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## Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Theory of Machines

Time: 3 hrs.

Max. Marks: 100

**Note:** Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

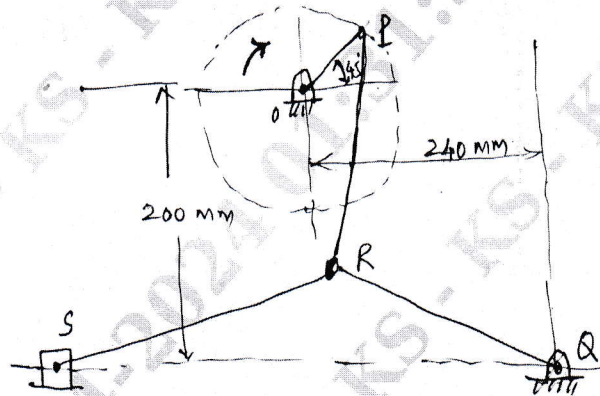
- 1 a. Define the following terms :
 

(i) Kinematic pair.	(ii) Kinematic chain.
(iii) Mechanism	(iv) Degree of freedom.
(iv) Inversion.	

(05 Marks)
- b. With neat sketch, explain any three inversions of four-bar kinematic chain. (09 Marks)
- c. A four bar chain mechanism ABCD is made up of four links, pin jointed at the ends. AD is fixed line which is 120 mm long. The links AB, BC and CD are 60 mm, 80 mm and 80 mm respectively. At a certain instant, the link AB makes an angle of  $60^\circ$  with the link AD. If the link AB rotates at a uniform speed of 10 rpm clockwise, determine angular velocity of the link BC and CD. (06 Marks)

**OR**

- 2 a. Distinguish between machine and structure. (Any four) (04 Marks)
- b. The Fig. Q2 (b) shows a toggle mechanism, Crank OP rotates at a uniform speed of 120 rpm in clockwise direction. Determine the velocity and acceleration of the slider S. The length of the various links are OP = 80 mm, PR = 180 mm, QR = 240 mm and SR = 270 mm. (08 Marks)



OP = 80 mm  
 PR = 180 mm  
 QR = 240 mm  
 SR = 270 mm

Fig. Q2 (b)

- c. Using complex algebra, determine the velocity and acceleration of the piston, angular acceleration of the connecting rod of a reciprocating engine. If the crank length is 50 mm, connecting rod 200 mm, crank speed is constant at 3000 rpm and crank angle is  $30^\circ$ . (08 Marks)

### Module-2

- 3 a. Explain the static equilibrium of two forces, three forces and member with two forces and a torque. (06 Marks)
- b. State D'Alemberts principle. When a crank  $45^\circ$  from inner dead centre on the down stroke. The effective steam pressure on the piston of a vertical steam engine is 2.5 bar. The diameter of the cylinder = 0.75 m, stroke of the piston = 0.50 m and the length of the connecting rod = 1 m. Determine the torque on the crank shaft, if the engine runs at 350 rpm and the mass of reciprocating parts is 200 kg. (06 Marks)



- c. What is fly wheel? The turning moment diagram for a multicylinder engine has been drawn to a scale of 1 mm = 600 N-m vertically and 1 mm = 3° horizontally. The intercepted areas between the output torque curve and the mean resistance line taken in order from one end are as follows : +52, -124, +92, -140, +85, -72 and +107 mm<sup>2</sup>.

When the engine is running at a speed of 600 rpm, if the total fluctuation of speed is not to exceed +1.5% of the mean. Find the necessary mass of the flywheel of radius 0.5 m.

(08 Marks)

OR

- 4 a. For the mechanism shown in Fig. Q4 (a), find the required input torque for static equilibrium. The lengths OA and AB are 250 mm and 650 mm respectively.  $F = 500$  N.

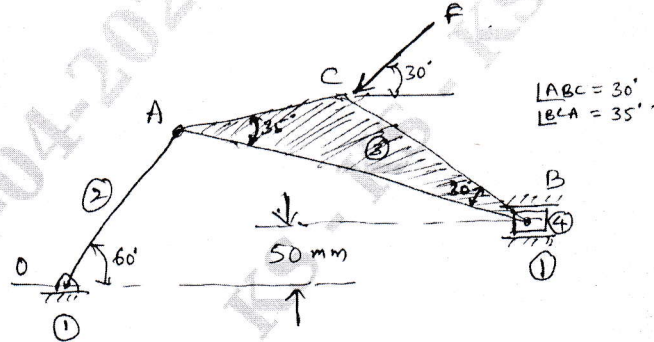


Fig. Q4 (a)

(10 Marks)

- b. The crank pin circle radius of a horizontal engine is 300 mm. The mass of reciprocating parts is 250 kg. when the crank has travelled 60° for IDC. The difference between the driving and the back pressure is 0.35 N/mm<sup>2</sup>. The connecting rod length between centres is 1.2 m and the cylinder bore is 0.5 m. If the engine runs at 250 rpm and if the effect of piston rod diameter is neglected, calculate : (i) Pressure on the slide bars (ii) Thrust in the connecting rod (iii) Tangential force on the crank pin and (iv) Turning moment on the crank shaft.

