

Total No. of Questions: 22

Total No. of Pages: 02

Roll No. _____

B.Tech IV sem (Main/Back) Exam April-May 2026

Automobile Engg.

4AE2-01 Data Analytics

Paper Code : 4E1308

AE, ME, PT, PI

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)
1- t-test table, Normal distribution table

2. NIL

Part A

(Short Answer upto 25 words, each carry 2 marks and all ten questions are compulsory)

- Q.1 Define multivariate statistics.
- Q.2 What is multi collinearity ?
- Q.3 Define homoscedasticity.
- Q.4 What is an outlier in data analysis ?
- Q.5 Define logistic regression.
- Q.6 What is discriminant analysis ?
- Q.7 Define principal component analysis.
- Q.8 What is factor rotation ?
- Q.9 Define cluster analysis.
- Q.10 What is ARIMA model ?

Part B

(Candidates have to answer any five questions out of seven from Q.1 to Q.7 and each question carries 4 marks)

- Q.1 Given the regression model :
$$Y = 5 + 2X_1 + 3X_2$$

If $X_1 = 4, X_2 = 6$, calculate predicted value of Y. Interpret coefficients.
- Q.2 A regression coefficient has estimated value = 1.8 with standard error = 0.6. Test significance at 5% level using t-test.
- Q.3 For logistic model : $P = \frac{1}{1 + e^{-(1+0.5X)}}$
Find probability when $X=2$

- Q.4 Given : Between group SS = 120, df=3. Within-group SS = 80 df = 16. Compute F-statistic and interpret significance.
- Q.5 Eigenvalues of covariance matrix are : 4.5, 2.5, 1.0. Compute percentage variance explained by first principal components.
- Q.6 A classification model correctly classifies 80 out of 100 observations. Compute classification accuracy and error rate.
- Q.7 Differentiate hierarchical and non- hierarchical clustering and explain situations where each is preferred.

Part C

(Candidates have to answer three questions out of five from
Q.1 to Q.5 and each carry 10 marks)

- Q.1 Given dataset :

X1	X2	Y
2	3	20
4	5	35
6	7	50

- (a) Fit a regression model. (b) introduce interaction term X_1, X_2 . (c) Interpret effect of interaction.
- Q.2 Given correlation matrix eigenvalues 5.0, 2.5, 1.5, 0.8
- (a) Determine number of factors using Kaiser criterion.
- (b) Compute total variance explained
- (c) Explain need for rotation.
- Q.3 Given two groups with means : Group 1: (4,5), Group 2: (6,8)
- (a) Form linear discriminant function.
- (b) Classify new observation (5,6).
- (c) Interpret classification result.
- Q.4 Given time series data : 100, 110, 120, 130, 140
- (a) Compute first difference
- (b) Identify ARIMA components (p,d,q)
- (c) Interpret trend.
- Q.5 Design a complete multivariate analysis framework for a marketing dataset including : Data screening (missing values, outliers, normality); regression / logistic model ; principal component analysis / factor analysis ; clustering and perceptual mapping ; Decision trees and big data integration.

3 x 10= 30

Total No. of Questions : 22

Total No. of Pages : 02

Roll No. _____

B.Tech IV sem (Main/Back) Exam April-May 2026

Aeronautical Engg.

4AN1-02 Technical Communication

Paper Code : 4E1303

All Branches

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)

All questions are compulsory

T-495

- Q. 1 What is Ideation in the process of Technical communication ?
- Q.2 What do you mean by Linguistic Competence ?
- Q.3 What is SQ3R Reading Technique ? Who developed this technique ?
- Q.4 Name any four graphic aids generally used in technical document ?
- Q.5 How will you ensure maximum engagement and share while preparing the online content ?
- Q.6 Define technical discourse.
- Q.7 What do you mean by the term Minutes of Meeting ?
- Q.8 What is Topicalising in the process of note making?
- Q.9 What does the term 'BCC' mean in the heading of an email ?
- Q.10 What is the main purpose of report writing? 10 x 2 = 20

Part B (Analytical/Problem solving questions)

Attempt any Five questions

- Q.1 What are the aspects of effective technical communication ?
- Q.2 How does active reading differ from passive reading ?
- Q.3 Reading is a complex communication process of receiving and interpreting the written word Elaborate.
- Q.4 What are the factors which affect the information and document design?
- Q.5 Correct the following sentences :
- (i) Neither of the boys are selected for the final
- (ii) The people of South India loves their tradition and follows them whole-heartedly.
- (iii) Sartia is more better than Hari in playing chess.
- (iv) What a terrible night it is ?

