

5E1321

Roll No. _____

Total No of Pages: **2**

5E1321

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

**ESC Automobile Engineering
5AE3 - 01 Mechatronic Systems
Common for AE, ME**

Time: 2 Hours

[To be converted as per scheme]

Max. Marks: 65

Min. Marks: 23

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and one questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only)

[5×2=10]

All questions are compulsory

Q.1 Define Kirchhoff's Law. [2]

Q.2 What are the different types of system modelling? [2]

Q.3 List any 5 types of sensors. [2]

Q.4 Difference between microprocessors and microcontrollers. [2]

Q.5 What is the use of programmable logic controllers (PLC's) in mechatronics? [2]

PART – B

(Analytical/Problem solving questions)

[4×10=40]

Attempt any four questions

- Q.1 Assume yourself as Prof. Venugopal, who is invited in MNIT Jaipur to give Guest Lecture on “Mechatronic System”. Explain the audience scope & application of mechatronic system. [10]
- Q.2 What is Actuator? Write its applications in Mechatronics? [10]
- Q.3 (a) What do you mean by LTI and LTV systems? Explain. [6]
(b) Why there is a need of Modeling? [4]
- Q.4 Define “Data Acquisition Systems” in mechatronics. [10]
- Q.5 With a suitable example, explain “Fault Analysis” in mechatronic systems. [10]
- Q.6 How do the Timers and Counters function in PLC? [10]

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)

[1×15=15]

Attempt any one questions

- Q.1 Explain Electrical, Hydraulic and Pneumatic Actuators with suitable examples. [15]
- Q.2 Explain any two mechatronic systems with suitable diagrams –
- (a) Car Engine Management System [5]
 - (b) Automatic Camera [5]
 - (c) Automatic Parking systems [5]
- Q.3 (a) What is the necessity of “Signal Conditioning”? Explain briefly the processes usually adopted in signal conditioning. [10]
(b) Explain Analogue to Digital Converter (ADC). [5]
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5E6202

Roll No. _____

Total No of Pages: 3

5E6202

B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021

Mechanical Engineering

5ME2A Dynamics of Machines

Common for ME, AE

Time: 2 Hours

Maximum Marks: 48
Min. Passing Marks: 15

Instructions to Candidates:

*Attempt **three** questions, selecting **one** question each from any three unit. All questions carry **equal** marks. 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. NIL

2. NIL

UNIT- I

Q.1 (a) Differentiate between 'Governor' and 'Flywheel' of an engine. [6]

(b) Derive expression for effort and power in a Porter governor. [10]

OR

Q.1 (a) Give classification of Governors. [8]

(b) Discuss stability of a governor with help of neat sketches and controlling force diagram. [8]

UNIT- II

Q.2 (a) Derive a formula for the magnitude of gyroscopic couple $C = I\omega\omega_p$

Where I = moment of inertia, ω = angular velocity of axis of spin and ω_p = angular velocity of precession. [6]

(b) Derive an expression for the angular acceleration of the connecting rod of a reciprocating engine. [10]

OR

Q.2 A certain machine requires a torque of $(5000 + 500 \sin \theta)$ N – m to drive it, where θ is angle of rotation of shaft measured from certain datum. The machine is directly coupled to an engine which produces a torque of $(5000 + 600 \sin 2\theta)$ N – m. The flywheel and the other rotating parts attached to the engine has a mass of 600 kg at a radius of gyration of 0.5m, if the mean speed is 160 rpm. Find- [16]

- (a) The fluctuation of energy
- (b) The total percentage fluctuation of speed and
- (c) The max. and min. angular acceleration of the flywheel and the corresponding shaft position.

UNIT- III

- Q.3 (a) State the Law of Gearing and derive the same. [6]
- (b) A pinion of 32 involute teeth and 4mm module drive a rack. The pressure angle is 20° . The addendum of pinion and rack is same. Find permissible value of addendum to avoid interference. Also find number of pairs of teeth in contact. [10]

OR

Q.3 The gear ratio of two spur gears in mesh externally is 4:1. The two gears in mesh have a module of 5 mm and a pressure angle of 20 degree. The pinion rotates at 180 rpm. Determine no. of teeth on pinion to avoid interference, the length of path of contact and no. of pairs of teeth in contact. [16]

UNIT- IV

- Q.4 (a) Explain construction, principle and working of a synchromesh gear box. [8]
(b) Explain the procedure to analyze sun and planet gear train. [8]

OR

- Q.4 The speed ratio of the reverted gear train (fig. 1) is to be 12. The module of gears A & B is 3.125 mm and of gears C and D is 2.5 mm. Calculate the suitable no. of teeth for gears. No gear is to have less than 24 teeth. [16]

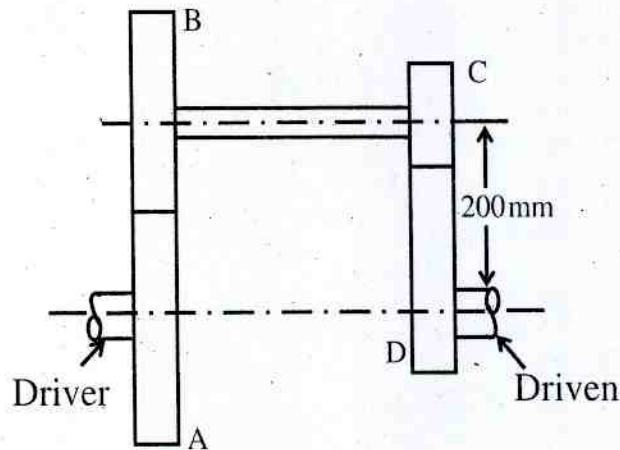


Fig.1

UNIT- V

- Q.5 (a) Explain the effect of partial balancing in locomotives. [8]
(b) Explain the concept of 'direct' and 'reverse' crank in balancing of a radial engine. [8]

OR

- Q.5 (a) 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 in a shaft are incomplete balance. Determine the angular position of the masses 12 kg and 15 kg relative to 8 kg mass. [12]
(b) Explain tractive force, swaying couple and hammer blow. [4]
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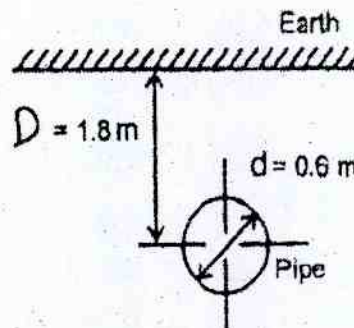
5E6201