(10 Marks)

**Module-3**

- 5 a. State law of gearing. Derive an expression for the minimum number of teeth on the pinion in order to avoid interference in involute gear teeth when it meshed with wheel. (08 Marks)
- b. Two mating gears with module pitch 6 mm have 20 and 50 teeth of pressure angle 30° and addendum 6 mm. Determine the number of pairs of teeth in contact. (05 Marks)
- c. What is a Gear Train? With neat sketch, explain different types of gear trains. (07 Marks)

OR

- 6 a. With neat sketch, explain spur gear terminology. (06 Marks)
- b. Two 20° involute spur gears mesh externally to give a velocity ratio of 3. Module is 3 mm and the addendum is equal to 1.1 times the module. If the pinion rotates at 120 rpm ; determine ; Minimum number of teeth on each wheel to avoid interference. (04 Marks)
- c. An epicyclic gear train consists of a sun wheel (S) a stationary internal gear (E) and the three identical planet wheel (P) carried on a star shaped planet carrier (C). The sizes of different toothed wheels are such that the planet carrier C rotates at  $\frac{1}{5}$  of the speed of the sun wheel.

The minimum number of teeth on any wheel is 16. The driving torque on the sun wheel is 100 N-m. Determine :

- (i) Number of teeth on different wheels of train.
- (ii) Torque necessary to keep the internal gear stationary.

(10 Marks)

**Module-4**

- 7 a. Three masses of 8 kg, 12 kg and 15 kg attached at radial distance of 80 mm, 100 mm and 60 mm respectively to a disc on a shaft are in static balance. Determine the angular positions of masses 12 kg and 15 kg relative to 8 kg mass. (06 Marks)
- b. Explain why only part of unbalanced forces due to reciprocating masses is balanced by revolving masses (06 Marks)
- c. What is a governor? Derive an expression for the equilibrium speed of a porter governor. (08 Marks)

**OR**

- 8 a. A rotating shaft carries four masses 1, 2, 3 and 4 which are radially attached to it. The mass centers are 30 mm, 38 mm, 40 mm and 35 mm respectively from the axis of rotation. The masses 1, 3 and 4 are 7.5, 5 and 4 kg respectively. The axial distance between the planes 1 and 2 is 400 mm and between 2 and 3 is 500 mm. The masses 1 and 3 are at right angles to each other. Find for complete balance
- Angle between 1, 2 and 1, 4
  - Axial distance between 3 and 4.
  - Magnitude of mass 2. (10 Marks)
- b. The radius of rotation of the balls of a Hartnell Governor in 8 cm at the minimum speed of 300 rpm. Neglecting gravity effect determine the speed after the sleeve is lifted by 6 cm ; also determine the initial compression of the spring, governor effort and power. The particulars of the governor are, length of ball arm = 15 cm, Length of sleeve arm = 10 cm, Mass of each ball = 4 kg and stiffness = 25000 N/m. (10 Marks)

**Module-5**

- 9 a. Define the terms : (i) Damping (ii) Damping ratio (iii) Stiffness of the spring (iv) Logarithmic decrement. (06 Marks)
- b. Determine the natural frequency of the simple pendulum by using Newton's method. Neglecting the mass of rod. (04 Marks)
- c. Determine the critical speed when an automobile trailer is travelling over a road with sinusoidal profile of wavelength 15 meter as shown in Fig. Q9 (c) and amplitude of 75 mm. The spring of the automobile are compressed 0.125 m under its own weight. Also determine the amplitude of yibration at 50 kmph.

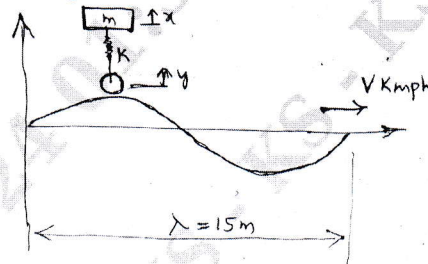


Fig. Q9 (c)

(10 Marks)

**OR**

- 10 a. Derive an expression for steady state solution with viscous damping due to harmonic force. (10 Marks)
- b. Determine the damped natural frequency for the system shown in Fig. Q10 (b). Also if  $m = 1.5$  kg,  $K = 4900$  N/m,  $a = 10$  cm and  $b = 13$  cm, determine the critical damping co-efficient 'C' for the system. (10 Marks)

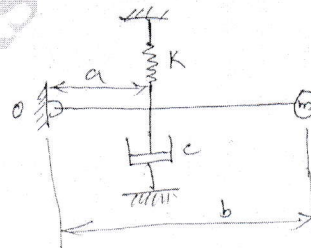


Fig. Q10 (b)

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# CBGS SCHEME

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21ME52

## Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Thermo-Fluids Engineering

Time: 3 hrs.