- Q.6 What are the main steps that are involved in summarizing technical texts ?
Q.7 What do you mean by the term Methodology in technical articles ?

5 x 4 = 20

Part C(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

T-435

- Q.1 Write short notes on following :
- Literature survey and data collection.
 - Difference between report and a Proposal.
 - Strategies for reading technical text.
 - Internal and External Proposals.
- Q.2 Assume yourself as Shashwat Sharma, a B. Tech. student from MNIT Jaipur. Write an email message to Mr. Ayush Bhatia personnel manager of NTPC Power Management Institute at Noida, U.P. requesting him to allow you to do summer training there as a part of your academic assignments.
- Q.3 Suppose you want to avail a study loan from State Bank of India. Write a letter to the Chief Manager, SBI branch of your locality requesting him/her to send you all the information related to the loan.
- Q.4 What are the types of Technical Report ? Mention the structure of a format Report ?
- Q.5 What is the importance of Technical communication in engineering? How can clear, concise and accurate documentation contribute to the success of engineering projects?

T-435

3 x 10 = 30

Total No. of Questions : 22

Total No. of Pages : 02

Roll No. _____

B.Tech IV sem (Main/Back) Exam April-May 2026
Aeronautical Engg.
4AN1-03 Managerial Economics & Financial Accounting
Paper Code : 4E1302
All Branches

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)
All questions are compulsory

T-435

- Q.1 Define Managerial Economics.
- Q.2 What is the meaning of demand ?
- Q.3 Define monopoly?
- Q.4 What is the meaning of Cash Flow analysis?
- Q.5 What is the meaning of Oligopoly?
- Q.6 Define Financial statement analysis ?
- Q.7 Define opportunity cost ?
- Q.8 What is the meaning of survey method ?
- Q.9 What is payback Period ?
- Q.10 Define Managerial Economics.

10 x 2 = 20

Part B (Analytical/Problem solving questions)
Attempt any Five questions

- Q.1 Discuss the importance of Managerial Economics in decision making.
- Q.2 Define 'Demand' and explain the factors that influence the demand of product.

- Q.3 Calculate the BEP in units and rupees using the following details :
- Selling price per unit Rs. 100 .
 - Variable cost per unit Rs. 60.
 - Fixed cost Rs. 20,000
 - Actual sales Rs. 2,00,000
- Q.4. Discuss the various concept of National income- Gross National products, Net National Product, Personal income and dispensable Income.
- Q.5 Define Balance Sheet ? Give two characteristics of Balance Sheet ?
- Q.6 Distinguish between Monopolistic competition and Perfect Competition ?
- Q.7 You are required to calculate.
- i) Margin of Safety
 - ii) Total sales
 - iii) Variable cost from the following figures
 - Fixed costs Rs. 12, 000
 - Profit Rs. 1,000
 - Break-Even Sales Rs. 60,000

5 x 4 = 20

Part C(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.1 Define **Ratio Analysis**. Explain the importance of Liquidity and Profitability ratio for a firm.
- Q.2 How the price and output is determined under the perfect competition during the short period ?
- Q.3 Explain the concept of Market Equilibrium the context of Demand and Supply. Discuss how changes in demand and supply affect equilibrium price and quantity. Use diagrams to illustrate your answer.
- Q.4 Calculate the Net present value (NPV) of the two projects X and Y. Suggest which of the two projects should be accepted assuming a discount rate of 10%.

Item	Project -A	Project-B
Initial Investment	Rs. 80,000	Rs. 1,20,000
Life Period	5 years	5 years
Scrap Value	Rs. 4,000	Rs.8000
(Annual Cash Inflows)	(CFAT)	(CFAT)
Year : 1	Rs. 24,000	Rs. 70,000
, 2	Rs. 36,000	Rs. 50,000
, 3	Rs. 14,000	Rs. 24,000
, 4	Rs. 10,000	Rs.8,000
, 5	Rs. 8,000	Rs.8,000

- Q.5 Define **Managerial Economics** and discuss its nature, scope, and relationship with other disciplines like statistics and Mathematics.