Roll No. _____

Total No of Pages: **3****5E6201****B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021****Automobile Engineering****5AE1A Heat Transfer****Common for ME, AE****Time: 2 Hours****Maximum Marks: 48****Min. Passing Marks: 15***Instructions to Candidates:**Attempt **three** questions, selecting **one** question **each** from any three unit.**All questions carry **equal** marks. 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. Data Book2. NIL**UNIT- I**

Q.1 (a) What is Heat Transfer? Explain the modes of Heat Transfer. [8]

- (b) A long pipe of 0.6 m outside diameter is buried in earth with axis at a depth of 1.8 m. The surface temperature of pipe and earth are 95°C and 25°C respectively. Calculate the heat loss from the pipe per unit length. The conductivity of earth is 0.51 W/mK. [8]



OR

- Q.1 (a) What is Thermal Conductivity? How is it affected by temperature? [8]
- (b) A spherical shaped vessel of 1.2 m diameter is 100 mm thick. Find the rate of heat leakage, if the temperature difference between the inner and outer surfaces is 200°C . Thermal conductivity of material is $0.0833 \text{ W/m}^{\circ}\text{C}$. [8]

UNIT- II

- Q.2 (a) What is Fin? Classify it with suitable diagrams. [8]
- (b) A long carbon steel rod ($k = 40 \text{ W/mK}$) of length 40 cm and diameter 10 mm is placed in such that one of its end is 400°C and the ambient temperature is 30°C . The film co-efficient is $10 \text{ W/m}^2\text{K}$. Determine- [8]
- (i) Temperature at the mid length of the fin
 - (ii) Fin efficiency
 - (iii) Heat transfer rate from the fin
 - (iv) Fin effectiveness

OR

- Q.2 Air at 25°C flows past a flat plate at 2.5 m/s . The plate measures $600 \text{ mm} \times 300 \text{ mm}$ and is maintained at a uniform temperature at 95°C . Calculate the heat loss from the plate, if the air flows parallel to the 600 mm side. How would this heat loss be affected if the flow of air is made parallel to the 300 mm side? [16]

UNIT- III

- Q.3 (a) What is Natural Convection? Explain it with suitable diagrams of velocity and temperature distributions in the boundary layer. [8]
- (b) Explain the pool boiling regimes with suitable diagram. [8]

OR

- Q.3 (a) Explain the drop and film wise condensation. [8]
- (b) Calculate the flow velocity through a 62.5 mm ID tube for obtaining the value of convective heat transfer coefficient of $4876 \text{ W/m}^2\text{K}$ for water at a bulk mean temperature of 180°C (same as boiling with $\Delta T = 2.9^{\circ}\text{C}$). [8]

UNIT- IV

- Q.4 (a) How are heat exchangers designed? Which parameters affect it and how? [8]
(b) Explain N.T.U. method for analysis. [8]

OR

- Q.4 (a) Derive an expression for effectiveness of parallel flow heat exchanger and show its temperature distribution. [8]
(b) Water flows at the rate of 65 kg/min through a double pipe counter flow heat exchanger. Water is heated from 50°C to 75°C by an oil flowing through the tube. The specific heat of the oil is 1.780 kJ/kg K. The oil enters at 115°C and leaves at 70°C. The overall heat transfer co-efficient is 340 W/m²K. Calculate the following- [8]
(i) Heat exchanger area
(ii) Rate of heat transfer

UNIT- V

- Q.5 (a) Classify the radiations and explain them. [8]
(b) The filament of a 75 W light bulb may considered as a black body radiating into a black enclosure at 70°C. The filament diameter is 0.10 mm and length is 5 cm. Considering the radiation, determine the filament temperature. [8]

OR

- Q.5 Write short notes on-
(a) Planck Distribution law [4]
(b) Black body [4]
(c) Shape factor [4]
(d) Radiation measurement [4]
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Total No of Pages: **3**

5E1322

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

PCC/PEC Automobile Engineering

5AE4 – 02 Heat Transfer

Common for AE, ME

Time: 2 Hours

[To be converted as per scheme]

Max. Marks: 82

Min. Marks: 29

Instructions to Candidates:

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

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. Heat Transfer Data Book

2. NIL

PART – A

(Answer should be given up to 25 words only)

[10×2=20]

All questions are compulsory

- Q.1 What is “Fourier Law of Conduction”?
- Q.2 What do you mean by critical radius of insulation?
- Q.3 Define fin effectiveness and efficiency.
- Q.4 What is Biot number? What is its physical significance?
- Q.5 What is Wien’s Displacement Law?
- Q.6 Define effectiveness of heat exchanger.
- Q.7 Define a geometrical or shape factor.
- Q.8 How are heat exchangers classified?
- Q.9 Define Nusselt number, Prandtl number and Grashof number.
- Q.10 What is Lumped Capacity?

PART – B

(Analytical/Problem solving questions)

[4×8=32]

Attempt any four questions

- Q.1 Heat is conducted through a tapered circular rod of 200mm length. The ends A and B having diameters 50mm and 25mm are maintained at 27°C and 227°C respectively. $K = 40\text{W/mK}$ (rod material). Find the heat conducted through the rod.
- Q.2 One end of a long rod 3cm diameter is inserted into a furnace with the other end projecting into the outside air. Once the steady state is reached, the temperature of the rod is measured at two points, 15cm apart and found to be 140°C and 100°C, when the atmospheric air is at 30°C with convection coefficient of $20\text{W/m}^2\text{K}$. Calculate the thermal conductivity of the rod material.
- Q.3 Water at 50°C enters 1.5cm diameter and 3m long tube with a velocity of 1.5 m/s. The tube wall is maintained at 100°C. Calculate the heat transfer coefficient if the water exit temperature is 70°C.
- Q.4 A vertical plate 0.3m wide and 11m high is maintained at 70°C and exposed to saturated steam at 100 kPa. Calculate the heat transfer rate and mass flow rate of the condensate.
- Q.5 The spectral emissivity function of an opaque surface at 1000K is approximated by-
- $$\epsilon_{\lambda} = \begin{cases} \epsilon_1 = 0.4 & ; \quad 0 \leq \lambda \leq 2\mu\text{m} \\ \epsilon_2 = 0.7 & ; \quad 2\mu\text{m} \leq \lambda \leq 6\mu\text{m} \\ \epsilon_3 = 0.3 & ; \quad 6\mu\text{m} \leq \lambda < \infty \end{cases}$$
- Calculate average emissivity and emissive power of the surface.
- Q.6 A solid cylinder (Surface-2) is located at the centre of a hollow sphere (surface-1). The diameter of the sphere is 1m, while the cylinder has a diameter and length of 0.5m each. Determine radiation view factor F_{11} .
- Q.7 Water is boiled at 150°C in a boiler by hot exhaust gases ($C_p = 1.05\text{ kJ/kgK}$) that enter the boiler at 550°C at a rate of 0.5kg/s and leaves at 200°C. The surface area of the heat exchanger is 0.64m^2 . Determine the overall heat transfer coefficient of heat exchanger.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