Max. Marks: 100

- Note:1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of thermodynamic data hand book is permitted.**

### Module-1

- 1 a. With suitable formulae, explain Morse test for measuring frictional power in an IC engine. (05 Marks)
- b. What are the parameters to be considered while framing heat balance sheet for an IC engine? (05 Marks)
- c. The following data refers to a four stroke diesel engine :  
Cylinder diameter = 200 mm,  
Stroke = 300 mm, Speed = 300 rpm,  
Effective brake load = 500 kg,  
Mean circumference of the brake drum = 400 mm,  
Mean effective pressure = 6 bar,  
Diesel consumption = 0.1 lt/min,  
Calorific value = 43900 kJ/kg,  
Specific gravity = 0.78.  
Find :  
(i) Brake power  
(ii) Indicated power  
(iii) Frictional power  
(iv) Mechanical efficiency  
(v) Indicated thermal efficiency. (10 Marks)

OR

- 2 a. Explain the procedure of conducting experiment to evaluate the performance of a reciprocating 2 stage air compressor. (06 Marks)
- b. With the help of PV diagram, derive an expression for the volumetric efficiency in terms of clearance ratio for a 2 stage reciprocating air compressor. (06 Marks)
- c. A double acting air compressor of 18 cm diameter and 120 cm stroke runs at 120 rpm and operates between 1 bar and 10 bar, the lower temperature being 15°C. Estimate the power, final temperature and temperature rise, if the compression index = 1.3. (08 Marks)

### Module-2

- 3 a. With a neat sketch, explain vapor absorption refrigerator. (06 Marks)
- b. Mention a few properties of a good refrigerant. (04 Marks)
- c. An air refrigerator was designed to produce 80 tons of refrigeration, with air entering the compressor at 8°C. The air was cooled after compression in a cooler to 27°C. It was observed that the actual power required was 20% more than theoretical power with an air circulation rate of 2 kg/s. Determine (i) The theoretical COP (ii) Actual COP (iii) Power required to run the compressor. Assume  $r = 1.4$ ,  $C_p = 1.005$  kJ/kgK for air and the cycle is ideal. (10 Marks)



OR

- 4 a. Define the terms :
- Dew point temperature.
  - Dry bulb temperature.
  - Wet bulb temperature.
  - Humidity ratio.
  - Relative humidity.
- (10 Marks)
- b. An auditorium of 150 seating capacity is conditioned for the following specifications:  
 Outdoor conditions =  $40^{\circ}\text{C}$  DBT and  $20^{\circ}\text{C}$  WBT,  
 Required indoor conditions =  $20^{\circ}\text{C}$  DBT and 60% RH.  
 Amount of outdoor air supplied =  $0.4\text{ m}^3/\text{min}$  per person.  
 If the required condition is achieved first by adiabatic humidification and then by cooling.  
 Calculate : (i) Capacity of the cooling coil in tones  
 (ii) The capacity of the humidifier in kg/min. (10 Marks)

**Module-3**

- 5 a. With a neat sketch, explain various parts of turbomachine. (06 Marks)
- b. With the proper velocity triangles derive an expression for alternate form of Euler's turbine equation. (06 Marks)
- c. The velocity of steam in a De-Laval turbine at the inlet is  $1200\text{ m/s}$ . The nozzle angle at the inlet is  $22^{\circ}$  and rotor blades are equiangular. Assuming relative velocities of the fluid at the inlet and exit to be equal and tangential speed of the rotor is  $400\text{ m/s}$ . Determine
- The blade angles at the inlet and exit.
  - Power developed if mass flow rate is  $1\text{ kg/s}$
  - Tangential force exerted on the blade ring
  - Utilization factor.
- (08 Marks)

OR

- 6 a. Compare turbomachines and positive displacement machines. (06 Marks)
- b. With a neat sketch, explain the working of a gear pump. (06 Marks)
- c. In a radial inward flow turbine, the runner outer diameter is  $75\text{ cm}$  and the inner diameter is  $50\text{ cm}$ . The runner speed is  $400\text{ rpm}$ . Water enters the runner at a velocity of  $15\text{ m/s}$  at an angle of  $15^{\circ}$  to wheel tangent at inlet. The flow is radial at exit with a velocity of  $5\text{ m/s}$ . Find the blade angles at inlet and exit. Also determine the power output for flow rate of  $1.5\text{ m}^3/\text{s}$ , degree of reaction and utilization factor. (08 Marks)