3 x 10= 30

Total No. of Questions: 22

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B.Tech IV sem (Main/Back) Exam April-May 2026

Automobile Engg.

4AE3-04 Digital Electronics

Paper Code : 4E1309

AE, ME, PI

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)

All questions are compulsory T-495

- Q.1 Draw ideal V_i Characteristic of an ideal diode.
- Q.2 Find the unknown numbers :
- (i) $(1A)_{16} + (342)_8 = (?)_4$
- (ii) $(?)_2 + (102)_8 = (420)_4$
- Q.3 Simplify the following Boolean function :-
 $Y = (A + \bar{B} + AB)(A + \bar{B})(\bar{A}B)$
- Q.4 Design on AX - OR gate using NAND gate.
- Q.5 Draw the output characteristic of an BJT in CE mode.
- Q.6 State the ideal characteristic of an operational amplifiers.
- Q.7 What is the difference between as table and monostable multivibrator?
- Q.8 Explain half wave rectifier.
- Q.9 Draw a circuit diagram of unity gain buffer using Op-amp IC741.
- Q.10 Define the basic elements of communication system.

10x2=20

Part B (Analytical/Problem solving questions)

Attempt any Five questions T-495

- Q.1 Design following gates using 2:1 mux :
- (i) NAND gate (ii) OR gate
- Q.2 Find the output voltage of an circuit as shown in figure 1 :-

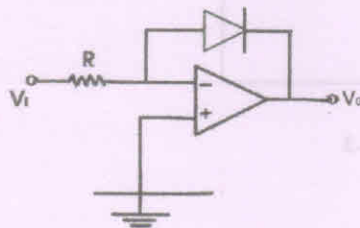


Figure-1

- Q.3 Implement the full adder using 4:1 multiplexers
Q.4. Minimize $F(x,y,z) = \sum (0,1,2,4,6) + d(3)$ using K-map.
Q.5 Find the voltage gain of circuit as shown in figure -2.

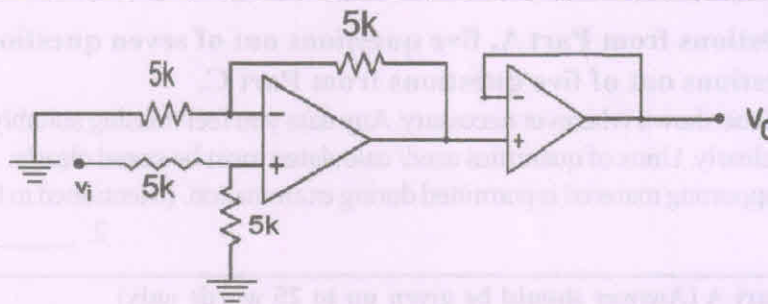


Figure -2

T-495

- Q.6 Explain the working and hence derive the expression for Wein Bridge Oscillators.
Q.7 State the difference between microprocessor and micro controller in detail with block diagram.

5x4=20

Part C (Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.1 Design a full subtractor circuit using NAND gate.
Q.2 Design a ± 12 V regulated power supply and explain its working also. Find the value of filtering capacitance also.
Q.3 Design a synchronous counter that counts from 0 to 12.
Q.4 Find the transistor currents in the circuit of figure 3. A silicon transistor with $\beta = 100$ and $I_{co} = 20 \times 10^{-5}$ mA is under consideration.

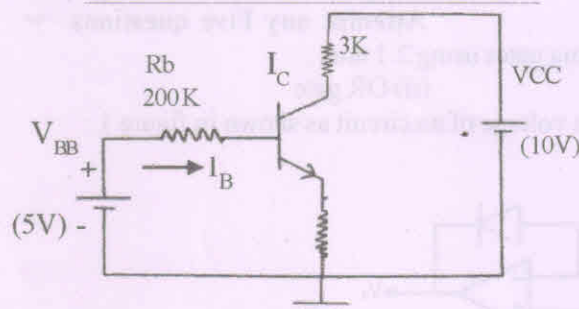


Figure -3

- Q.5 Write short note on following :
i. Mobile communication system.
ii. IEEE frequency spectrum

T-495

3x10=30

Total No. of Questions: 22

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B.Tech IV sem (Main/Back) Exam April-May 2026

Automobile Engg.