- Q.1 A 50mm thick large steel plate ($k = 45 \text{ W/mK}$, $\alpha = 0.04 \text{ m}^2/\text{s}$) initially at 425°C is suddenly exposed on both sides to an environment with convective heat transfer coefficient $285 \text{ W/m}^2\text{K}$ and temperature 65°C . Determine the centre line temperature, and temperature inside the plate 12.5 mm from the midplane after 3 minutes.
- Q.2 Derive expressions for temperature distribution and heat dissipation in straight uniform cross section fin for infinite long fin.
- Q.3 Derive an expression for temperature distribution during steady state heat conduction in a solid sphere with internal heat generation and exposed to convection environment.
- Q.4 Derive an expression for effectiveness of parallel flow heat exchanger by NTU method.
- Q.5 Derive general heat conduction equation in Cartesian coordinates.
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5E6203

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Total No of Pages: 2

5E6203

B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021

Mechanical Engineering

5ME3A Measurement and Metrology

Common for ME, PI

Time: 2 Hours

Maximum Marks: 48

Min. Passing Marks: 15

Instructions to Candidates:

*Attempt **three** questions, selecting **one** question each from any three unit.*

*All questions carry **equal** marks. 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. NIL

2. NIL

UNIT- I

Q.1 (a) Explain Sensitivity and Readability with suitable examples. [8]

(b) What is the concept of measurement? Explain the needs for measurement. [8]

OR

Q.1 (a) Differentiate between the accuracy and precision with suitable examples. [8]

(b) Describe the various types of errors in measurement. [8]

UNIT- II

Q.2 (a) Explain with a neat diagram the measurement of straightness using autocollimator. [8]

(b) Explain Gauge design and application of limit Gauges. [8]

OR

Q.2 (a) Explain the optical system in a mechanical optical comparator. What are its advantages when compared to a mechanical comparator? [12]

(b) What are the advantages of electrical comparator? [4]

UNIT- III

Q.3 Write short notes on –

- (a) Screw Thread Measurement [4]
- (b) Roundness Measurement [4]
- (c) Straightness Measurement [4]
- (d) Flatness Measurement [4]

OR

Q.3 Name and discuss the various elements of the spur gear which are checked for accuracy of the gear. Also explain the constant chord method. [16]

UNIT- IV

Q.4 (a) Distinguish between the following with respect to CMM probes – [10]

- (i) Contact and non-contact probes
- (ii) Hard and soft probes

(b) Explain the Laser based distance measuring instruments. [6]

OR

Q.4 (a) Explain the construction details of column type CMM. [10]

(b) What is the laser interferometry? Explain the use of laser in interferometry. [6]

UNIT- V

Q.5 (a) Explain the various types of dynamometer with a neat sketch. [10]

(b) What is the difference between static and dynamic torque? Explain with suitable examples. [6]

OR

Q.5 (a) What does Bourdon tube measure? Why are Bourdon tubes elliptical-shaped?

What are the advantages and limitations of Bourdon tube? [10]

(b) How is measuring of force using load cell done? Explain. [6]

5E1323

Roll No. _____

Total No of Pages: 4

5E1323

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

PCC/PEC Automobile Engineering

5AE4 – 03 Manufacturing Technology

Common for AE, ME

Time: 2 Hours

[To be converted as per scheme]

Max. Marks: 82

Min. Marks: 29

Instructions to Candidates:

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

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only)

[10×2=20]

All questions are compulsory

- Q.1 Why metal removal process is the most expensive among other manufacturing processes?
- Q.2 Explain the term “Machine Tool” and how it is different from a machine?
- Q.3 Classify various metal removal processes.
- Q.4 What is rake angle? How does it affect the cutting process?
- Q.5 Compare high speed steel and cemented carbide cutting tool materials.
- Q.6 Explain the effect of temperature of cutting on the tool life.
- Q.7 What are different functions of cutting fluids?
- Q.8 What is the function served by a lead screw in a machine tool?
- Q.9 What is magnetic pulse forming?
- Q.10 Enlist the factors affecting machinability.

PART – B

(Analytical/Problem solving questions)

[4×8=32]

Attempt any four questions

- Q.1 Explain the chip formation process and types of chips with neat diagrams.
- Q.2 Derive an expression of shear force in orthogonal cutting with neat figures.
- Q.3 Write a short note on ceramic cutting tool material.
- Q.4 Estimate the actual machining time required for the component (C steel) as shown in figure -1 using a centre lathe. The available spindle speeds are 70, 110, 176, 280, 440, 700, 1100, 1760 and 2800. Use a roughing speed of 30 m/min and finish speed of 60 m/min. The feed for roughing is 0.24 mm/rev while that for finishing is 0.10 mm/rev. The maximum depth of cut for roughing is 2 mm. Finish allowance may be taken as 0.75 mm. Blank to be used for machining is 50 mm in diameter. Assume over travel of tool as 2 mm.