**Module-4**

- 7 a. Explain the experimental procedure to evaluate the efficiency of a Pelton wheel. (06 Marks)
- b. Derive an expression for hydraulic efficiency of a Pelton turbine. (06 Marks)
- c. The external and internal diameters of inward flow reaction turbine are  $1.2\text{ m}$  and  $0.6\text{ m}$  respectively. The head on turbine is  $22\text{ m}$  and velocity of flow through the turbine is constant and is equal to  $2.5\text{ m/s}$ . The guide blade angle is  $10^{\circ}$  and runner vanes are radial at inlet. If the discharge at outlet are radial. Determine
- Speed of turbine
  - Vane angle at outlet of runner.
  - Velocity triangles at inlet and exit
  - Hydraulic efficiency.
- (08 Marks)



OR

- 8 a. Derive expression for theoretical head capacity relationship of a centrifugal pump for different vane angles. (08 Marks)
- b. With a sketch, show different parts of a centrifugal pump. (04 Marks)
- c. A centrifugal pump is designed to run at 1450 rpm. With minimum discharge of 1800 litres/min against a total head of 20 m. The suction and delivery pipes are designed such that they are equal in size of 100 mm. If the inner and outer diameters of the impeller are 12 cm and 24 cm respectively. Determine the blade angles  $\beta_1$  and  $\beta_2$  for radial entry neglecting friction and other losses. (08 Marks)

Module-5

- 9 a. Briefly explain the terms in relation with a centrifugal compressor,  
 (i) Diffuser  
 (ii) Slip factor. (06 Marks)
- b. Derive an expression for pressure ratio of a centrifugal compressor. (06 Marks)
- c. A centrifugal compressor delivers 30 kg/s of air with a total head pressure ratio of 4 : 1. The speed of the compressor is 12000 rpm, inlet total temperature is 15 °C, stagnation pressure at inlet 1 bar, slip factor is 0.9, power input factor is 1.04, efficiency 80%. Calculate the outer diameter of the impeller. (08 Marks)

OR

- 10 a. Derive an expression for maximum blade efficiency for impulse turbine. (10 Marks)
- b. A simple impulse turbine has a mean blade speed of 200 m/s. The nozzles are inclined at 20° to the plane of rotation of the blades. The steam velocity from nozzles is 600 m/s. The turbine uses 3500 kg/hr of steam. The absolute velocity at exit is along the axis of the turbine. Determine, (i) Inlet and exit angles of blades (ii) Power output of turbine (iii) Diagram efficiency. (10 Marks)

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## Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Finite Elements Analysis

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Explain briefly the general steps involved in finite element method. (10 Marks)  
 b. Explain convergence criteria and discretization process in F.E.M. (10 Marks)

**OR**

- 2 a. Explain 1D, 2D and 3D elements in F.E.M. (10 Marks)  
 b. Explain plane stress and plane strain conditions. (10 Marks)

### Module-2

- 3 a. Derive shape functions for 1D Quadratic bar elements in natural coordinates. (10 Marks)  
 b. Derive shape functions for constant strain triangle, in natural coordinates. (10 Marks)

**OR**

- 4 A stepped bar as shown in Fig Q4. Determine the nodal displacement and stresses at each node. Take  $E = 2 \times 10^5 \text{ N/mm}^2$ .

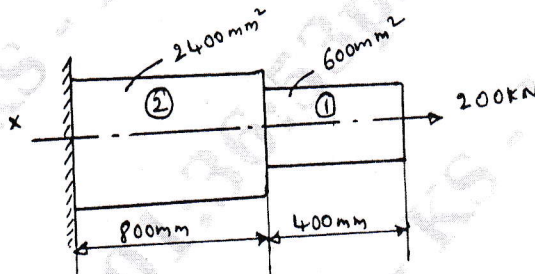


Fig Q4

(20 Marks)

### Module-3

- 5 a. Derive  $H_1$  and  $H_2$  Hermite shape functions for beam elements. (10 Marks)  
 b. A cantilever beam subjected to point load of 250kN as shown in Fig Q5(b). Determine the deflection at free end Take  $E = 200\text{GPa}$ ,  $I = 4 \times 10^6 \text{ mm}^4$ .