4AE4-05 Fluid Mechanics and Fluid Machines/Fluid Engineering

Paper Code : 4E1310

AE, ME, PI

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)

All questions are compulsory

T-435

- Q.1: Define the following fluid properties; Mass density, specific weight, specific volume, specific gravity and compressibility.
- Q.2: Explain the variation of viscosity with temperature.
- Q.3: Calculate the specific weight, mass density and specific gravity one litre of a liquid and which weight is 7 N.
- Q.4: Differentiate kinematic viscosity and dynamic viscosity. Give their dimensions.
- Q.5: Define dimensional homogeneity.
- Q.6: Define volumetric efficiency of a turbine.
- Q.7: List the important characteristic curves of a turbine.
- Q.8: Define the Euler equation of a pump.
- Q.9: Name all the velocity components at inlet and exit of the rotor of a turbine.
- Q.10: Write the four differences between Francis and Kaplan turbine. 10 x 2 = 20

Part B (Analytical/Problem solving questions)

Attempt any Five questions

T-435

- Q.1: A plate 0.025mm at a distance from a fixed plate moves at 60 cm/sec and requires a force of 2 N/m². Determine the dynamic and kinematic viscosity between the plates.
- Q.2: Define surface tension. Derive the relationship between surface tension and pressure inside a droplet of liquid in excess of outside pressure.
- Q.3: The surface tension of water in contact air at 20°C is 0.072 N/m. The pressure inside of water droplet of water is to be 0.02 N/cm² greater than the outside pressure. Calculate the diameter of the droplet of water.

- Q.4: Explain the phenomenon of capillarity. Obtain an expression for capillary rise of a liquid.
- Q.5: The time period (t) of a pendulum depends upon the length (l) of the pendulum and acceleration due to gravity (g). Derive expression for time period $T=4\pi\sqrt{\frac{l}{g}}$
- Q.6: Derive the expression for velocity triangles and work done for Pelton wheel
- Q.7: Describe briefly about pumps in series and pumps in parallel. Derive the expression for specific speed and what is the minimum starting speed. $5 \times 4 = 20$

Part C (Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.1: Define the following terms; vapour pressure, manometers, center of pressure, buoyant force and energy gradient.
- Q.2: A Pelton wheel is to be designed for the following specifications: Shaft power = 11,772 KW; Head = 380 m; Speed = 750 rpm; Overall efficiency = 86%; Jet Diameter is not exceeding one - sixth of the wheel diameter. Determine: a) The wheel diameter b) The number of jets required c) Diameter of the jet; Take $K_v = 0.98$, $K_u = 0.45$
- Q.3: Francis turbine with an overall efficiency of 75% is required to produce 148.25 kW power. It is working under a head of 7.62m. The peripheral velocity = $0.26 \sqrt{2gh}$ and the radial velocity of flow at inlet is $0.96 \sqrt{2gh}$ The wheel runs at 150 rpm. and the hydraulic losses in the turbine are 22% of the available energy. Assuming radial discharge, determine: a) The guide blade angle b) The wheel vane angle at inlet c) Diameter of the wheel at inlet d) Width of the wheel at inlet.
- Q.4: A centrifugal pump delivers water against a net head of 14.5m and a design speed of 1000 rpm. The vanes of curved back to an angle of 30° with the periphery. The impeller diameter is 300 mm and outlet width is 50mm. Determine the discharge of the pump if manometric efficiency is 95%.
- Q.5: Explain the working principle of centrifugal pump and obtain the expression for work done by an impeller. $3 \times 10 = 30$

Total No. of Questions : 22

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Roll No. _____

B.Tech IV sem (Main/Back) Exam April-May 2026

Automobile Engg.

4AE4-06 Manufacturing Processes

Paper Code : 4E1311

AE, ME

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)

T-435

All questions are compulsory

- Q.1 Define manufacturing process.
- Q.2 What is casting?
- Q.3 What are moulding sands?
- Q.4 Define hot working.
- Q.5 What is forging.
- Q.6 What is rolling?
- Q.7 What is deep drawing?
- Q.8 Define welding.
- Q.9 What is soldering?
- Q.10 Define powder metallurgy.