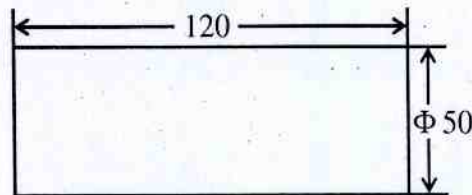


Figure –1(Blank)

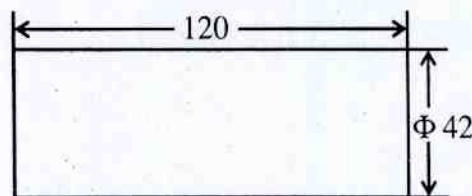


Figure – 2 (Finished component)

- Q.5 Why chucks are used? List various types of chucks used in lathes. Describe any one with neat sketch.
- Q.6 What is a drill? List various types of drills used. Describe any two types of drills with neat sketches.
- Q.7 Compare grinding, honing and lapping.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [2×15=30]

Attempt any two questions

Q.1 What is a milling machine? Describe working principle and various parts of horizontal knee and column type milling machine with diagram.

Q.2 Describe working principle of electro – hydraulic forming process with neat diagram. What are advantages and limitations of it? Also give application.

Q.3 A 600 mm long job of 150 mm diameter of AISI 4140 steel is to be turned with a depth of cut of 1.5 mm and a feed rate 0.25 mm/rev. The following data is applicable for the problem:

Labour cost per hour = ₹ 12.00, Machine overhead per hour = ₹ 40.00, Grinding cost per hour = ₹ 15.00, Grinding machine overhead per hour = ₹ 50.00 and Idle time = 5 minutes. The Taylor's tool life equation is given by $VT^{0.22} = 475$. The operation can be carried out using tungsten carbide tools either as brazed tools or throwaway tools.

For brazed tools:

Initial cost = ₹ 60.00, Grinding time = 5 minutes/edge, Tool change time = 2 minutes. 9 grinds per tool before salvage.

For Throwaway tips:

Initial cost = ₹ 40.00, Tool change time = 1.5 minutes, Total cutting edges = 8.

Find the optimum cutting speed, tool life and the cost of operation for both the brazed tip and throwaway type using the following criteria:

- (a) Minimum production cost and
- (b) Maximum production rate.

Q.4 (i) Find the time required for taking a complete cut on a plate $600 \times 900 \text{ mm}^2$, if the cutting speed is 9m/min. The return time to cutting time is 1:4 and the feed is 3mm for the shaper. The clearance at each end is 75 mm.

(ii) A hole of 30 mm diameter and 75 mm depth is to be drilled. The feed is 1.3 mm/rev and the cutting speed is 62 m/min. Assuming tool approach and tool over travel as 6 mm. Calculate :

(a) Cutting time and

(b) Material removal rate

Q.5 Write short note on the following –

(i) Up milling and down milling processes

(ii) Balancing of grinding wheels

(iii) Gear hobbing

5E6204

Roll No. _____

Total No of Pages: **4****5E6204****B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021****Mechanical Engineering****5ME4A Quality Assurance and Reliability****Time: 2 Hours****Maximum Marks: 48****Min. Passing Marks: 15***Instructions to Candidates:**Attempt **three** questions, selecting **one** question each from any three unit.**All questions carry **equal** marks. 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. NIL2. NIL**UNIT- I**

Q.1 (a) What is the meaning of Quality of Conformance? Explain the various factors which influence the Quality of Conformance. [4+4=8]

(b) How do you know the Cost of Quality and the Value of Quality? How to balance them? [4+4=8]

OR

Q.1 (a) The following table shows a typical data on measurement of weight in grams- [4+4=8]

Measurement	Frequency	Measurement	Frequency	Measurement	Frequency
148	1	142	22	136	4
147	5	141	8	138	5
146	3	140	15	135	2
145	12	139	7	134	1
144	7	138	8	133	2
143	4	137	19	132	3

(i) Compute \bar{X} and σ for this distribution.

(ii) What percentage of normal distribution having \bar{X} and σ would fall between the specification limits of 136.5 and 143.5?

- (b) A controlled manufacturing process is 0.3% defective. What is the probability of taking 2 or more defectives from a lot of 100 pieces? [4+4=8]

- (i) By using Binomial distribution
(ii) By using Poisson Approximation

UNIT- II

- Q.2 (a) Define the term "Statistical Quality control". Explain merits, demerits and industrial applications of Statistical Quality Control. [4+4=8]

- (b) Plot the control charts for \bar{X} and R, using the following sample data and a sample size 5. From the chart find out whether the process is in control - [8]

\bar{X}	5.004	5.204	5.014	5.008	5.009	5.016	5.030	5.010	5.016	5.010
R	0.02	0.08	0.03	0.05	0.04	0.09	0.04	0.04	0.05	0.07

OR

- Q.2 (a) With regard to control chart for variables - [8]

- (i) How is the population change recognized?
(ii) How should the items which make up a single sample be selected?
(iii) How should the frequency of sample be taken?
(iv) How does the firm decide where these charts should be applied?

- (b) A sub group of 5 items each are taken from a manufacturing process at a regular interval. A certain quality characteristic is measured and \bar{X} R values computed. After 25 subgroups it is found that $\Sigma \bar{X} = 357.50$ and $\Sigma R = 8.80$. If the specification limits are 14.40 ± 0.40 ; and if the process is in control then what conclusion can you draw about this process to produce items within specifications? [8]

UNIT- III

- Q.3 (a) What is meant by process capability? How will you determine the same? Show how assignable causes of variation are identified on \bar{X} and R chart. [6]
- (b) A fair percentage of certain product requires costly rework operations to change a certain quality characteristic after the product has been rejected by the manufacturer's 100% final inspection. Rework is possible whenever the value of this quality characteristic falls above the upper specification limit. If the value falls below the lower specification limit, the product must be scrapped. \bar{X} and R control charts have been initiated and maintained for 50 subgroups of 5 each with samples taken from production every 2 hours. The specification requirements for measured quality are 119 ± 10 and σ' of 5. On the assumption that the quality characteristic is normally distributed, approximately what percentage of defective product is being produced? How much can it be reworked? [10]

OR

- Q.3 (a) (i) Outline the theory underlying control charts for fraction defectives. [6]
- (ii) State and explain the conditions favorable for economic use of control charts for defects per unit.
- (b) A p-chart is to be used to analyze the September record for 100% inspection of certain radio transmitting tubes. The total number inspected during this month was 2,196 and the total number of defectives were 158. Compute \bar{p} . Compute individual 3 σ limits for the following 3-days and state whether the fraction defective falls within control limit for each day. [10]