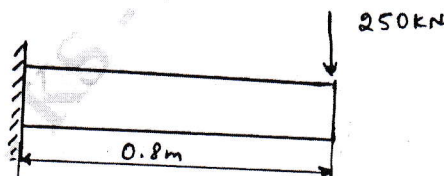


Fig Q5(b)

(10 Marks)

**OR**

- 6 a. Derive stiffness matrix equation for torsion of shaft. (10 Marks)  
 b. A solid stepped bar of circular cross section as shown in Fig Q6(b), is subjected to a torque of 1kN-m at its free end and a torque of 3kN-m at its change in C/S. Determine the angle of twist in the bar. Take  $E = 2 \times 10^5 \text{ MPa}$ ,  $G = 7 \times 10^4 \text{ MPa}$ .



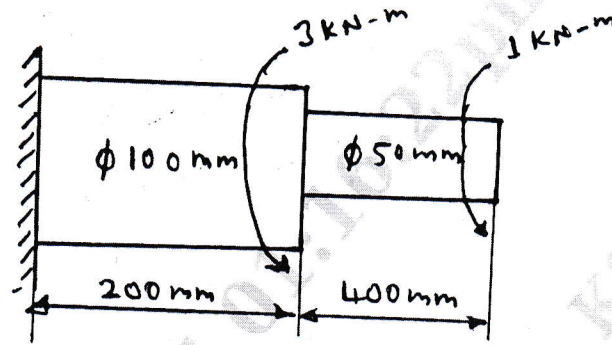


Fig Q6(b)

(10 Marks)

**Module-4**

- 7 Determine the temperature distribution in the wall using 1D heat elements. Give  $K_1 = 25\text{W/m}^\circ\text{C}$ ,  $K_2 = 35\text{W/m}^\circ\text{C}$ ,  $h = 30\text{w/m}^2\text{C}$ ,  $T_\infty = 900^\circ\text{C}$ ,  $A = \text{unit area}$ .

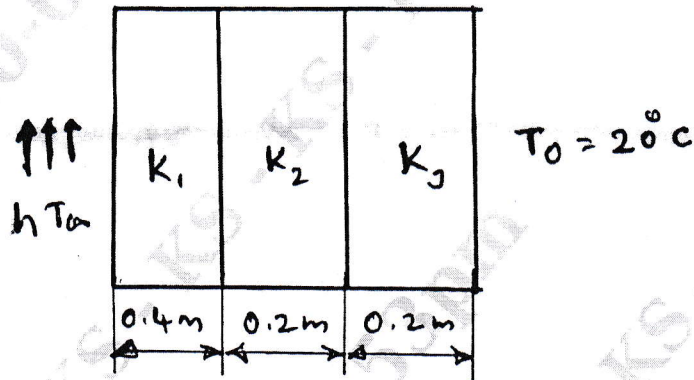


Fig Q7

(20 Marks)

OR

- 8 For smooth pipe of variable c/s shown in Fig Q8. Determine potential at junctions, Velocities in each section of pipe and volumetric flow rate. Potential at left end  $P_1 = 10\text{m}^2/\text{s}$ , right end  $P_4 = 1\text{m}^2/\text{sec}$ , fluid flow through pipe  $K_x = 1$ .

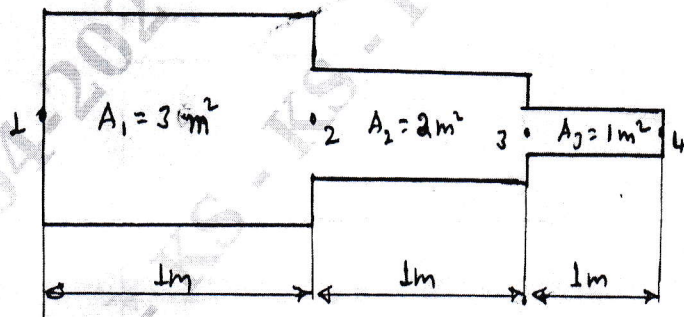


Fig Q8

(20 Marks)

**Module-5**

- 9 a. Derive stiffness, matrix of axisymmetric nodes with triangular elements. (10 Marks)  
 b. Evaluate nodal forces used to replace the linearly varying surface traction shown in Fig Q9(b)

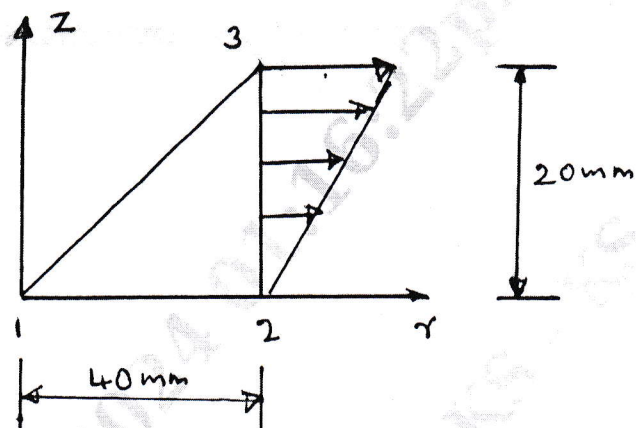


Fig Q9(b)

(10 Marks)

OR

- 10 Find Eigen values and Eigen vectors for stepped bar when it is subjected to axial vibration with fixed free end condition as shown in Fig Q10.