10 x 2 = 20

Part B (Analytical/Problem solving questions)

T-435

Attempt any Five questions

- Q.1 Explain the classification of manufacturing processes.
- Q.2 Explain the properties and preparation of moulding sand.
- Q.3 Differentiate between hot working and cold working.
- Q.4 Describe the characteristics and applications of rolling

- Q.5 Explain resistance welding and its applications
T-495
- Q.6 Describe TIG welding and MIG welding processes.
- Q.7 Explain the steps involved in powder metallurgy.

5x 4 = 20

Part C (Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

- Q.1 Explain the casting process in detail. Discuss the types of casting methods.
- Q.2 Describe the composition, properties, and testing of moulding sand.
- Q.3 Discuss forging processes and explain drop forging with advantages and applications.
- Q.4 Describe the extrusion process and explain its applications.
- Q.5 Describe welding defects, causes, and remedies. T-495

3 x 10 = 30

Total No. of Questions: 22

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Roll No. _____

B.Tech IV sem (Main/Back) Exam April-May 2026

Automobile Engg.

4AE4-07 Theory of Machines

Paper Code : 4E1312

AE, ME, PI

Time: 3 Hours

Maximum Marks: 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. _____

2. _____

Part A (Answer should be given up to 25 words only)

All questions are compulsory

T-435

- Q.1 Distinguish between analysis and synthesis of mechanism.
- Q.2 What is velocity of rubbing ? How is it found ?
- Q.3 What are centripetal and tangential components of acceleration? When do they occur ?
- Q.4 What is friction ? Is it a blessing or curse ? Justify your answer with giving example.
- Q.5 What is the difference between a brake and a clutch ?
- Q.6 What is the difference between double -helical and herringbone gears?
- Q.7 What is a reverted gear train ? Where is it used ?
- Q.8 Define pitch circle and pressure angle of a cam profile.
- Q.9 What do you mean by spin, precession and gyroscopic couple planes ?
- Q.10 Why is balancing necessary for high speed engines ?

10×2 = 20

Part B (Analytical/Problem solving questions)

Attempt any Five questions

T-435

- Q.1 The turbine rotor of a ship has a mass of 2.2 tonnes and rotates at 1800 rpm clockwise when viewed from the aft. The radius of gyration of the rotor is 320 mm. Determine the gyroscope couple and its effect when the

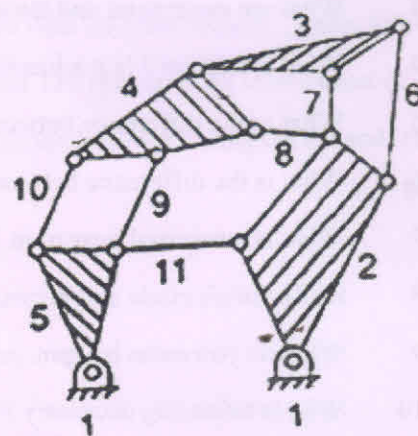
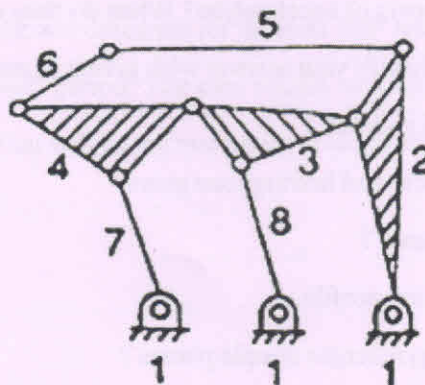
- (a) Ship turns right at a radius of 250 m with a speed of 25 km / h.
 (b) Ship pitches with the bow rising at an angular velocity of 0.8 rad/s.
 (c) Ship rolls at an angular velocity of 0.1 rad/s

T-435

Q.2 What are quick return mechanisms ? Where are they used ? Explain crank and slotted lever quick return mechanism with neat sketch.

Q.3 For the kinematic linkages shown in the figure below, calculate the following :

- the number of binary links (N_b)
- the number of ternary links (N_t)
- The number of other quaternary , etc) links (N_o)
- the number of total links (N)
- The number of loops (L)
- the number of joints or pair (P_1)
- the number of degrees of freedom (F)



Q.4. State and derive law of gearing. Also derive the expression for velocity of sliding between a pair involute teeth.