Date (September)	Number inspected	No. of defectives
14	54	8
15	162	24
16	213	3

UNIT- IV

- Q.4 (a) (i) What is the quality Audit? Name and describe the various types of quality audits. [4]
- (ii) What do you mean by the term “field complaints”? State the significance of field complaints in quality assurance function. [4]
- (b) (i) State and explain the advantages and limitations of acceptance sampling over 100% inspection. [4]
- (ii) Compare Random Sampling and Stratified Sampling. [4]

OR

- Q.4 Explain the various sampling plans which are practiced in industry with their respective acceptance criteria. [16]

UNIT- V

- Q.5 Discuss Taguchi's philosophy for quality improvement. Discuss his loss function and its contribution. [16]

OR

- Q.5 (a) Explain the bath tub curve for any product. [8]
- (b) Define Reliability. Explain procedures that improve the reliability of a system [8]

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5E1324

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

PCC/PEC Automobile Engineering

5AE4 – 04 Design of Machine Elements - I

Common for AE, ME

Time: 2 Hours

[To be converted as per scheme]

Max. Marks: 82

Min. Marks: 29

Instructions to Candidates:

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

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. Design Data Book

2. NIL

PART – A

(Answer should be given up to 25 words only)

[10×2=20]

All questions are compulsory

Q.1 Write the objective of course “Design of Machine Elements”.

Q.2 Write the outcome of course “Design of Machine Elements”.

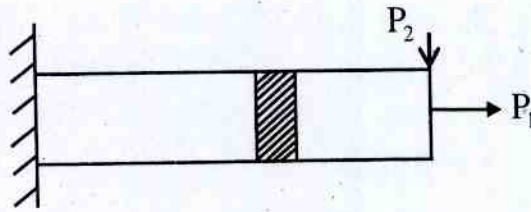
Q.3 What are the factors which govern the selection of a material for a machine component?

Q.4 Write the advantages of cast iron as an engineering material.

Q.5 What do you mean by factor of safety?

Q.6 Write the expression of stresses induced in ‘Kennedy key’.

Q.7 A beam is subjected to axial load P_1 and bending load P_2 as shown in figure. Locate the critical point.



Q.8 Why hollow shaft is more preferred over the solid shaft?

Q.9 What do you mean by bolt of uniform strength?

Q.10 Why preloading is necessary in bolts?

PART – B

(Analytical/Problem solving questions)

[4×8=32]

Attempt any four questions

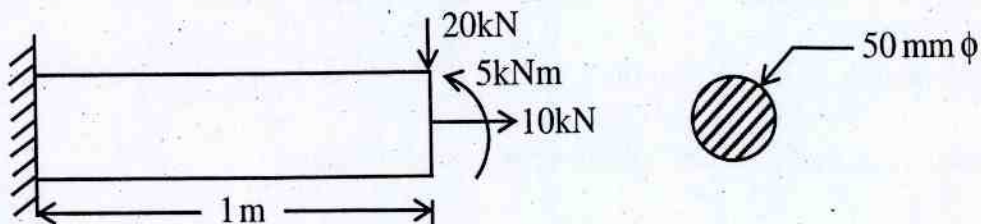
Q.1 Write the design consideration for forged parts.

Q.2 What is stress concentration? How it is mitigated?

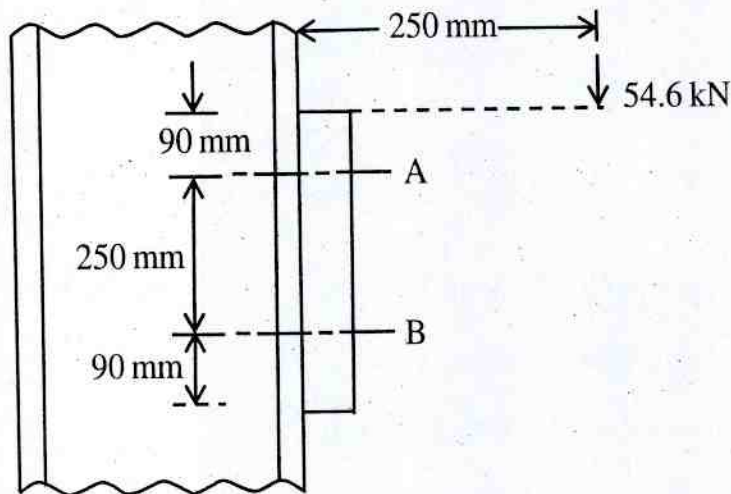
Q.3 Write the mechanical properties of materials used in the design of parts.

Q.4 The standard cross – section for a flat key, which is fitted on a 50 mm diameter shaft is 16×10 mm. The key is transmitting 475 Nm torque from the shaft to the hub and is made of commercial steel ($S_{yt} = S_{yc} = 230 \text{ N/mm}^2$). Design the key for 20% overload condition.

Q.5 Locate the critical points for beam as shown in figure.



- Q.6 A rigid coupling is used to transmit 20 kW power at 720 r.p.m. There are four bolts and the pitch circle diameter of the bolts is 125 mm. The bolts are made of steel 45C8 ($S_{yt} = 380 \text{ N/mm}^2$) and the factor of safety is 3. Determine the diameter of the bolts.
- Q.7 The hinged connection shown in figure carries a load of 54.6 kN. All components are made from steel. Determine the size of the bolts. The allowable stresses in tension and shear are 75 N/mm^2 and 60 N/mm^2 respectively. (Four bolts)



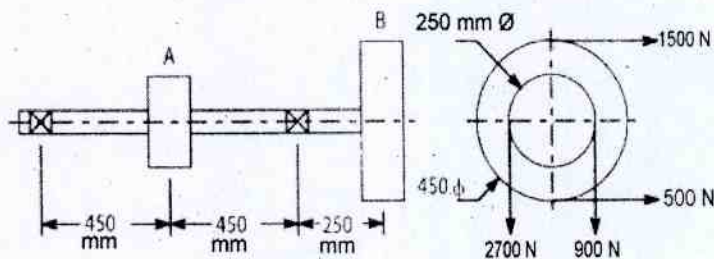
PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [2×15=30]

Attempt any two questions

- Q.1 Design a gib and cotter joint to resist safely a tensile load of 40kN. The material of the gib, cotter and rods is same for which the allowable safe stresses are:
- $\sigma_c = 60 \text{ N/mm}^2$
- $\sigma_t = 25 \text{ N/mm}^2$
- $\sigma_s = 20 \text{ N/mm}^2$
- Q.2 Write the design procedure of laminated spring.