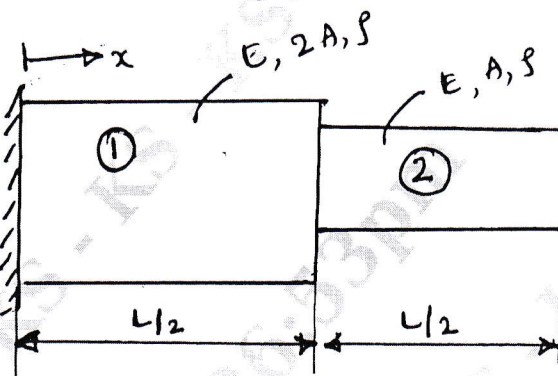


Fig Q10

(20 Marks)

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21ME54

## Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024 Modern Mobility and Automotive Mechanics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

### Module-1

- 1 a. List the components of Automotive Engine. Mention their function and materials used for manufacturing. (10 Marks)  
b. With neat sketch, explain the working of thermosyphon cooling system. (10 Marks)

OR

- 2 a. Explain dry sump lubrication system, with help of neat sketch. (10 Marks)  
b. Sketch and explain Electronic [Battery] Ignition system. (10 Marks)

### Module-2

- 3 a. With the help of neat sketch, explain Multi-Plate Clutch. (10 Marks)  
b. With neat sketch, explain Torque converter. (10 Marks)

OR

- 4 a. Explain with neat sketch about the working of synchromesh gear box. (10 Marks)  
b. With a neat sketch, explain the working principle of Air suspension system. (10 Marks)

### Module-3

- 5 a. What is Steering geometry? Define the following : i) Camber ii) Caster  
iii) King - pin inclination iv) Toe - in Toe - out. (10 Marks)  
b. What is ABS? Explain with appropriate sketch. (10 Marks)

OR

- 6 a. Explain the working of Power steering. (10 Marks)  
b. Explain about the safety terms : i) Air bags ii) Seat belt iii) Defogger and spoiler  
iv) Fire safety measures. (10 Marks)

### Module-4

- 7 a. What is Pollution? Explain the exhaust gas pollutants effects on Environment. (10 Marks)  
b. Explain about the IC engine fuels and its advantages and disadvantages. (10 Marks)

OR

- 8 a. What is CNG vehicles? Explain its operation, advantages and disadvantages. (10 Marks)  
b. With the layout of electric hybrid vehicles, explain its operation and function of transmission and control system. (10 Marks)

### Module-5

- 9 a. Explain the principle of Electric vehicles of 4 wheels. (10 Marks)  
b. What is Motor? Explain different types of motor and construction and working of any one. (10 Marks)

OR

- 10 a. Explain the construction and working of : i) lead batteries ii) sodium based batteries. (10 Marks)  
b. What are requirements of battery charging? How fire safety measuring in EV vehicles. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

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**Fifth Semester B.E. Degree Examination, Dec.2023/Jan.2024**  
**Research Methodology & Intellectual Property Rights**

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

**Module-1**

- 1 a. What is Engineering Research? What are the primary objectives of conducting research in engineering? (10 Marks)  
b. What are the various types of engineering research? Explain. (10 Marks)

**OR**

- 2 a. Explain Fabrication, Falsification and Plagiarism related to Engineering research. (10 Marks)  
b. What ethical considerations and responsibilities should be taken into account when determining authorship in Engineering research? (10 Marks)

**Module-2**

- 3 a. How do researchers distinguish between new and existing knowledge during a literature review? (10 Marks)  
b. How can researchers effectively use search engines to find relevant literature in their fields? (10 Marks)

**OR**

- 4 a. What challenges do researchers commonly face when reading mathematical content or algorithm? (10 Marks)  
b. What is impact of Title and Keywords on Citations? Explain Citation based knowledge flow. (10 Marks)

**Module-3**

- 5 a. What is definition of Intellectual Property (IP)? In what way does Intellectual Property contribute to economic growth and cultural development in a society? (10 Marks)  
b. Discuss the history of Intellectual property in India. (10 Marks)

**OR**

- 6 a. Explain the step by step process of obtaining a patent. From the initial idea to the grant of the patent. (10 Marks)  
b. What are the commonly used terms in the field of patenting and how do they contribute to effective communication in this domain. (10 Marks)

**Module-4**

- 7 a. Explain the criteria that an original work must meet to qualify for copyright protection. (10 Marks)  
b. Explain the process of copyright registration? What are the benefits for the copy right holders? (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.