T-435

Q.5 A conical pivot with a angle of cone as 100° supports a load of 18 KN. The external radius is 2.5 times the internal, radius. The shaft rotates at 150 rpm. If the intensity of pressure is to be 300 kN/m² and coefficient of friction as 0.05 , what is the power lost in working against the friction ?

- Q.6 Two 20° involute spur gear mesh externally and give a velocity ratio of 3. The module is 3 mm and the addendum is equal to 1.1 module. If the pinion rotates at 120 rpm, determine the
- Minimum number of teeth on each wheel to avoid interference
 - Number of pairs of teeth in contact (Contact ratio)
- Q.7 Three masses of 8 kg, 12 kg and 15 kg attached at radial distances of 80 mm, 100 mm and 60 mm respectively to a disc on a shaft are in complete balance. Determine the angular position of the masses of 12 kg and 15 kg relative to the 8 kg mass.

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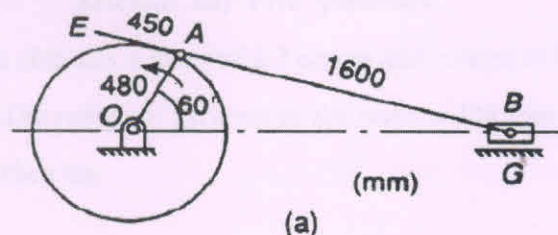
$$5 \times 4 = 20$$

Part C (Descriptive/Analytical/Problem Solving/Design question)

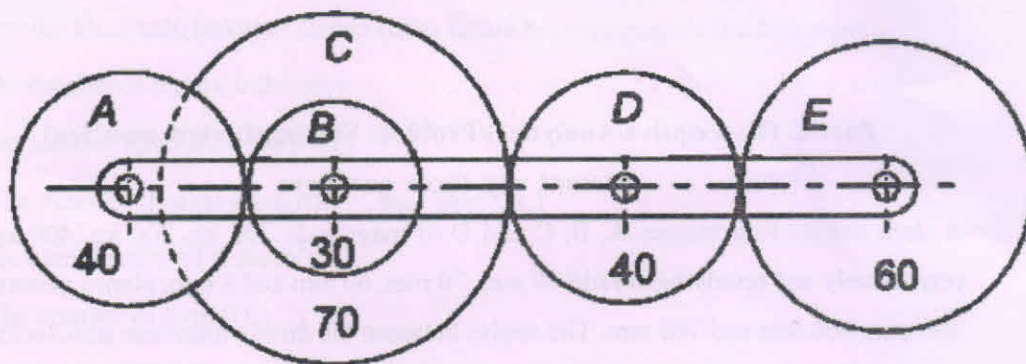
Attempt any three questions

- Q.1 A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 8 mm, planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45° , B to C 70° and C to D 120° . The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions.
- Q.2 A differential band brake has a drum with a diameter of 800 mm. The two ends of the band are fixed to the pins on the opposite sides of the fulcrum of the lever at distances of 40 mm and 200 mm of the fulcrum. The angle of contact is 270° and the coefficient of friction is 0.2. The force of 600 N is applied to the lever at a distance of 800 mm from the fulcrum. Determine the brake torque for clockwise and counter clockwise rotation of the drum.
- Q.3 For a configuration of a slider crank mechanism shown in the figure below, calculate the
- Velocity of the point E
 - Acceleration of the slider at B
 - Angular acceleration of the link AB
- OA rotates at 20 rad/s counter - clockwise.

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- Q.4 Figure shown a gear train in which gears B and C constitute a compound gear. The number of teeth are shown along with each gear in the figure. Determine the speed and direction of rotation of gears A and E if the arm revolves at 210 rpm clock wise and the gear D is fixed.



- Q.5 Daws the profile of a cam operating a knife edge follower having a lift of 30 mm. The cam raises the followers with SHM for 150° of the rotation followed by a period of dwell for 60° . The follower descends for the next 100° rotation of the cam with uniform velocity, again followed by dwell period. The cam rotates at a uniform velocity of 120 rpm and has least radius of 20 mm. What will be the maximum velocity and acceleration of the follower during the lift and return?

$$3 \times 10 = 30$$