- Q.3 A line shaft supporting two pulleys A and B are shown in figure. Power is supplied to the shaft by means of a vertical belt on pulley A, which is then transmitted to pulley B carrying a horizontal belt. The ratio of belt tensions on tight and loose sides is 3:1 and the maximum tension in either belt is limited to 2.7 kN. The shaft is made of plain carbon steel 40C8 ($S_{ut} = 650 \text{ MPa}$ and $S_{yt} = 380 \text{ MPa}$). The pulleys are keyed to the shaft. Design the shaft. Use $K_b = 1.5$ & $K_t = 1$.



- Q.4 Design a crank hook with the useful load lifting capacity of the crane as 50kN. The weight of the hook with grabbing tongs is 10kN.
- Q.5 Two shafts 100 mm diameter are to be connected by means of two cast iron couplings. The allowable shearing stress of the bolt material is 45 N/mm^2 . While that of the shaft material is 55 N/mm^2 . Find the size of the bolts to be used. Check the flange for the induced crushing stress. Is it a safe stress?

5E1325

Roll No. _____

Total No of Pages: 2

5E1325

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021
PCC/PEC Mechanical Engineering
5ME4 - 05 Principles of Management
Common for AE, ME

Time: 2 Hours

[To be converted as per scheme]

Max. Marks: 65

Min. Marks: 23

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and one questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only)

[5×2=10]

All questions are compulsory

- Q.1 Distinguish between Management and administration. How far is this distinction justified in your opinion?
- Q.2 Point out the distinctive contribution of Taylor to the theory of Management. Why is he regarded as the father of Scientific Management?
- Q.3 What is social audit? What are its advantages?
- Q.4 "Planning is essentially forward looking". Explain.
- Q.5 "Organization charts provide a broad picture of positions of authority and their relationships in the organization structure". Critically examine the statement.

PART – B

(Analytical/Problem solving questions)

[4×10=40]

Attempt any four questions

- Q.1 Describe a matrix organization. What are its advantages & disadvantages?
- Q.2 Write a comprehensive note on the recruitment and selection practices in Indian Industry.
- Q.3 “The successful leader accurately understands himself, the organization, the individuals and the group he is dealing with and the broader social environment in which he operates”. Discuss with example.
- Q.4 “Budget making is primarily a planning process whereas its administration is a part of controlling”. Elaborate with example.
- Q.5 “Managers at all levels require same competence in each of the technical, human and conceptual skills, albeit with difference in emphasis”. Analyze this statement with suitable examples from your work experience.
- Q.6 Explain “Planning Premises”. List the planning premises you would have as a manufacturer of any one of the following –
Cement, Sugar, liquor.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)

[1×15=15]

Attempt any one questions

- Q.1 Are there any differences in planning, organizing, leading, controlling and coordinating between a restaurant and a food processing firm. Between a general hospital and a steel plant and between a college and a recreation club? Discuss with real life examples. [15]
- Q.2 Discuss in detail with examples, the various contrasting management practices followed by –
- (i) Dhirubhai Ambani and Ratan Tata [8]
 - (ii) Steve Jobs and Bill Gates [7]
- Q.3 Write short notes on –
- (i) Advantages of decentralization [3]
 - (ii) Empowerment [3]
 - (iii) Guidelines for effective delegation [3]
 - (iv) Training in emotional intelligence [3]
 - (v) 360 – degree appraisal [3]
-

5E6205

Roll No. _____

Total No of Pages: 2

5E6205

B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021

Production & Industrial Engineering

5PI5A Sociology and Economics for Engineers

AE, ME, PI

Time: 2 Hours

Maximum Marks: 48

Min. Passing Marks: 15

Instructions to Candidates:

*Attempt **three** questions, selecting **one** question each from any three unit.*

*All questions carry **equal** marks. 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. NIL _____

2. NIL _____

UNIT- I

Q.1 What is meant by sociology? Define structure of sociology. Write a note on caste and class of society. [16]

OR

Q.1 Write short notes on –

(a) Secularism and Communalism [8]

(b) Modernization and Globalization [8]

UNIT- II

Q.2 Differentiate between exclusion process and inclusion process. [16]

OR

Q.2 Discuss ecology and environment. [16]

UNIT- III

- Q.3 Discuss price determination under monopoly market. Prepare diagram of both short run profit & loss and long run profit. [16]

OR

- Q.3 What is meant by WPI? Write the methods of national income measurement. [16]

UNIT- IV

- Q.4 What are the various functions of Commercial Banks? [16]

OR

- Q.4 Write a note on Monetary Policy. [16]

UNIT- V

- Q.5 What are the areas where Indian economy can take growth? Discuss the structure of productive activity. [16]

OR

- Q.5 Differentiate between public sector and private sector and their role in economy. [16]

5E1326

Roll No. _____

Total No of Pages: 4

5E1326

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

PCC/PEC Mechanical Engineering

5ME5 – 11 Steam Engineering

Common for AE, ME

Time: 2 Hours

[To be converted as per scheme]

Max. Marks: 82

Min. Marks: 29

Instructions to Candidates:

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

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. Steam Tables

2. Mollier Diagram

PART – A

(Answer should be given up to 25 words only)

[10×2=20]

All questions are compulsory

- Q.1 What is power plant? What is its significance?
- Q.2 Differentiate between water tube and fire tube boiler.
- Q.3 What is the difference between safety valve and pressure relief valve?
- Q.4 What do you mean by “stagnation properties”? What is its significance?
- Q.5 How the throat pressure affect the maximum discharge through a nozzle convergent-divergent section?
- Q.6 Describe Nozzle governing briefly.
- Q.7 What is pressure compounding and velocity compounding?
- Q.8 What do mean by degree of reaction?
- Q.9 How thermal efficiency and erosion of turbine blades is influenced in Regenerative cycle as compared to Simple Rankine cycle?
- Q.10 Explain the effects of air leakage in a condenser.