OR

- 8 a. Explain the process of Trademark registration. (10 Marks)  
b. Explain the classification system for trademarks and its role in categorizing different types of marks. (10 Marks)

**Module-5**

- 9 a. Explain the process of Industrial design registration. (10 Marks)  
b. Explain the famous case law between Apple Inc Vs Samsung Electronics Co. related with Industrial Design rights. (10 Marks)

OR

- 10 a. Which specific acts, laws and rules govern geographical indications in India? Give some examples of well known geographical indications registered in India. (10 Marks)  
b. How would you describe the overall ecosystem and significance of geographical indications in India? (10 Marks)

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Question Paper Version : D

**Fifth Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan. 2024**  
**Environmental Studies**

Time: 1 hr.]

[Max. Marks: 50

### INSTRUCTIONS TO THE CANDIDATES

1. Answer all the **fifty** questions, each question carries one mark.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

- 
- 1 GIS uses the information from which of the following sources  
a) Non-Spatial Information System  
b) Spatial Information System  
c) Global Information System  
d) Position Information System
  - 2 EIA can be expanded as  
a) Environment and Industrial Act  
b) Environmental and Impact Activities  
c) Environmental Impact Assessment  
d) Environmental Impact Activity
  - 3 ISO 14000 standards deals with  
a) Pollution management  
b) Risk management  
c) Environmental management  
d) None of these
  - 4 Which of the following represents India in ISO  
a) PFRDA  
b) FSSAI  
c) BIS  
d) BCCI
  - 5 Which of the following is having high population density  
a) India  
b) China  
c) USA  
d) Western Europe
  - 6 Environment education is targeted to  
a) General public  
b) Professional social groups  
c) Technical and Scientists  
d) All of the above



- 7 Discharge of municipal waste cause  
 a) Depletion of dissolved oxygen  
 b) Destroy aquatic life  
 c) Impair biological activity  
 d) All of the above
- 8 \_\_\_\_\_ is are referred to a Earth's lungs  
 a) Forests                      b) Carbon cycle                      c) Water sources                      d) Miner
- 9 Solid waste is best managed through  
 a) Incineration                      b) Open dumping                      c) Sanitary landfill                      d) Composting
- 10 Love canal tragedy is attributed to  
 a) Soil pollution                      b) Hazardous waste                      c) Air pollution                      d) None of these
- 11 Disaster management includes \_\_\_\_\_  
 a) Mitigation                      b) Reconstruction                      c) Rehabilitation                      d) All of these
- 12 What is the health effects of fluoride in drinking waster  
 a) Arthritis                      b) Diarrhea                      c) Anemia                      d) All of these
- 13 What is the permissible range of pH for drinking water as per Indian standards  
 a) 6 – 9                      b) 6 – 8.5                      c) 6.5 – 8.5                      d) 6.5 – 7.5
- 14 The infiltration of water into the subsurface is the  
 a) Influent                      b) Effluent                      c) Discharge                      d) Recharge
- 15 Environmental (Protection Act) was enacted in the year  
 a) 1986                      b) 1992                      c) 1984                      d) 1974
- 16 What is the full form of NGO  
 a) Non-Governmental Organization  
 b) Non-Governance Organizations  
 c) No- Governance Organizations  
 d) Null – Governmental organizations
- 17 The primary cause of acid rain around the world is  
 a) CFC                      b) SO<sub>2</sub>                      c) CO                      d) O<sub>3</sub>
- 18 Bhopal Gas Tragedy caused due to leakage of  
 a) Methyl ISO Cyanate (MIC)                      b) Sulphur dioxide  
 c) Mustered gas                      d) Methane
- 19 Deforestation can  
 a) Increase the rainfall  
 b) Increase soil fertility  
 c) Introduce silt in the river  
 d) None of the above
- 20 The word Environment is derived from  
 a) Greek                      b) French                      c) Spanish                      d) English
- 21 According to Biomedical Waste (Management and Handling) Rules 1998, waste should not be stored beyond \_\_\_\_\_  
 a) 12 hours                      b) 48 hours                      c) 72 hours                      d) 96 hours

