 2 M
7. What are the types of Cam with Specified Contours? 2 M
8. Define Pressure angle with respect to cams. 2 M
9. Why the externally applied torques, used to keep the gear train in equilibrium? 2 M
10. Write the application of epicyclic gear trains. 2 M

PART-B

Answer the following. Each question carries TEN Marks.

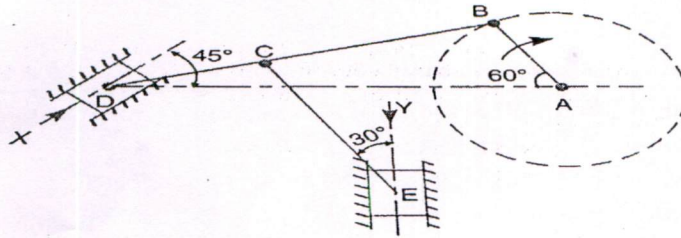
5x10=50M

- 11.A). Describe in detail about the Crank and Slotted lever mechanism with neat sketch. 10M
- OR**
11. B). i) State the meaning of Kinematic Link and the Mechanisms. 6M
ii) Sketch and explain the Double Crank mechanism. 4M
12. A). PQRS is a four bar chain with link PS fixed. The lengths of the links are PQ = 62.5mm; QR = 175mm; RS = 112.5mm; and PS = 200mm. The crank PQ rotates at 10rad/s clockwise. Draw the velocity and acceleration diagram and examine the mechanism to compute following kinematic parameters when angle QPS = 60° and Q and R lie on the same side of PS. 10M
- i) Find the angular velocity of coupler link
 - ii) Angular acceleration of links QR and PS.

(P.T.O..)

OR

12. B). The dimensions of the mechanism as shown in Fig. are as follows $AB = 0.45\text{m}$; $BD = 1.5\text{m}$; $BC=CE=0.9\text{m}$. The crank AB turns uniformly at 180 r.p.m in the clockwise direction and the blocks at D and E are working in frictionless guides. Examine the mechanism and compute the following velocity at various points. 10M



- Draw the velocity diagram for the mechanism.
- Find the velocities of the sliders D and E in their guides.

13. A). i) Derive an expression for the ratio of angular velocities of the shafts of a Hooke's joint. 5M
ii) What is a Scott-Russel mechanism? What is its limitation? 5M

OR

13. B). i) An Ackermann steering gear does not satisfy the fundamental equation of a steering gear at all positions. Yet it is widely used Why? 5M
ii) Sketch a Paucellier mechanism. Show that it can be used to trace a straight line. 5M

14. A). Draw the profile of a cam operating a roller reciprocating follower and with the following data, 10M
(a) Minimum radius of cam = 25 mm
(b) Lift = 30 mm
(c) Roller diameter = 15 mm

The cam lifts the follower for 120° with SHM followed by a dwell period of 30° . Then the follower lowers down during 150° of the cam rotation with uniform acceleration and deceleration followed by a dwell period. If the cam rotates at uniform speed of 150 rpm ;

- Draw the displacement diagram.
- Draw the cam profile

OR

14. B). A cam rotating at 150 rpm operates a reciprocating roller follower of radius of 25 mm . The follower axis is offset by 25 mm to the right. The least radius of the cam is 500 mm and the stroke of the follower is 50 mm . Ascent and descent both takes place by uniform acceleration and retardation. Ascent takes place during 75° and descent during 90° of cam rotation. Dwell between ascent and descent is 60° . 10M
i) Draw the displacement. ii) Draw the cam profile.

15. A). i) The following data refers to two matching involute gears of 20° pressure angle. Number of teeth on pinion = 20 , Gear ratio = 2 , Speed of pinion = 250 rpm and Module = 12 mm . If the addendum of each wheel is such that the path of approach and path of recess on each side are half the maximum possible length, Calculate addendum for both the wheels. 5M
ii) With a neat sketch explain herringbone gear. 5M

(P.T.O.)

OR

15. B). i) In an epicyclic gear train an arm carries two gears A and B having 42 and 58 teeth respectively. If the arm rotates at 215 rpm in the anticlockwise direction about the center of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed makes 365 rpm in the clockwise direction, what will be the speed of gear B? 6M
- ii) Briefly discuss the differential gear of an automobile. 4M