PART – B

(Analytical/Problem solving questions)

[4×8=32]

Attempt any four questions

- Q.1 How are boilers classified? Explain the working of LaMont boiler with the help of suitable sketch.
- Q.2 What is the function of preheater, economizer and super-heater? Where is reheater located?
- Q.3 Why is convergent – divergent nozzle generally used in steam turbine? How will you select a nozzle for a particular type of job and how the friction affects the nozzle performance?
- Q.4 Obtain the expression for the optimum value of the ratio of blade speed to steam speed (for maximum efficiency) for a single stage impulse turbine with the help of suitable velocity diagram.
- Q.5 The total tangential force on one ring of Parson's turbine is 1200 N, when the blade speed is 100 m/s. The mass flow rate is 8 kg/s. The blade outlet angle is 20° . Determine the steam velocity at outlet from the blades. If the friction losses which would occur with pure impulse are 25% of the kinetic energy corresponding to the relative velocity at entry to each ring of blades and if the expansion losses are 10% of the heat drop in the blades, determine the heat drop per stage and the stage efficiency.
- Q.6 Steam leaves the boiler and enters the turbine at 3 MPa, 350°C . The turbine exhaust pressure is 0.08 bar. The main condensate is heated regeneratively in two stages by steam bled from the turbine at 5 bar and 1 bar respectively. Calculate masses of steam bled off at each pressure per kg of steam entering the turbine and the theoretical thermal efficiency of the cycle.

- Q.7 A surface condenser of a large steam power plant receives steam from turbine exhaust at the rate of 1500 tonnes/hr at 40°C having 88% dryness fraction. The circulating cooling water enters the condenser at 30°C and leaves at 38°C. The pressure inside the condenser is maintained at 0.078 bar. The velocity of circulating water is 2 m/s. The condenser tubes are of 25 mm OD and 1.25 mm thickness. Assume overall coefficient as 2600 W/m²/K. Show the process on T-s diagram and calculate –
- the rate of flow of cooling water
 - the rate of air leakage into the condenser shell
 - number of tubes and
 - the length of tubes

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [2×15=30]

Attempt any two questions

- Q.1 Derive the following expressions for nozzle flow –

$$\frac{dA}{A} = \frac{1}{n} \frac{dp}{p} \left(\frac{1-M^2}{M^2} \right)$$

Assuming circular cross section, calculate the inlet, throat and exit diameter for the nozzle for the following data –

Initial pressure 30 bar; initial temperature 450°C; back pressure 6 bar; nozzle efficiency 90%; initial steam velocity 60 m/s; mass flow rate 2 kg/s.

- Q.2 The nozzles in a two row velocity compounded impulse stage are 19 cm in height and extended over an arc of 76 cm. The effective angle at outlet is 16° and the specific volume of steam is 0.623 m³/kg. The main diameter of blades is 72 cm and the rotational speed 3000 rpm. The steam velocity at outlet from the nozzle is 558 m/s. The height of the second row of moving blades is 2.5 times radial height of the nozzle, i.e., 47.5 cm, the blade height increase in arithmetic progression that is $l_1 = 28.5$ cm, $l_f = 38$ cm and $l_2 = 47.5$ cm. Find the blade inlet and outlet angles assuming that the blades have an actual width of 2.54 cm and that the thickness of the outlet edge 0.0508 cm and the blade velocity coefficient $K = 0.86$. The mean circumferential pitch of the blades may be calculated by the means of Billing's formula, $S = b/2 \sin 2\beta$

Q.3 Explain the throttle governing with the help of neat sketch.

The following particulars refers to a stage of an impulse reaction turbine. Outlet angle of fixed blades = 20° , Outlet angle of moving blades = 30° , radial height of fixed blades = 20 cm, radial height of moving blades = 10 cm, mean blade velocity = 138 m/s, ratio of blade speed to steam speed = 0.625, specific volume of steam at fixed blade outlet = $1.235 \text{ m}^3/\text{kg}$. Specific volume of steam at moving blade outlet = $1.305 \text{ m}^3/\text{kg}$.

Q.4 A steam turbine gets its supply of steam at 70 bar and 450°C . After expanding to 25 bar in high pressure stages, it is reheated to 420°C at the constant pressure. Next, it is expanded in intermediate pressure stages to an appropriate minimum pressure such that part of the steam bled at this pressure heats the feed water to a temperature of 180°C . The remaining steam expands from this pressure to a condenser pressure of 0.07 bar in the low pressure stage. The isentropic efficiency of the h.p. stage is 78.5%, while that of intermediate stage and l.p. stage is 83% each. From the above data –

- (i) determine the minimum pressure at which bleeding is necessary, and sketch a line diagram of the arrangement of the plant
- (ii) sketch all the processes on T-s diagram
- (iii) determine the quantity of steam bled per kg of flow at the turbine inlet and
- (iv) calculate the cycle efficiency. Neglect pump work.

Q.5 Discuss the desirable characteristics of a working fluid in vapour power cycle. What are the advantages and disadvantages of mercury as working fluid? With the help of component diagram and T-s diagram, explain in brief, the working of Binary vapour power cycle.

5E1327

Roll No. _____

Total No of Pages: **2**

5E1327

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

PCC/PEC Mechanical Engineering

5ME5 – 12 Automobile Engineering

Common for AE, ME

Time: 2 Hours

[To be converted as per scheme]

Max. Marks: 82

Min. Marks: 29

Instructions to Candidates:

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

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only)

[10×2=20]

All questions are compulsory

- Q.1 What is the role of clutches in automobile?
- Q.2 Write the names of various parts in a single plate clutch.
- Q.3 What are the advantages of automatic transmission system over manual transmission system?
- Q.4 Explain the purpose and features of all wheel drive.
- Q.5 Draw and indicate the name of various parts of a torque tube drives (No explanation).
- Q.6 What is the role of a suspension system?
- Q.7 How battery testing help us to know about its health? Indicate only names of various parameters which can be test.
- Q.8 What chemical reaction occurs while inflating air bags? What material is used in air bags?
- Q.9 Why automotive safety is essential? Only name various safety features available.
- Q.10 What is alternator? How it gets its input power?