- 22 Pyrolysis is an \_\_\_\_\_ process  
a) Exothermic                      b) Endothermic                      c) Both a and b                      d) Neither a and b
- 23 Chlorofluorocarbons are  
a) Nontoxic                      b) Flammable                      c) Corrosive                      d) Odorous
- 24 Which of the following is an air pollutant  
a) Carbon dioxide                      b) Oxygen                      c) Nitrogen                      d) Particulate matter
- 25 Urbanization is  
a) Local environmental issue  
b) Nation environmental issue  
c) Both a and b  
d) Not at all an issue
- 26 Earth day is held every year on :  
a) June 5<sup>th</sup>                      b) November 23<sup>rd</sup>                      c) April 22<sup>nd</sup>                      d) January 26<sup>th</sup>
- 27 The term hotspot was introduced by –  
a) Norman Myere                      b) Jacob Von Verkul  
c) A.G. Transley                      d) Ernst Haeckel
- 28 In an Ecosyste, the energy flow is always  
a) Always unidirectional  
b) Always bidirectional  
c) In any direction  
d) Always down directional
- 29 Which of the following is considered as an alternate fuel  
a) CNG                      b) Kerosene                      c) Coal                      d) Petrol
- 30 Nuclear power plant in Karnataka is located at  
a) Bhadravati                      b) Sandur                      c) Raichur                      d) Kaiga
- 31 The main cause of damage to Taj Mahal is \_\_\_\_\_  
a) Water pollution                      b) Soil pollution                      c) Acid rain                      d) Fog
- 32 Reducing the amount of future climate change is called.  
a) Mitigation                      b) Geo-engineering                      c) Adaptation                      d) None of these
- 33 Ozone layer is at a height of \_\_\_\_\_ above the Earth's surface  
a) 19 to 48m                      b) 19 to 480m                      c) 19 to 48km                      d) 190 to 480km
- 34 Which ministry is mainly responsible for research and development in renewable energy sources such as wind, power small hydro, biogas and solar power  
a) Human Resource Development  
b) Agriculture and Famous welfare  
c) Ministry of new and Renewable energy  
d) Health and Family welfare
- 35 The OTEC is an energy technology that converts  
a) Energy in large fides of ocean to generate electricity  
b) Energy in ocean waves to generate electricity  
c) Energy in ocean due to thermal gradient to generate electricity  
d) Energy in the fast moving ocean currents to generate electricity



- 36 In a Lake, phytoplankton grow in abundance in  
 a) Littoral zone                      b) Limnetic zone                      c) Profundal zone                      d) Benthic region
- 37 The prescribed limits of noise in residential area during day is  
 a) 55dB                                      b) 45dB                                      c) 60dB                                      d) 50dB
- 38 The maximum allowable concentration of fluorides in drinking water  
 a) 3mg/L                                      b) 2mg/L                                      c) 2.5mg/L                                      d) 1.5mg/L
- 39 The color code of plastic bag for disposing microbial laboratory culture waste  
 a) Red    b) Black    c) Blue    d) White
- 40 The hazardous pollutant released from batteries is  
 a) Arsenic                                      b) Cobalt                                      c) Barium                                      d) Cadmium
- 41 Biodiversity is a measure of variation at the \_\_\_\_\_ level  
 a) Genetic                                      b) Species                                      c) Ecosystem                                      d) All of these
- 42 World Environment Day is celebrated on \_\_\_\_\_  
 a) 5<sup>th</sup> May                                      b) 5<sup>th</sup> June                                      c) 18<sup>th</sup> June                                      d) 16<sup>th</sup> August
- 43 Mining means  
 a) To conserve minerals                                      b) To check pollution  
 c) To extract minerals and ores                                      d) None of these
- 44 Direct conversion of solar energy is attained by  
 a) Solar Photo volcanic system  
 b) Solar diesel hybrid system  
 c) Solar thermal system  
 d) Solar air heater
- 45 What % of its geographical area of a country should be under forest cover  
 a) 23%                                      b) 43%                                      c) 13%                                      d) 33%
- 46 Hazardous Waste Management Act was enacted in India in the year  
 a) 1988                                      b) 1989                                      c) 1990                                      d) 1991
- 47 Which of these following elements is the case of e-waste?  
 a) Cadmium                                      b) Beryllium                                      c) Lead                                      d) All of these
- 48 Remote sensing techniques make use of the properties of \_\_\_\_\_ emitted, reflected or diffracted by the sensed objects  
 a) Electric waves                                      b) Sound waves  
 c) Electromagnetic waves                                      d) Wind waves
- 49 The altitudinal distance of a geostationary satellite from the earth is about  
 a) 26,000km                                      b) 30,000km                                      c) 36,000km                                      d) 44,000km
- 50 Montreal protocol is related to the  
 a) Food security                                      b) Global warming  
 c) Sustainable development                                      d) Ozone layer depletion

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