PART – B

(Analytical/Problem solving questions)

[4×8=32]

Attempt any four questions

- Q.1 Draw and explain various types of chassis frames. What parameter will you consider while designing chassis frame for a passenger car and a loading truck. Justify your answer.
- Q.2 Draw and explain hydraulic torque converter. Explain the effect of speed v/s slip with the help of graph.
- Q.3 Write various types of steering gear boxes. Draw and explain any two of them with suitable diagram.
- Q.4 Draw and indicate various parts in a starter motor. Why two different windings are used? Is there any capacitor in the circuit? If yes why?
- Q.5 Draw and explain the working of a fuel level indicator. What are the possible causes which may reflect wrong indication of fuel level in a passenger car? How it can be rectified?
- Q.6 Draw line diagram of automotive air conditioner system. From where and how this air conditioner took power. Name few refrigerants which are used in it.
- Q.7 Draw the diagram and write permissible range for –
- (a) Camber angle (b) Caster angle
 - (c) King pin inclination (d) Toe in and Toe out

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)

[2×15=30]

Attempt any two questions

- Q.1 Draw complete power transmission system for rear wheel drive. Indicate all the parts, its role and limitation (if any).
- Q.2 Draw differential sketch. Explain its construction and working. How will you overcome its effect when one wheel is subjected to very high slip w.r.t other?
- Q.3 Draw hydraulic power brakes with complete details. What is the role of viscosity in hydraulic braking system? How bleeding can be done in such braking system.
- Q.4 Draw and explain coil spring, leaf spring and shock absorbers with suitable applications of each. Which suspension will you prefer for bikes and why?
- Q.5 Explain the following with proper sketch –
- (a) Night Vision System (NVS)
 - (b) GPS (Global Positioning System)
 - (c) Radio Ranging
-

5E1328

Roll No. _____

Total No of Pages: 2

5E1328

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021
PCC/PEC Mechanical Engineering
5ME5 – 13 Non Destructive Evaluation & Testing
Common for AE, ME

Time: 2 Hours

[To be converted as per scheme]

Max. Marks: 82

Min. Marks: 29

Instructions to Candidates:

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

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. NIL

2. NIL

PART – A

(Answer should be given up to 25 words only)

[10×2=20]

All questions are compulsory

- Q.1 Mention the advantages of non-destructive testing over destructive testing.
- Q.2 State the principle of acoustic emission test.
- Q.3 Mention the situation, wherein the radiographic imaging is required.
- Q.4 What are the general procedure of radiography?
- Q.5 “Visual testing is inherently part of all other NDT methods.” Justify the statement.
- Q.6 Define the principle of eddy current testing for flaw detection.
- Q.7 What is B-Scan & C-Scan modes in Ultrasonic – Tests?
- Q.8 What is pressure vessel testing?
- Q.9 How do you perform flaw sizing in ultrasonic inspection?
- Q.10 Write sensitometric characteristics of X-Ray films.

PART – B

(Analytical/Problem solving questions)

[4×8=32]

Attempt any four questions

- Q.1 How Ultrasonic testing can help in medical diagnosis and inspecting welded joints?
- Q.2 What are the advantages and disadvantages of eddy current testing method?
- Q.3 Discuss in brief about skin effect.
- Q.4 Describe in brief about photographic latent image & radiation protection in X-Ray Radiography.
- Q.5 What is holography? Also explain the principles and practices of optical holography.
- Q.6 Describe the acoustic procedure for detection of material defects?
- Q.7 Write short notes –
 - (a) Ultrasonic – probes
 - (b) Industrial X – Ray films

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)

[2×15=30]

Attempt any two questions

- Q.1 Discuss the safety procedures and standards to be adopted in handling the radiography based inspection systems.
 - Q.2 With a suitable example, explain the magnetic particle wet fluorescent inspection of a crack in a casting.
 - Q.3 Explain Magnetic Particle Inspection (MPI) technique with the help of a neat sketch.
 - Q.4 Describe the film processing, interpretation and evaluation of test results in radiography testing method.
 - Q.5 Explain the following (Any three) –
 - (a) Piping NDT in casting
 - (b) Acoustic Coupling and Media
 - (c) The Spurious echoes and Noise
 - (d) Liquid penetrant testing
-

5E6207

Roll No. _____

Total No of Pages: 2

5E6207

B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021

Mechanical Engineering

5ME6.2A Automobile Engineering

Time: 2 Hours

Maximum Marks: 48

Min. Passing Marks: 15

Instructions to Candidates:

Attempt three questions, selecting one question each from any three unit.

All questions carry equal marks. 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. NIL

2. NIL

UNIT- I

- Q.1 (a) Make a neat sketch of the chassis frame of a modern car. Name the different elements and state how these elements are braced or stiffened. [8]
- (b) Explain with a neat sketch the construction and working of multi-plate clutch. [8]

OR

- Q.1 (a) State the different criterion which form the basis for the classification of brakes. [8]
- (b) Enumerate the various transfer of clutch system along with their causes and suggest suitable remedies. [8]

UNIT- II

- Q.2 (a) It is possible to make a faster climb in low gear on certain gradient than the top gear. Comment on the validity of this statement. What purpose is served by an idler gear? [8]
- (b) Draw a neat diagram of a constant mesh gear box and explain its working. [8]

OR

- Q.2 (a) What is the purpose of providing universal joint and slip joint with the propeller shaft? [8]
- (b) What are the two types of axles? How are they different from each other? [8]

UNIT- III

- Q.3 (a) Describe the construction of different types of wheels. Mention their merits and demerits. [8]
- (b) What is the importance of having correct tyre pressure? Mention the results of under inflation and over inflation of vehicle tyres. [8]

OR

- Q.3 (a) State and explain the principle of Ackerman steering mechanism. [8]
- (b) What is toe in and toe out? How much toe in is initially provided and why? [8]

UNIT- IV

- Q.4 (a) Describe with a neat sketch, the construction and operation of any alkaline battery. [8]
- (b) Enumerate the possible defects that occur in a starting system. How can they be rectified? [8]

OR

- Q.4 (a) Make a circuit diagram of coil ignition system of a motor vehicle and describe how the spark is produced at the spark plug? [8]
- (b) How is an electrical wire specified? List the desirable properties of wire used in an automobile electrical circuit. [8]

UNIT- V

- Q.5 (a) Draw the layout of the air conditioning system for a car and explain its working. [8]
- (b) Mention the different troubles that arise in the heating system of a car. State the possible causes. [8]

OR

- Q.5 (a) Explain the different safety devices in an automobile. [8]
- (b) Explain the following-
- (i) Night Vision System (NVS) [4]
- (ii) Global Positioning System (GPS) [4]
-